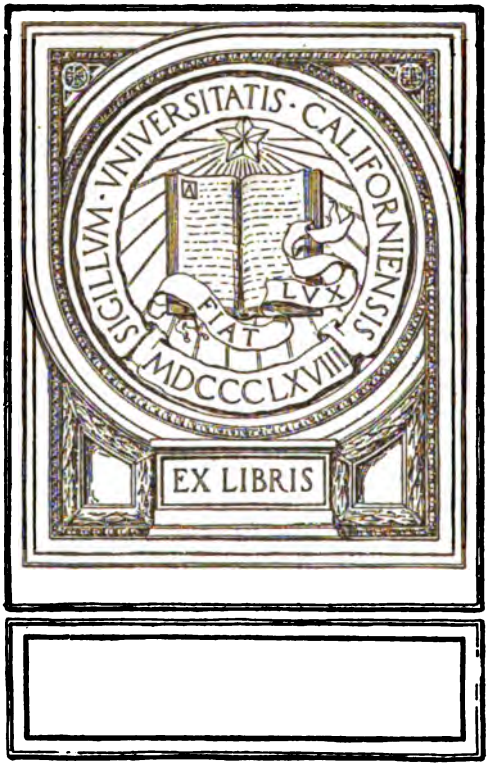

PRACTICAL BUSINESS FORECASTING

BY

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TO
F. M. R.

INTRODUCTION

The estimation of future business involves problems which confront every individual engaged in commerce. The large industrial corporation is compelled to look far into the future in order to keep pace with the increasing demand for its products. Smaller enterprises, interested less seriously in the outlook for the next year and the years beyond, are compelled by competitive conditions to study immediate prospects if they are to operate profitably. Despite a universal interest in the subject, literature in this field has been decidedly limited.

Estimating future business, as understood by the author of this book, is not the same thing as "business forecasting" in the popular sense of the latter term. The general impression prevails that business forecasting is an attempt to foretell the trend of economic conditions some six to twelve months in advance. Such forecasts, known as cyclical estimates because they involve the application of the "business cycle" theory, do not comprise the entire field of estimating for the future. In many cases, the probable fluctuations in general activity affect only slightly the problem; and, in some instances, the influence of the cycle is completely ignored. That which is widely understood by the term "business forecasting" is in reality only part of the more comprehensive field of future business estimating.

Business forecasting has come into a certain disrepute, due partly to this erroneous conception of its true function, and partly to unwarranted claims as to its utility. It is not a way by which the future can be accurately measured, since it can never represent more than a rough approximation of probable events. It does not provide an unqualified basis for the determination of future policy. It does indicate the direction that such policy should take, but always with the assumption that sufficient flexibility is present to meet the unexpected.

The progress made thus far in the field of future business estimating has failed to satisfy those only who are impatient for definite success in a field where complete accuracy will

always be unattainable. Development must naturally be slow in any field of research where knowledge comes chiefly from experience and where experience is often contradictory. But the fact that practically every large company in the country is now doing at least some work along this line is evidence that the occult interpretation of business forecasting is rapidly disappearing.

A book upon the subject at this time can be little more than a milestone on a road which has but recently been charted. This volume aims to be a concise survey of accepted principles as distinguished from debatable theories. It endeavors to show actual practices as contrasted with hypothetical problems. It would be a composite answer to the question of how American business is trying to plan intelligently for the future.

The material used in the preparation has been gathered from many sources. Whenever possible, definite credit has been shown in the text. In general the author desires to express acknowledgment:

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The original charts herein were prepared by Bernard Broudy, a former student in the Graduate School of Business Administration at New York University.

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CHAPTER I

THE FIELD OF FORECASTING

Business forecasting.—Business forecasting may be defined as being the preparation of future business estimates. In every business, large or small, some idea of probable economic developments must be formed if future plans are to be laid intelligently. Even those business men who feel that future conditions cannot be foretold with a reasonable degree of accuracy are required to make some estimate in the conduct of their own affairs.

The degree of accuracy which can be secured in these forecasts naturally depends upon the nature of the problem. If the desired information is the output of pig iron in the United States over the next five years, an estimate can readily be prepared which will be approximately correct. But if the problem covers the probable production of motor cars in 1930, the answer must be more or less in the nature of a guess.

The intelligent business man appreciates the limitations of forecasting rather than condemns its possibilities. If accurate forecasting were possible, commerce would be conducted along vastly different lines. It is the unknown beyond the present horizon that makes business one of the most fascinating pursuits. Economic research will never completely penetrate the veil, but it is rapidly creating a store of knowledge of future trends from which business men can draw with profit.

Possibility of accurate forecasting.—General agreement exists that the man in business who is able to foresee developments has a decided advantage over less fortunate rivals. But a wide variance of opinion exists as to the limit to which

the future may be predetermined. The world at large is disposed to consider the future as an impenetrable mystery, quite beyond the power of ordinary humans to foretell. Yet even the most superficial examination of the achievements of men in science and in commerce is sufficient to indicate that coming events may be predicted with accuracy.

The discovery of the planet Neptune was predicted by Leverrier in France and Adams in England as a result of pure mathematical calculations—one of the greatest accomplishments of the human intellect. In fact, so certain was the prediction, that astronomers date the discovery from the time of the forecast. Halley predicted that the comet which bears his name would return in 1758, and although he knew he could not live to observe the verification of his foresight, he stated that he was content that impartial posterity would deal with him fairly. The amazing accuracy with which eclipses are foretold, and tide effects are predetermined, bear witness to the possibility of successful forecasting.

But the reader may register objection. Astronomy is such an exact science, and economics so inexact, that the analogy may not be well taken. However, there are other fields in which forecasting must constantly be employed, such as life insurance, weather reporting, crop reporting, census work, and the preparation of governmental budgets. The purpose of the remainder of this chapter will be to examine the methods employed and to verify the accomplishments, in order to ascertain the degree of accuracy with which the future has been foretold in each of these fields.

Mathematics of probabilities.—A consideration of the mathematical theory of probabilities is of interest at this point. The theory of probabilities has its foundation in the law of causality which may be stated broadly as follows:

> *Everything that happens, and everything that exists, necessarily happens or exists as the consequence of a previous state of things.*[1]

"This law cannot be proved. It must be taken, *a priori*, as an axiom; but once accepted as a truth it does away with the

[1] "The Mathematical Theory of Probabilities," Arne Fisher, p. 2.

belief of a capricious ruling power, and even if the strongest disbeliever of the law may deny its truth in theory he invariably applies it in practice during his daily occupation in life." [2]

The law of causality is the basis of all intelligent forecasting. The practical business man, unlike Macbeth, has as little faith in seers who gaze into crystal globes as he has in fortune-telling. What has happened to-day is the result of the events of yesterday and the days before; what will happen to-morrow will be the effect of causes presently operating. The problem of successful forecasting resolves itself, therefore, into the apparently less difficult task of properly appraising existing forces.[3]

The mathematics of probabilities offers but limited assistance to the predetermination of economic developments, however. Its domain includes only those cases where all possible happenings are known in advance, and where no particular happening will occur in preference to any other. It is a study of pure chance, and originated with the problems of gambling. In economics, its most important function is its service in the field of insurance. In other branches of industry, the application of the theory is attendant with considerable risk.[4]

In business, conditions are not opportune for a general application of the theory of mathematical probability. Human intellect has not thus far developed the capacity simultaneously to comprehend and properly to coördinate all the possible happenings in the economic activity of the world, even were those events "equally likely" to occur—a hypothesis contrary to established belief.

Astronomical predictions.—So great is public confidence that the predictions of the astronomers (as sharply distin-

[2] "The Mathematical Theory of Probabilities," Arne Fisher, p. 2.

[3] "Consider how all events are interconnected. When we see the lightning, we listen for the thunder; when we hear the wind, we look for the waves on the sea; in the chill autumn, the leaves fall. Everywhere order reigns, so that when some circumstances have been noted we can foresee that others will also be present."—A. N. Whitehead, "An Introduction to Mathematics," p. 11.

[4] "The theory has been applied freely, and, in many cases, rashly, too little attention having been paid to the fact that its applications really lie in the domain of those events whose occurrences may properly be compared to the drawings of balls from a bag."—"The Americana," Vol. 22, p. 624.

guished from the astrologers)[5] will be verified, that they are accepted with the same assurance that one feels toward sunrise on the morrow. The startling accuracy with which the astronomers predict eclipses, comets, and tides is based upon the mathematical application of Newton's law of gravitation, which is a specific illustration of the law of causality. The astronomers measure the causes, and their accuracy in predicting the effect reflects the completeness with which they have taken into consideration existing forces. But even the astronomers err at times. Halley's Comet reached perihelion on April 20, 1910, differing by 2.7 days from the predictions. The percentage of error was less than 1-100 of 1 per cent, which was ascribed to the existence of forces which are not pure gravitation, and which, therefore, could not be measured.

The prediction of tidal movements is fully as remarkable as that of eclipses and comets. The movement is fairly uniform in some parts of the world, but in other regions the irregularity is marked even from day to day. The method employed in predetermining the Indian tides is of especial interest:

> Along the coasts of the British Isles the tides are somewhat exceptional, in that the two tides each day are approximately of the same height. In consequence the tides are not very difficult to predict with fair accuracy by the use of rather rough and ready methods. In other parts of the world—India, for example—the two successive tides are very unequal, and they vary apparently very irregularly. Far more scientific procedure is then required to predict the tides with the accuracy demanded by navigators in the eastern seas. First, the tides, for a series of years, must be observed at various ports. Then the observed tidal curve must be analysed into its separate components by the method known as harmonic analysis. When that is done, the tides for future years can be predicted by the beautiful machine, the property of the Government of India, which used to stand in the Museum at South Kensington, and is now in the National Physical Laboratory at Bushby House. Every year a series of pulley wheels in this machine are set to execute the oscillations prescribed for them by the results of the analysis. A cord passes over the entire series and carries a pen at the end. The machine is set in motion, and the pen, actuated by the combined

[5] Astronomy is a study of the celestial bodies, independent of occurrences on the earth; astrology endeavors to associate occurrences on the earth with the position of the stars. Astrology is a delusion, not a science.

motion of all the pulleys, draws in a few hours the predicted curves for the year, one after the other for the principal Indian ports.[6]

That forecasting has developed into a science in certain fields whereby it is actually accomplished by machinery will prove a revelation to business men who believe the future is "with the gods alone."

Life insurance forecasting.—The ability of life insurance companies to predetermine from year to year the amounts which they will be called upon to pay in death claims has long been a subject for favorable comment in commercial circles. The solvency of the institutions, as well as the determination of the amount of the premium charge, depends upon an accurate estimate of the obligations which arise from month to month. The fact that the amount of these obligations depends directly upon the apparently uncertain life tenure of the policyholders would seem to make the problem of the insurance companies infinitely more difficult than that of the ordinary commercial enterprises whose obligations appear to have a greater element of definitiveness. An inquiry into the method employed by the life insurance companies in anticipating their obligations, and the extent to which they have been successful, is of interest.

Practically all of the United States life insurance companies estimate their anticipated death claims from the American Experience Table of Mortality which is shown, though in a somewhat abridged form, on page 8. This table was compiled about 1870 and is supposed to represent the actual experience of one of the larger American companies during the preceding years.[7]

An investigation conducted by The Actuarial Society of America in 1918 reviewed the actual experience of the principal American life insurance companies during the years 1900 to 1915 inclusive, based on policies issued from 1843 to 1914 inclusive. The result is shown in the table on page 9.

[6] Arthur R. Hinks, "Astronomy," p. 59.

[7] The table was compiled in 1868 by Sheppard Homans of the Mutual Life of New York. Cf. "Transactions of the Actuarial Society of America," Vol. I, pp. 32–34.

AMERICAN EXPERIENCE TABLE OF MORTALITY *

Age	Number Living	Number Dying	Yearly Probability of Dying Per Cent	Age	Number Living	Number Dying	Yearly Probability of Dying Per Cent
10	100,000	749	00.75	53	66,797	1,091	1.63
11	99,251	746	00.75	54	65,706	1,143	1.73
12	98,505	743	00.75	55	64,563	1,199	1.85
13	97,762	740	00.76	56	63,364	1,260	1.98
14	97,022	737	00.76	57	62,104	1,325	2.13
15	96,285	735	00.76	58	60,779	1,394	2.29
16	95,550	732	00.77	59	59,385	1,468	2.47
17	94,818	729	00.77	60	57,917	1,546	2.66
18	94,089	727	00.77	61	56,371	1,628	2.88
19	93,362	725	00.78	62	54,743	1,713	3.12
20	92,637	723	00.78	63	53,030	1,800	3.39
21	91,914	722	00.79	64	51,230	1,889	3.68
22	91,192	721	00.79	65	49,341	1,980	4.01
23	90,471	720	00.80	66	47,361	2,070	4.37
24	89,751	719	00.80	67	45,291	2,158	4.76
25	89,032	718	00.81	68	43,133	2,243	5.20
26	88,314	718	00.82	69	40,890	2,321	5.67
27	87,596	718	00.83	70	38,569	2,391	6.19
28	86,878	718	00.83	71	36,178	2,448	6.76
29	86,160	719	00.84	72	33,730	2,487	7.37
30	85,441	720	00.85	73	31,243	2,505	8.01
31	84,721	721	00.86	74	28,738	2,501	8.70
32	84,000	723	00.87	75	26,237	2,476	9.43
33	83,277	726	00.88	76	23,761	2,431	10.23
34	82,551	729	00.88	77	21,330	2,369	11.10
35	81,822	732	00.89	78	18,961	2,291	12.08
36	81,090	737	00.90	79	16,670	2,196	13.17
37	80,353	742	00.92	80	14,474	2,091	14.44
38	79,611	749	00.94	81	12,383	1,964	15.86
39	78,862	756	00.95	82	10,419	1,816	17.42
40	78,106	765	00.97	83	8,603	1,648	19.15
41	77,341	774	01.00	84	6,955	1,470	21.13
42	76,567	785	01.02	85	5,485	1,292	23.55
43	75,782	797	01.05	86	4,193	1,114	26.76
44	74,985	812	01.08	87	3,079	933	30.30
45	74,173	828	01.11	88	2,146	744	34.66
46	73,345	848	01.15	89	1,402	555	39.58
47	72,497	870	01.20	90	847	385	45.45
48	71,627	896	01.25	91	462	246	53.24
49	70,731	927	01.31	92	216	137	63.42
50	69,804	962	01.37	93	79	58	73.41
51	68,842	1,001	01.45	94	21	18	85.71
52	67,841	1,044	01.53	95	3	3	100.00

* Compiled from "Practical Lessons in Actuarial Science," Vol. II, p. 7.

VERIFICATION OF THE AMERICAN EXPERIENCE TABLE OF MORTALITY BY THE PRINCIPAL UNITED STATES LIFE INSURANCE COMPANIES, 1900-1915 *

Attained Age	*Ratio of Actual Deaths to Expected Deaths Per Cent*
20	51
25	53
30	51
35	55
40	59
45	69
50	86
55	95
60	99
65	103
70	100
75	96
80	92
Average	78

* After eliminating policies in force five years or less.—From "American-Canadian Mortality Investigation, 1918."

The result is somewhat surprising in as much as the insurance companies apparently do not gain the degree of accuracy with which they are usually credited. The experience of the companies during the nineteenth century should have enabled them to prepare estimates for the first fifteen years of the twentieth century which should be closer than 78 per cent accurate. In fairness to the companies, it must be stated that they appreciate that the American Experience Table is an overestimate, and that they actually anticipate that from 80 to 85 per cent only of the expected deaths will occur. For obvious reasons, they are willing to continue to use the American Experience Table,[8] although an "ultimate table" prepared by the actuaries gains a ratio of nearly 100 per cent [9] of expectation.

The methods employed by the life insurance companies are purely empirical. Apparently no attempt is made to

[8] Premium rates are based upon the American Experience Table. The overcharge is returned to the policyholders as "dividends"—an obvious misnomer.

[9] "As additional proof, it may be mentioned that the ratio of actual to expected deaths from the eleventh to the fifteenth insurance years inclusive for ages of entry 15 to 34 inclusive was 98.7 per cent, while from the sixth to the tenth insurance years it was 100.1 per cent—the expected deaths being calculated by the ultimate table."—"American-Canadian Mortality Investigation, 1918."

establish trends from year to year or from generation to generation in the average duration of life. The conditions which accomplished a certain result in a nineteenth century decade are accepted as holding equally true in the present century. That this will prove correct is by no means certain; changing living standards, better housing conditions, improved hygiene, and medical advancement ought to bring some measurable increase in the average length of human life.

Weather forecasts.—"The wind bloweth where it listeth," runs the old adage. Yet few Americans appreciate that the winds in the United States blow where they "listeth" only 3 per cent of the time, while the other 97 per cent of the time they blow in the direction previously foretold by the Weather Bureau. The accompanying table shows in detail the verification of the weather forecasts for the years 1915 to 1919 inclusive. The combined average of weather and temperature predictions for all the districts is 88.4 per cent accurate. This covers "affirmative" predictions [10] only and is actually equivalent to 97 per cent accuracy on all predictions made during the period.

As in life insurance, weather forecasting is still in the empirical stage. The observations of the past are used solely in predetermining the future. The Weather Bureau is only beginning to ascertain the possibility of a law of changing climate to determine if weather passes through cycles of definite periods and amplitudes. Present predictions are based upon current information with no attempt to correlate the forecasts with the influence of any existing trend.[11] But at least one independent investigation [12] indicates a distinct prob-

[10] An "affirmative" prediction is a prediction of a change in the weather. Since during the year the weather does not change on successive days 70 per cent of the time, an individual making a daily prediction that the weather for the ensuing day would be unchanged from the current day would gain an average of about 70.0 per cent for the year. The average of 88.4 per cent gained by the Bureau really represents 88.4 per cent of the normal margin of 30 per cent which comprises the domain of "affirmative" predictions. A "negative" prediction is a forecast of unchanged weather.

[11] The method employed in forecasting weather and temperature is a further illustration of the law of causality. Air rushing from cool regions to warmer adjacent regions causes the wind. As the cool air meets the warm atmosphere, the latter loses its capacity to hold vapor, and the condensation, that is, rainfall, results.

[12] Henry Ludwell Moore, "Economic Cycles: Their Law and Cause," Chap. II.

VERIFICATION OF A. M. 36-HOUR WEATHER AND TEMPERATURE FORECASTS OF THE U. S. WEATHER BUREAU, 1915–1919 *

	1915		1916		1917		1918		1919		Average		
District	*Wea.*	*Tem.*	*Wea.*	*Tem.*	*Wea.*	*Tem.*	*Wea.*	*Tem.*	*Wea.*	*Tem.*	*Wea.*	*Tem.*	*Comb.*
Washington	85.9	92.6	85.9	91.5	85.6	91.5	83.3	89.3	84.4	91.0	85.0	91.2	88.1
Chicago	85.3	87.5	85.7	87.2	88.1	87.3	85.7	86.8	86.9	88.2	86.3	87.4	86.9
New Orleans	87.1	91.9	89.9	90.8	90.0	90.7	88.8	90.5	86.1	91.8	88.4	91.1	89.8
Denver	88.5	89.2	89.0	89.1	91.0	89.5	88.3	89.3	88.6	89.3	89.1	89.3	89.2
San Francisco	87.8	92.1	89.6	91.0	90.0	91.2	87.9	90.7	88.3	90.5	88.7	91.1	89.9
Average	86.3	91.0	87.0	90.2	87.6	90.3	85.4	89.0	86.0	90.3	86.5	90.2	88.4

* From "U. S. Dept. of Agriculture, Report of the Chief of the Weather Bureau." 1919-20.

ability that cycles of rainfall exist.[18] The empirical nature of the Weather Bureau forecasts is further illustrated by the inability of the Bureau to predict with accuracy more than two or three days in advance.

Census forecasting.—Although the Federal Census of the United States is taken on a decennial basis, the Department of Commerce estimates each year the population not only for the entire country but for the various subdivisions as well. The method employed is to take the average annual increase as indicated by the ten-year period between the two preceding enumerations on a percentage basis. For instance, the Federal Census of 1900 showed a gain of 20.7 per cent over the 1890 enumeration; it was, therefore, assumed that the 1910 census would show an increase of the same percentage over that of 1900. This assumption proved surprisingly accurate, as the actual increase was exactly 21.0 per cent. If the same reasoning were applied in predetermining the 1920 census, the margin of error would have been considerable as the increase in 1920 was but 14.9 per cent. The discrepancy, however, is entirely attributable to the World War.

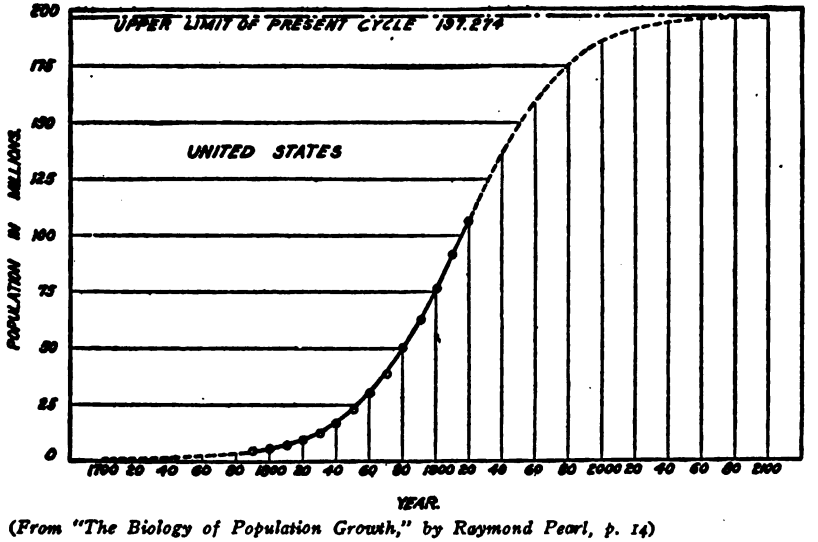
RATE OF GROWTH OF POPULATION OF THE UNITED STATES, 1800–1920

Year	*Percentage of Increase Over Previous Census*
1920	14.9
1910	21.0
1900	20.7
1890	25.5
1880	22.6
1870	30.1
1860	35.6
1850	35.9
1840	32.7
1830	33.5
1820	33.1
1810	36.4
1800	35.1

[18] Those who have been inclined to have but little faith in the value of the weather forecasts have doubtless been surprised to learn of the accuracy indicated in the table. "Forecasts cannot be made with mathematical accuracy, for they are practically all empirical deductions but they do have such a high degree of verification that no one whose life or property is affected by the coming of severe storms would to-day consider for a moment doing without the benefit to be derived from them."—"The Americana," Vol. 29, p. 131.

This method of estimating population increases is open to many objections. As is indicated by the accompanying table, the procedure would have yielded satisfactory results in the decades preceding the Civil War. Since 1860, however, there has been considerable irregularity in the increases on a percentage basis. The average decennial increase for the hundred years terminating in 1890 was 32.05 per cent; for the hundred years ending in 1900, 30.69 per cent; ending in 1910, 29.15 per cent; ending in 1920, 27.33 per cent. This clearly reflects a downward trend in the rate of increase, an important factor which should be taken into consideration in estimating future increases.

The population of the United States in 1920 was 105,708,771 according to the revised figures. If the trend on the



(From "The Biology of Population Growth," by Raymond Pearl, p. 14)

Population Growth in the United States.

basis of the periods of one hundred years each which ended in 1890, 1900, 1910, and 1920, respectively, should continue, the percentages of increase at the next three Federal censuses should be approximately as follows: 1930, 18.1 per cent; 1940, 17.3 per cent; and 1950, 16.9 per cent. If this were to hold good the population in 1930 would be about 125,000,000; in 1940 about 145,000,000; and in 1950 about 170,000,000.

Experience, however, has shown that it is extremely unlikely that the actual increase will be so great. In countries such as France and Belgium where the natural resources have been utilized to a maximum extent, the population shows a high degree of stability in contrast to the continual increases in the newer lands of America. If the European experience—and for that matter, the Oriental as well—is to be repeated in this country, the rate of increase will decline sharply before the end of the present century. A recent forecast of the prospective population of the United States on the basis of the European and Oriental experience estimated the population in 1930 would be about 120,000,000; in 1940 about 135,000,000; in 1950 about 148,000,000; in 2000 about 183,000,000; and a maximum population of 198,000,000 would be reached in 2080.[14]

POPULATION OF THE UNITED STATES, ACTUAL AND PROSPECTIVE *

1790	3,929,214
1800	5,308,483
1810	7,239,881
1820	9,638,453
1830	12,866,020
1840	17,069,453
1850	23,191,876
1860	31,443,321
1870	38,558,371
1880	50,155,783
1890	62,947,714
1900	75,994,575
1910	91,972,266
1920	105,708,771
1930	120,000,000
1940	135,000,000
1950	148,000,000
1960	159,000,000
2000	183,000,000
2080	198,000,000

* Figures 1790-1910, "Statistical Abstract of the United States," p. 31, 1920. 1920, *Commercial and Financial Chronicle*, Vol. 112, No. 2900, p. 331. 1930–1950, *Harper's Magazine*, Vol. 142, No. 852, p. 705.

National budget estimates.—In the preparation of national budgets, it is necessary to forecast both revenues and expendi-

[14] "Forecasting the Growth of Nations," Raymond Pearl and F. C. Kelly, in *Harper's Magazine*, Vol. 142, No. 852, p. 704.

tures for the period in question. The predetermination of revenues can be accomplished far more scientifically than that of expenditures, owing to the uncertainty of legislative appropriations after the compilation of the budget. None of the large nations following the budgetary system has achieved a greater degree of accuracy in this respect than has England. For the fiscal year which ended March 31, 1921, the estimated revenues were £1,418,300,000 and the actual receipts were £1,426,000,000, or less than 6-10ths of 1 per cent from the anticipated figure. As is shown the average accuracy for the ten-year period from 1911 to 1921 was 93.76 per cent, despite the fact that this period included the entire war duration when revenues were constantly increasing. The average accuracy for the pre-war years 1911–12, 1912–13, 1913–14, and for the first post-war year 1920–21, was 98.8 per cent.

VERIFICATION OF THE ESTIMATES OF REVENUES UNDER THE NATIONAL BUDGET OF THE UNITED KINGDOM, 1911–1921*
(000 *omitted*)

Year	*Estimated*	*Actual*	*Percentage of Accuracy*
1920–1921	£1,418,300	£1,426,000	99.4
1919–1920	1,201,100	1,339,571	88.5
1918–1919	842,050	889,020	94.6
1917–1918	638,600	707,234	89.2
1916–1917	509,000	573,429	87.4
1915–1916	305,000	336,766	89.8
1914–1915	211,296	226,694	92.9
1913–1914	195,825	198,242	98.5
1912–1913	187,189	188,802	99.5
1911–1912	181,621	185,090	97.8

* Compiled from *The Economist*, London.

Three methods are employed in predetermining revenues under National budget systems:[15]

1. The automatic (averaging) system. Under this method, the results of the year before the last year, the "penultimate" as it is called, are arbitrarily assumed to obtain for the coming year.

2. The system of (estimating) increases (and decreases).

3. The system of direct valuation (estimating *de novo* each year).

[15] René Stourm, "The Budget," p. 172.

Crop forecasting.—The monthly reports of the Department of Agriculture may be regarded as incomplete forecasts. They state that the current condition of a certain crop indicates a definite yield per acre, *provided normal conditions obtain until the final harvest.* The Department does not attempt to predetermine abnormal occurrences which may develop in the interim, such as unusual weather, abandoned acreage, insect ravage, and similar factors. For this reason, the crop reports [16] are not issued as definite forecasts of the ensuing harvest. The degree of accuracy has accordingly varied with the influence of the factors not taken into consideration. As the quantitative interpretation of the condition reports of the principal crops, except cotton, was not begun until 1911, the Department has exercised natural hesitancy, in view of its limited experience, in attempting a complete forecast which would take into consideration the effect of the factors not presently included.

The extent to which the Department has been successful in its estimates is illustrated in the ensuing table of cotton statistics which compares the September 1 estimates with final ginnings over the period from 1915 to 1924.

VERIFICATION OF COTTON ESTIMATES

Year	*Forecast (bales)*	*Ginnings (bales)*	*Variation (per cent)*
1915.....	11,697,000	11,192,000	+ 5
1916.....	11,800,000	11,450,000	+ 3
1917.....	12,499,000	11,302,000	+ 11
1918.....	11,137,000	12,041,000	— 8
1919.....	11,230,000	11,421,000	— 2
1920.....	12,783,000	13,440,000	— 5
1921.....	7,037,000	7,954,000	— 12
1922.....	10,575,000	9,762,000	+ 8
1923.....	10,788,000	10,170,000	+ 3
1924.....	12,787,000	13,639,000	— 7

[16] The forecasts are such figures that, based upon average conditions in the past years, there is an even chance or probability that the final yield will be either above or below the figure forecast."—"Government Crop Reports, Their Value, Scope and Preparation," U. S. Dept. of Agriculture, Bureau of Crop Estimates, Circular 17, Revised.

Chapter II

THE FUNCTION OF FORECASTING

The purpose of business forecasts.—It is the duty of some member or members of every business enterprise to plan for its future. These plans vary according to the nature and size of the concern. The period under observation may be quite brief, as is the case when retail stocks of merchandise are purchased to be sold within a few days. It may be extremely long, as illustrated in the twenty-year forecasts of telephone growth. It may be any intermediate period from one week to ten years.

The purpose of the forecast may be to aid in the planning of factory expansion to meet an increased demand for the product; or a possible curtailment of facilities to parallel a declining market. In either case, the management is given notice of future changes in market conditions sufficiently far in advance to permit economical adjustment of present facilities to changed circumstances.

The object may be to insure the continued solvency of the enterprise through the establishment of budgets of expected revenues and disbursements for a series of years into the future, or for so short a period as twelve months in advance. Such studies of probable future financial condition enable the concern to avoid embarrassment in periods of stress and to take advantage of the many benefits which accrue to companies in a strong cash position.

Another reason for a survey of future conditions is the determination of policy to meet the probable fluctuations in business movements during periods of activity and depression. A courageous policy would be advisable during that phase of the cycle of business when conditions are recovering from a period of depression, whereas a cautious policy would be necessary during a later phase when conditions become abnormally active.

Another object may be the application of greater sales efforts in those fields which seem to have enhanced opportunities in the more or less immediate future. Regions and industries which have promising futures should receive careful sales cultivation. Economic surveys tend to bring out these opportunities.

The study of past periods of business activity and depression often brings out a significant relationship between the movement of general conditions and that of an individual enterprise. Members of such companies thereby secure a fairly reliable basis for estimating future variations in the volume of business to be received. If the forecast indicates that a certain decline in the volume of orders is likely to occur —and the reason may be a permanent downward trend, a sympathetic falling off with a decline in general business, or a temporary seasonal slump—the management is notified in time to prepare for the contingency through decreased stocks, price adjustments, or increased sales efforts.

In the agricultural field, forecasting surveys give valuable estimates of probable acreage to be planted in the principal crops, of the volume of the crops before harvesting actually begins, of the advisability of holding or selling the crops at harvest time, of the volume of farm-purchasing power over near-by periods, and of the probable prices for principal farm products several months in advance.

In the industrial field, forecasts of estimated sales permit ready regulation of factory output, and prevent unreasonable expansion of plant capacities. Inventory control is simplified, and purchase commitments are economically administered.

In the financial world, forecasts of the condition of the money market and of interest rates are of great assistance. Commercial banking and investment banking operations exert large influence upon business conditions. Banking policies should be based as largely upon future developments as upon current events.

The purpose of the preparation of future business estimates is, therefore, to permit the establishment of present commercial policy to take full advantage of the business which is now available and which is likely to develop in the future.

Practical forecasting.—Examples of practical forecasting are to be found in all lines of business. Although more numerous in the large enterprises, even the corner-store merchant has his problems in this respect. Yet it may safely be said, *The larger the enterprise, the farther ahead the management must look.* Individual businesses as large as the New York Central Railroad, or the Pacific Gas & Electric Company, or the United States Steel Corporation must plan at least ten years in advance in order to keep pace with increasing demand. The reasons are fairly obvious: expansion plans cannot be wisely determined under the stress of a time handicap; property extensions cannot be made economically nor can funds be conveniently provided.

A second observation is, *The more rapid the growth of the business, the more urgent is the need of forecasts.* Electric power companies, for example, with an annual growth of 10 per cent compounded, are obliged to keep more closely in touch with demand than are steel mills, which have a growth of less than 4 per cent. A cursory expansion policy might prove practicable to the latter enterprise, due to flexibility of capacity, but would quickly bring grave danger to the former. Moreover, in companies of rapid growth, due allowance must be made for a recession in the rate of growth at some time in the future. The industrialist who recently expressed the opinion that the saturation point in the marketing of automobiles would be reached "when America stops growing boys" was a greater optimist than any student of commercial history would dare be. The saturation point, meaning the stage at which the rate of growth coincides with the normal growth of the country, is a subject of large interest even outside of the automotive trade. It seems to have been reached in the case of agriculture, railroading, and iron production. It is a factor of importance in many other fields, such as electrical production, radio apparatus, artificial silk, and petroleum consumption.

A third observation is, *The farther away from the ultimate consumer the producer or distributor is, the more valuable the forecasts become.* The final distributor is close to the consumer, and usually carries small stocks, depending upon rush orders to meet quickened demand. Consequently, the brunt of the problem falls upon the distant producer. It is a matter

of record that the basic industries are usually most affected in changing economic conditions. In the depression of 1921, pig-iron production declined to less than half of normal, whereas retail store sales were within 10 per cent of expectation.

In connection with the preceding observations, it is clearly apparent that all of the major departments of a business are vitally concerned with the forecasts. Sales officials must foresee sales resistance, production and shipment difficulties, seasonal slumps, and price fluctuations. Production managers must coördinate factory schedules to probable sales volume and to current inventory position. Purchasing agents must adjust commitments with due regard to prospective changes in price levels, shipping conditions, inventories, and plant operation. Financial departments should be able to foresee favorable and unfavorable money markets, and know when to be liberal and when to be critical in granting credits.

The forecasted period.—Forecasts may be divided into three classes according to the duration of the period to be covered. If the period involved is one year or less, the classification is "short-term"; from one to five years, "medium-term"; and beyond five years, "long-term." While this division is arbitrary, justification exists for the classification, both in the nature of common forecasting problems and in the methods employed.

Long-term forecasts are particularly serviceable to large business enterprises. In such cases, the cost of expansion is large and the period of construction is long. Forecasts of probable demand for at least ten years ahead are absolutely essential in the formation of economical expansion policies. So it is that organizations as widely divergent as the Interborough Rapid Transit Company of New York and the Southern California Edison Company have been compelled to plan additions from ten to fifteen years in advance. And what is true of the great utility companies in this regard is true almost to the same extent of the large American industrial enterprises, such as General Motors Corporation and General Electric Company.

Medium-term forecasts have a broader appeal to the average business man. Three years usually provide sufficient time for expansion requirements to be met without undue haste. Such forecasts would probably prevent the authorization of

additional capacity to meet a temporary "bulge" in orders. They would also tend to restrict construction at peak costs, when a substantial reduction might reasonably be expected within the ensuing year or two, and would permit the business man conveniently to adjust his affairs in harmony with changing economic conditions from year to year.

Short-term forecasts probably always will be most popular. The human instinct is to desire results quickly in forecasting as elsewhere. Yet it may safely be said that, in many cases, the business man's interest in a short-term forecast is a passive interest. Experience has taught him that the shortness of the forecasted period often makes accuracy more difficult. Forecasts from three to six months in advance are of limited value, since commitments must usually be made at least that far ahead. Forecasts from six to twelve months in advance are more valuable, since the probabilities are that the complexion of business will change perceptibly by that time. Yet it must be admitted that it is in the speculative fields that short-term forecasts are most eagerly sought.

Accuracy in forecasting.—Estimates of the future in business can never be more than relatively accurate. Many causal factors not susceptible of precise measurement, so-called "imponderables," are constantly operating and altering the expected course of events. In all cases, the forecast is the most probable development; but this does not mean that it is highly probable to occur. Whether it be a twenty-year forecast of demand for telephone service, or a three-year forecast of conditions of activity or depression, or a one-week forecast of the price of cotton, the management desires the most accurate estimate possible. Properly interpreted, which means with reasonable allowance for possible error, these forecasts should be almost invaluable. Ten years ago, reliance was placed almost entirely upon the intuition of the responsible officials. To-day, intuition has largely given place to research, and there is reason to believe that the change has been for the better.

Chapter III

LONG-TERM FORECASTS (OVER FIVE YEARS)

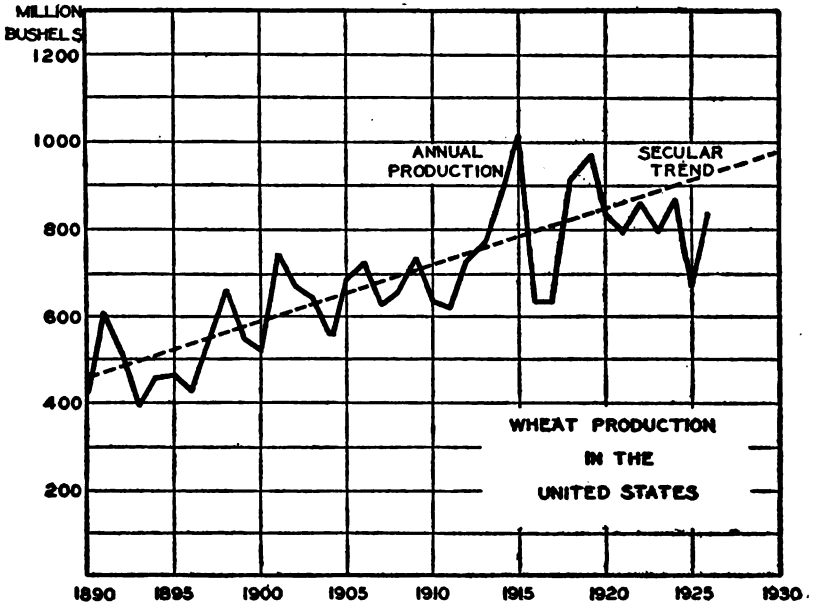
The line of growth.—Long-term forecasts are generally based upon the assumption that the rate of progress or retrogression experienced over a series of years will continue into the future. While no certainty exists that five years hence the production of pig iron will be so much greater than that of the present year as current output exceeds that of five years past, there is at least some evidence in favor of the assumption. Moreover, if each successive five-year period over the past thirty years shows about the same rate of growth, an even stronger case is presented.

The rate of growth of any series at first inspection may seem highly irregular, but usually it will be found to follow one of two types of trends. The normal annual increase generally shows either absolute or relative equality. If the increase from year to year is about the same quantity, for example, 37,000 tons, an arithmetical ratio of gain is indicated; if the annual increase is about the same percentage, for example, 7.4 per cent, a geometric ratio of gain is shown. It will be noted that a constant arithmetical ratio is equivalent to a declining geometric ratio.

Determination of trend.—Available data must be carefully inspected to determine (1) if arithmetical, geometric, or irregular rate of growth is operating, and (2) what the actual rate is. If a satisfactory answer is available, the task of long-term forecasting becomes the relatively simple operation of carrying forward the established trend.

The most simple method of determining the nature of the trend is to plot on ordinary graph paper the available data over a period of at least ten years, using items on the abscissa (horizontal) scale and years on the ordinate (vertical) scale. If the data appear as monthly totals, the monthly average for each year, or the annual total, should be used. After the items have been plotted, the points should be connected by a continuous line. A ruler, or straight-edge, laid along the

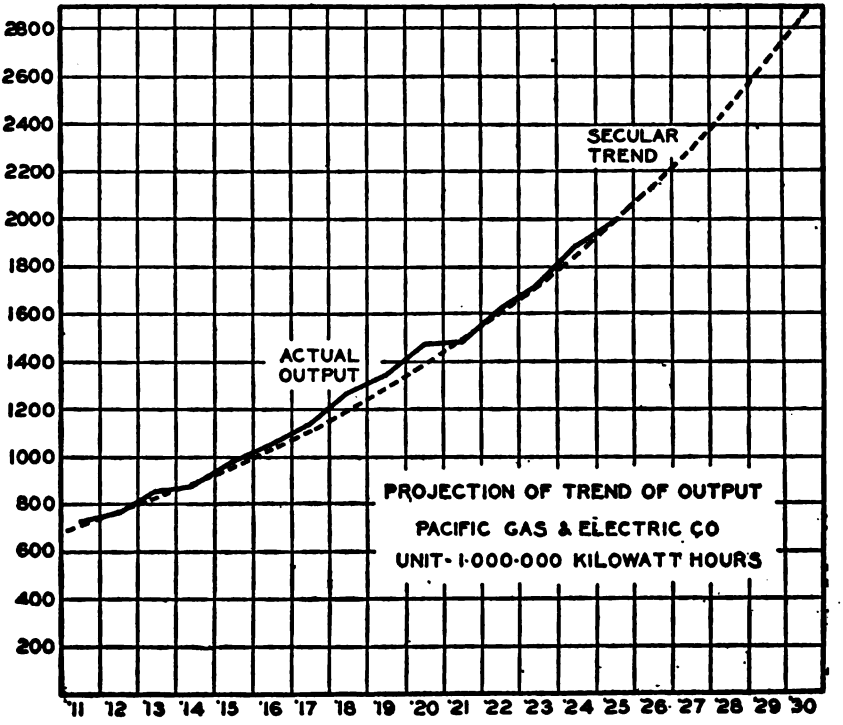
plotted line should readily indicate the nature of the trend. If a straight line can be drawn through the plotted line in such manner as to create equal areas above and below as determined by the confining plotted line—if, in other words, it seems to indicate the average position over the period—the conclusion is that a *straight-line,* that is, arithmetical, rate of growth has been established. If an ascending curved line seems to fit the plotted line more accurately than does the straight line, a geometric rate of growth is indicated.



An illustration of straight-line growth is afforded in the case of wheat production in the United States from 1890 through 1925. The following table gives items in millions of bushels produced yearly:

1890..... 402*	1900..... 522	1910..... 635	1920..... 833
1891..... 612	1901..... 748	1911..... 621	1921..... 795
1892..... 516	1902..... 670	1912..... 730	1922..... 862
1893..... 396	1903..... 638	1913..... 763	1923..... 797
1894..... 460	1904..... 552	1914..... 891	1924..... 873
1895..... 467	1905..... 693	1915.....1026	1925..... 669
1896..... 428	1906..... 735	1916..... 636	1926..... —
1897..... 530	1907..... 634	1917..... 637	1927..... —
1898..... 675	1908..... 663	1918..... 921	1928..... —
1899..... 547	1909..... 737	1919..... 968	1929..... —

* Ciphers are omitted.

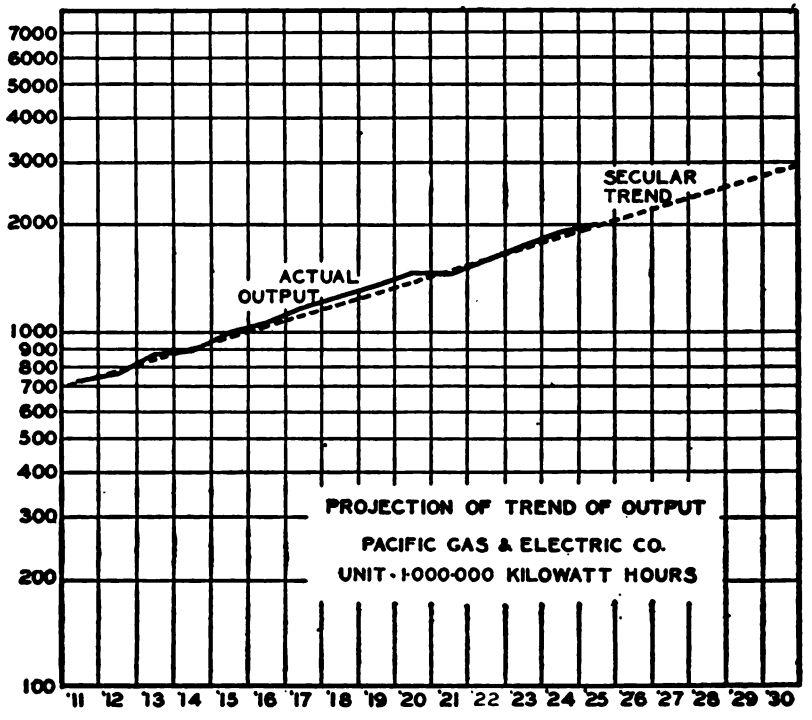


A straight line fits this trend acceptably. A graphic projection, therefore, may be made into the year 1930 and indicates that a reasonable forecast of normal wheat production for that year would be about 975,000,000 bushels. Of course, climatic conditions decidedly affect the harvest of any year, but the forecast indicates what the output should be under average conditions.

An illustration of a geometric rate of growth is afforded in the case of the output of electricity by the Pacific Gas & Electric Company for the years 1911 through 1924. The table gives items of millions of kilowatt hours produced annually:

1911.....	727 *	1918.....	1265
1912.....	771	1919.....	1344
1913.....	859	1920.....	1476
1914.....	898	1921.....	1489
1915.....	981	1922.....	1609
1916.....	1047	1923.....	1726
1917.....	1042	1924.....	1887

* Ciphers are omitted.



A graphic representation of this trend shows a gradually ascending curve rather than a straight-line tendency. The forecast is made by projecting the curve over the desired period. As the projection of a straight line is easier than the projection of a curve, in cases of geometric, or compound, growths, it is suggested that the graph be prepared on ratio (semi-log) graph paper. This form is prepared especially for the purpose of showing changes in *absolute* values on a *relative* basis. An *absolute* increase of 100 units is *relatively* less important when it succeeds 1200 units than when it follows 700 units. Accompanying graphs show both methods. The indicated output for 1930 is 2,841,000,000 kilowatt hours.

Determination of rate of growth.—If the rate of growth is in arithmetical (straight-line) ratio, the rate of annual increase may be determined by inspection directly from the graph. Or it may be mathematically calculated by the method of least squares as indicated.[1]

[1] See G. R. Davies, "Introduction to Economic Statistics," p. 105.

TREND OF WHEAT PRODUCTION IN THE UNITED STATES

Year	*Million Bushels* (*y*)	*x*	x^2	*xy*	*Trend*
1900	522	—10	100	—5220	596
1901	748	—9	81	—6732	609
1902	670	—8	64	—5360	622
1903	638	—7	49	—4466	635
1904	552	—6	36	—3312	648
1905	693	—5	25	—3465	661
1906	735	—4	16	—2940	674
1907	634	—3	9	—1902	687
1908	663	—2	4	—1326	700
1909	737	—1	1	— 737	713
1910	635	0	0	0	726
1911	621	1	1	621	739
1912	730	2	4	1460	752
1913	763	3	9	2289	765
1914	891	4	16	3564	778
1915	1026	5	25	5130	791
1916	636	6	36	3816	804
1917	637	7	49	4459	817
1918	921	8	64	7368	830
1919	968	9	81	8712	843
1920	833	10	100	8330	856
	15253	0	770	10289	

SUMMARY*

Midyear (1910) ..... 15,253 + 21 = 726
Annual increase ..... 10,289 + 770 = 13

* The total of column *y* is divided by the number of years in the series and the result is assumed to be the midpoint and to represent normal for the middle year. This amount is increased or decreased by the annual increment to give the indicated normal for the other years in the series.

If the rate of growth is in geometric (compound) ratio, the rate may be determined by inspection directly from the graph with the help of a slide rule, or it may be determined mathematically in the following manner:

Actual sales in units of a certain product over the period from 1910 through 1923 were as follows:

1910..... 2580	1915..... 4120	1920..... 7370
1911..... 2840	1916..... 5640	1921..... 6100
1912..... 4410	1917..... 4650	1922..... 7950
1913..... 4410	1918..... 2710	1923..... 9410
1914..... 4310	1919..... 6130	1924..... 9130

The average annual sales for the five-year period at the beginning (1910-1914) were 3710 units which is centered at

COMPOUND ACCUMULATION TABLE

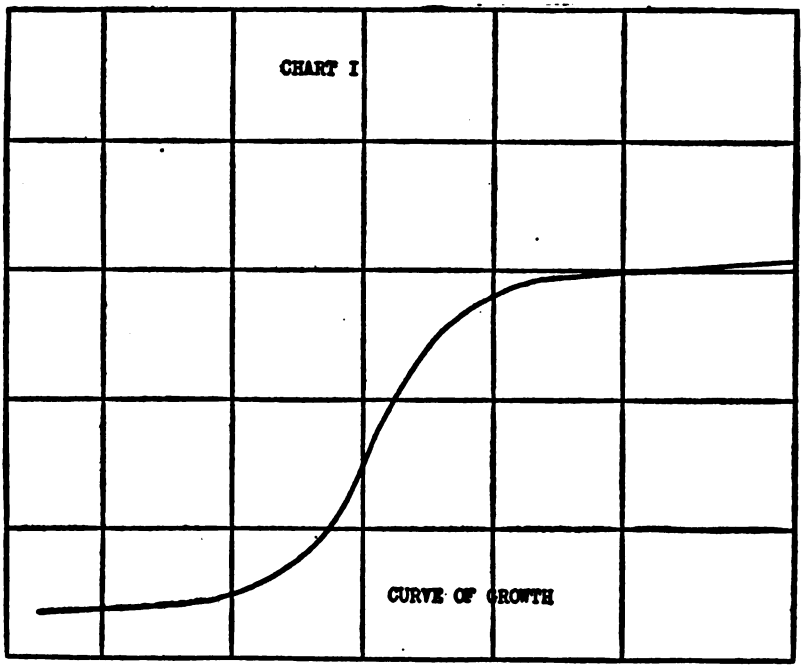
Years	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%
1	101	102	103	104	105	106	107	108	109	110	111	112	113	114
2	102	104	106	108	110	112	114	117	119	121	123	125	128	130
3	103	106	109	112	116	119	123	126	129	133	137	140	145	148
4	104	108	113	117	122	126	132	136	141	147	152	157	164	169
5	105	110	116	122	128	134	141	147	154	162	168	176	185	193
6	106	113	119	127	134	142	151	159	168	178	187	197	209	220
7	107	115	123	132	141	150	161	171	183	196	207	221	236	251
8	108	117	127	137	148	159	172	185	199	216	230	248	267	286
9	109	119	131	142	155	169	185	200	217	238	255	278	302	326
10	110	122	134	148	163	179	197	216	237	262	283	311	341	372
11	111	124	138	154	171	190	211	233	258	284	314	348	385	424
12	112	127	143	160	180	201	226	252	281	312	349	390	435	483
13	114	129	147	167	189	213	242	272	306	343	387	437	492	551
14	115	132	151	173	198	226	259	293	334	376	430	489	556	628
15	116	135	156	180	208	239	277	317	364	414	477	548	628	716
16	117	137	160	187	218	254	296	342	397	455	529	614	710	816
17	118	140	165	195	229	269	317	369	433	501	587	688	802	930
18	119	143	170	202	240	285	339	399	472	551	652	771	906	1060
19	120	146	175	211	252	302	363	431	514	606	723	864	1024	1208
20	122	149	180	219	265	320	388	465	560	667	803	968	1157	1377

the middle year (1912). The corresponding average for the final five years (1920-1924) was 7990 centered at 1922. The volume of average sales during the final period was 215 per cent of the average for the beginning period, covering an interval of ten years (1912 to 1922). Reference to the compound accumulation table shows that an increase totaling 215 per cent over ten years is equivalent to 8 per cent per annum.

SUGGESTED FORM FOR DETERMINATION AND PROJECTION OF RATE OF GROWTH

Year	*Yearly Total*	*Calculation of Rate of Growth*
1900	———	*Beginning period*	*Ending period*
1901	———	19— (———)	19— (———)
1902	———	19— (———)	19— (———)
1903	———	19— (———) A′	19— (———) B′
1904	———	19— (———)	19— (———)
1905	———	19— (———)	19— (———)
1906	———	5) ———	5) ———
1907	———	——— A	——— B
1908	———	average centered for year 19— (A′)	average centered for year 19— (B′)
1909	———	
1910	———	
1911	———	——— (B) divided by ——— (A) equals — % (C)
1912	———	19— (B′) minus 19— (A′) equals — years (C′)
1913	———	
1914	———	Upon reference to compound table, a growth of — % (C) in — years (C′) is equivalent to an annual rate of — % (D).
1915	———	
1916	———	
1917	———	
1918	———	*Projection*
1919	———	
1920	———	Basic year 19— (B′) ——— (B)
1921	———	Next year 19— ——— (B plus — % D)
1922	———	19— ———
1923	———	19— ———
1924	———	19— ———
1925	———	19— ———
1926	———	19— ———
1927	———	19— ———
1928	———	19— ———
1929	———	19— ———
1930	———	19— ———

The basic year for the projection into the future is 1922, the basic normal is 7990, and the rate of growth is 8 per cent



(*From Journal of the American Statistical Association, Vol. 19, No. 148, article by L. E. Peabody*)

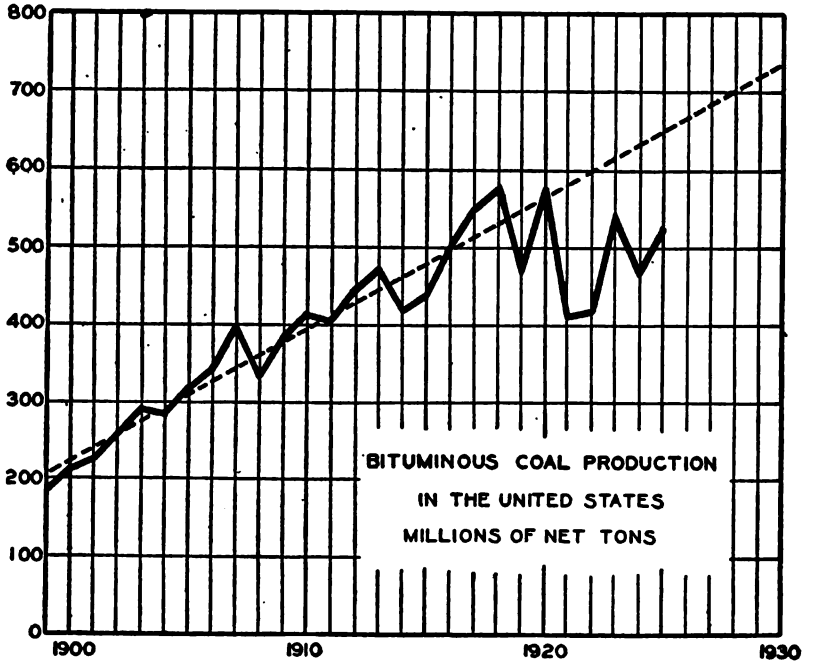
The Curve of Growth.

per annum. Accordingly, the forecast as made in 1925 would indicate probable sales volume as follows:

Year	*8% Trend*	*Forecast*	*Actual*
1922.....	100	7990	7950
1923.....	108	8630	9410
1924.....	117	9348	9130
1925.....	126	10060	?
1926.....	136	10860	?
1927.....	147	11745	?
1928.....	159	12700	?
1929.....	171	13660	?
1930.....	185	14780	?

A five-year average is employed to avoid the influence of any abnormal year. Moreover, a period of five years usually comprises at least one complete business cycle.[2]

[2] The reader may be interested in a simple method, known as the "rule of 72," for quick measurement of compound growth. The rule is, that it will take as many years for a given quantity to double itself, as the number of times the annual rate of growth is contained in 72. For example, at 6 per cent per annum growth, twelve years will be required; at 8 per cent, nine years;



Changing trends.—If the record covers a long period of years, such as the index of wholesale prices in the United States from 1870 to 1913, more than one trend may be involved. In that instance, the trend was sharply downward until 1896 and upward thereafter.

In the preceding case a complete change in the direction of the trend occurred. More often changing trends involve increases or decreases in the *rate* rather than in the *direction* of the movement. Experience shows that rates of growth in secular trends usually show a declining tendency after the movement has attained what might be termed its maturity. The growth is customarily slow at first, then rapid, as it passes through the development stage, then somewhat slower, as it enters a sort of saturation plateau. This tendency may be indicated graphically as is shown in the chart.

An illustration of this declining rate of growth is to be seen in the production of bituminous coal in the United States from 1899 through 1924. Up to about 1918 the growth was

at 4 per cent, eighteen years, etc. From the opposite viewpoint, if the growth is doubled in ten years, the rate of growth is about 7.2 per cent annually; if doubled in five years, the rate is about 14.4 per cent, etc.

fairly steady at the rate of about 16,800,000 tons a year. Since that time, a decided falling off has occurred. A forecast running into 1930 would have to allow for a material tapering down of the indicated trend. Another example of declining rate of growth is afforded in new railroad mileage added yearly since 1910 in the United States.

Adjustment for price changes.—Because of fluctuations in price levels, it is always preferable to measure secular trend in terms of physical units rather than in dollar values. The great advance in price levels between 1913 and 1920 entirely distorts the actual rate of growth during the period if measured in terms of dollars. The number of units or some other physical measure of volume, such as total capacity of the units, is a more reliable criterion. Obviously, it would be unfair to measure the rate of growth of any company during such period from its sales billings.

In many cases, however, dollar values comprise the only basis for computation. Particularly is this so where a great variety of products are included. In such instances adjustment must be made for the influence of changing prices. The adjustment may be made in simple fashion by dividing the total for each year by the price index for that year compiled by the United States Department of Labor. Often it will be preferable to use one of the class indexes rather than the general index for all commodities. If the subject matter is

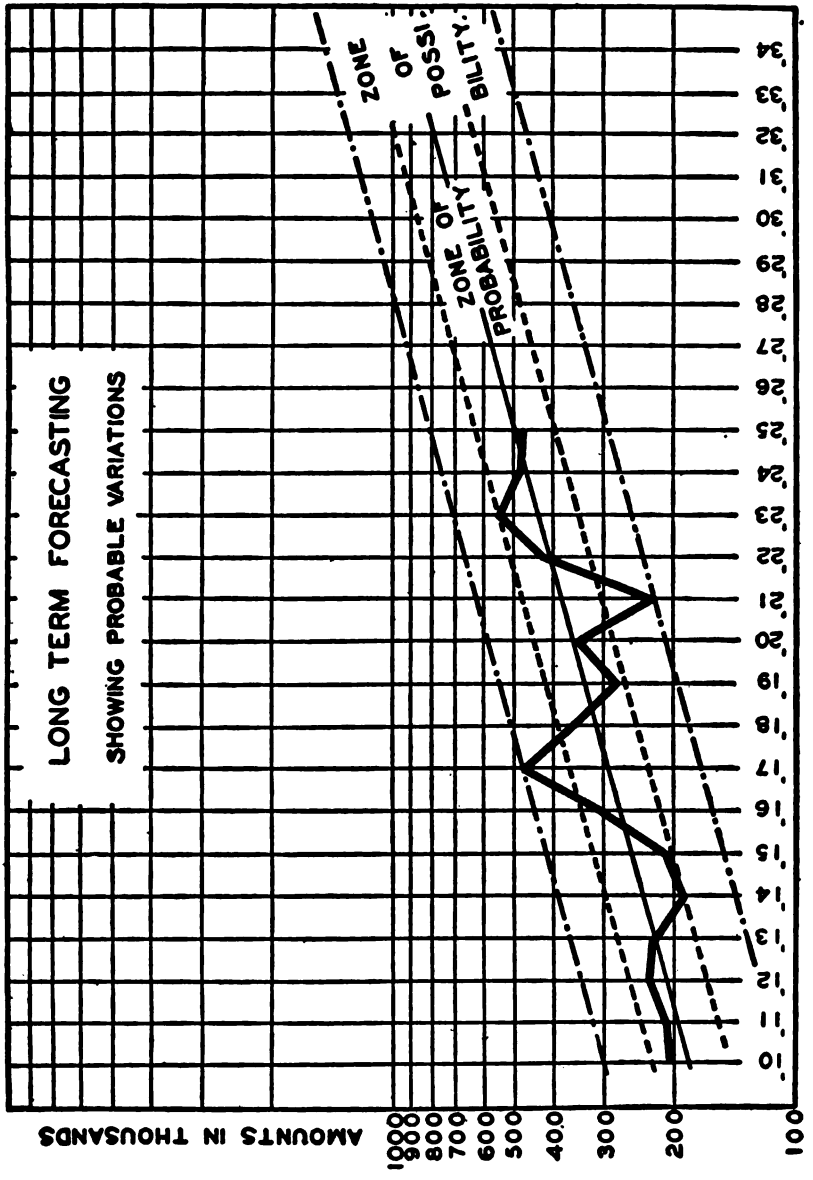
ADJUSTED SALES TREND

UNITED STATES STEEL CORPORATION

Year	*Actual Sales (millions)*	*Price Index*	*Adjusted Sales (millions)*
1910	$ 703	94	$ 748
1911	615	89	691
1912	745	99	753
1913	796	100	796
1914	558	85	656
1915	726	99	733
1916	1231	162	760
1917	1683	231	728
1918	1744	187	933
1919	1448	162	893
1920	1755	192	914
1921	986	129	764
1922	1092	122	895
1923	1571	144	1091
1924	1263	135	936

REVISED INDEX NUMBERS OF WHOLESALE PRICES, BY YEARS, 1890 TO 1925 (1913 = 100)

Year	Farm Products	Foods	Cloths and Clothing	Fuel and Lighting	Metals & Metal Prod.	Building Materials	Chemicals & Drugs	House-furnishings	Miscellaneous	All Commodities
1890	70	86	95	62	116	82	91	88	99	81
1891	75	85	91	60	102	78	92	89	97	80
1892	68	79	91	57	92	74	93	85	91	75
1893	71	85	90	58	85	73	91	85	92	77
1894	61	75	79	56	72	70	82	80	88	69
1895	61	74	77	66	77	68	81	77	93	70
1896	55	69	76	65	78	68	81	77	92	67
1897	59	71	75	55	72	66	88	75	93	67
1898	63	74	77	56	72	70	97	78	96	70
1899	64	74	80	67	110	77	101	80	100	75
1900	70	79	88	76	108	81	102	87	104	81
1901	74	79	81	73	103	78	105	87	96	79
1902	81	83	82	84	100	80	108	87	93	84
1903	77	81	87	98	99	82	105	90	102	86
1904	81	84	88	87	88	79	105	89	110	86
1905	79	86	90	81	98	85	103	88	117	86
1906	80	83	98	85	113	95	96	91	116	89
1907	87	89	105	89	121	100	98	98	111	94
1908	86	91	94	88	95	92	99	92	101	90
1909	97	97	98	84	93	95	100	92	130	97
1910	103	101	100	78	94	98	102	96	151	101
1911	93	97	96	76	89	98	102	93	111	93
1912	101	104	97	84	99	99	101	94	110	99
1913	100	100	100	100	100	100	100	100	100	100
1914	103	102	98	93	85	92	101	100	95	98
1915	104	105	98	88	99	94	134	100	95	101
1916	123	121	127	126	162	120	181	106	121	127
1917	190	167	175	169	231	157	202	125	148	177
1918	218	188	228	170	187	172	215	153	156	194
1919	231	207	253	181	162	201	169	184	175	206
1920	218	220	295	241	192	264	200	254	196	226
1921	124	144	180	199	129	165	136	195	128	147
1922	133	138	181	218	122	168	124	176	117	149
1923	141	144	200	185	144	189	131	183	123	154
1924	143	144	191	170	135	175	130	173	117	150
1925	158	158	190	175	130	175	134	169	135	159



an article of food, a special index under that title is available; likewise in clothing, metals, chemicals, and other lines as shown in the accompanying statement.

An illustration of the use of price index numbers in the

adjustment of dollar values is offered in the case of the United States Steel Corporation. The metals and metal products price index is used as a natural preference in this instance.

Extreme care must be exercised in the application of price indexes to dollar values. What may be true for prices in general may not hold for specific cases. If the company in question had been Studebaker rather than the Steel Corporation, the index used would give a misleading result. Automobile prices since 1913 have not followed the general trend. However, in the Studebaker case such adjustment would be unnecessary, since the number of cars sold provides an acceptable measure of growth.

Range of error.—In long-term forecasts, allowances must be made for fluctuating business conditions. In some years, favorable factors will cause the volume of trade to exceed the estimates; in other years, unfavorable factors operate conversely. While it is possible to a certain extent to foresee these changes a limited time in advance, it is wholly impossible to do so five years ahead. Some of the years will be "active" and others will be "inactive." Accordingly, the estimate for any single year is upon the assumption that it will be an average year. The estimate should prove over or under, in proportion as the year varies from normal. It may be further stated that the total estimates for any five consecutive years are more likely to agree with the actual total than is the estimate for any single year to agree with the actual result for that year. A "range of error" zone should, therefore, be set up above and below the estimate based upon the variations established in good and poor years in the past.

An accompanying graph brings out the application of this idea. The trend line shows an exact forecast for each year. From a practical viewpoint it is fully appreciated that the actual results for a given year are as likely to be under, as over, a definite forecast. A more reliable forecast in such cases would be to establish a normal zone of probability by extending parallel lines above and below the trend line and say it is likely that the actual amount will fall in this zone. Also similar lines may be drawn from record high and low points to mark a larger zone of extraordinary possibility.

Chapter IV

MEDIUM-TERM FORECASTS (ONE TO FIVE YEARS)

Section One: Cyclical Movement

Factors involved.—Medium-term forecasts must take into consideration not only the normal growth during the period, but also the probable fluctuations in the volume of commercial activity throughout the country. Since the purpose of the forecast usually is to ascertain certain characteristics of the business situation at a definite time within the ensuing five years, and since a complete cycle of activity ordinarily occurs within that period, the importance of carefully studying impending developments becomes apparent.

Indeed, in forecasts up to five years, the cyclical tendency is of greater significance than the effect of normal growth. In practically all trends the rate of normal growth is relatively small. Ten per cent annually is exceptionally large; 5 per cent is above the average; and 3 per cent is not uncommon. Over a few years, therefore, the influence of normal growth is generally a minor factor. In contrast, the effect of changing economic conditions is decidedly of major consequence. The case of the American Locomotive Company may be cited. In a recent year, when conditions were favorable, the sales were some $90,000,000; during the following year, unfavorable conditions obtained and the sales volume declined to below $30,000,000. Allowance must be made for extreme fluctuations of this nature.

Secular trend.—The methods explained in the preceding chapter in the determination of long-term movement for forecasts beyond five years apply in the case of medium-term forecasts. The projection, either graphic or mathematical, which is made ten years into the future, must necessarily be made through the first five years. In other words, the rate of growth established over the preceding ten or

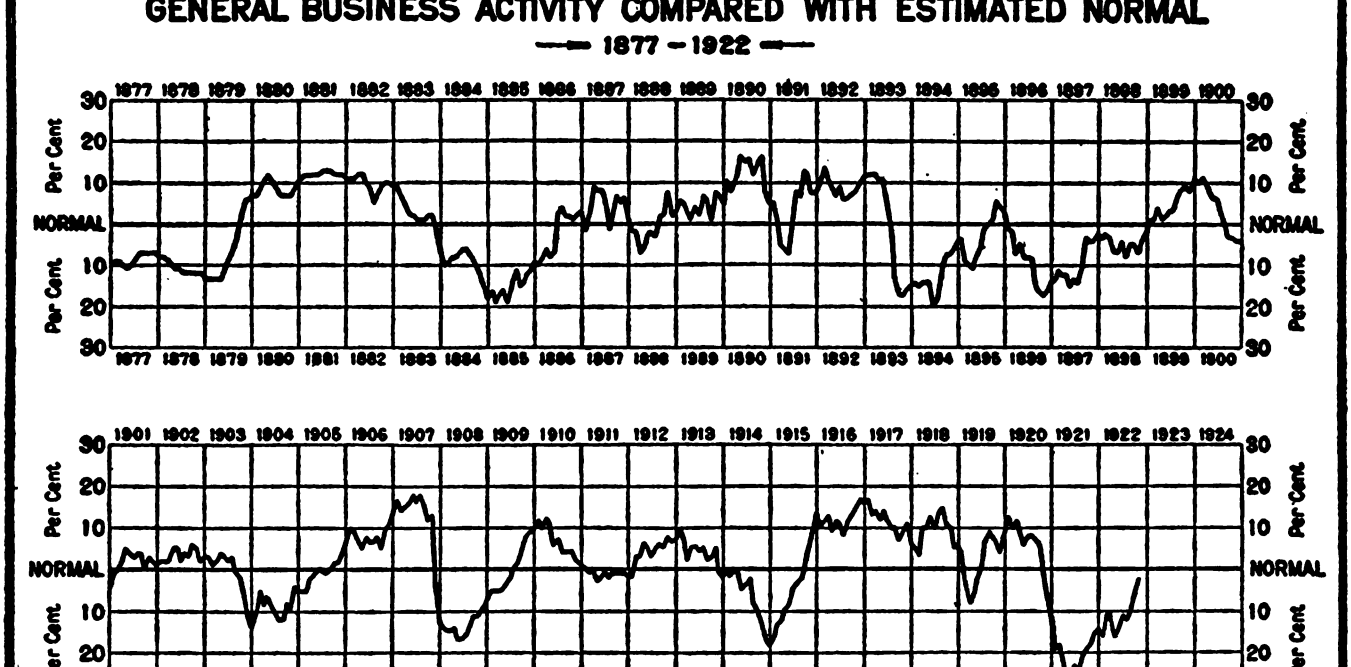
twenty years may reasonably be expected to continue over the next five years. While it is possible that a change in the rate may occur during the selected five years, the effect probably will be too gradual materially to affect the estimated data. A tentative forecast is thus made for each or any of the succeeding five years. This forecast, however, is subject to qualification for cyclical movement.

As previously explained, changes in the degree of business activity from year to year materially affect the accuracy of a forecast based on secular trend alone. While the "range of error" zone applies equally to medium-term forecasts, it is possible in such forecasts to foresee to a certain extent the positive or negative effect of the cyclical movement. Accordingly, the medium-term forecast based upon secular trend is subject to this adjustment.

Cyclical movement.—In the accompanying chart is shown a graphic representation of American business activity over the past fifty years. Allowance has been made for annual growth in establishing the position for each year. The following points should be carefully noted in studying the chart:

1. Business activity follows an irregular cyclical tendency;
2. In very few years were conditions sustained close to 100 per cent of normal;
3. The extreme variations from normal were plus 18 per cent and minus 25 per cent;
4. The successive cycles lacked uniformity in duration, extent, and time of occurrence.

Typical cycles.—The generally accepted theory of business cycles divides the complete movement into four successive periods—depression, recovery, prosperity, and decline. Periods of depression exist when business activity is below normal expectation; periods of prosperity, when business activity is above normal; periods of recovery mark the transition from a stage below normal to a stage above; periods of decline, the reverse. The dividing line between the periods cannot be sharply drawn. A certain degree of decline is noticed even before a period of prosperity has reached the peak; and signs of recovery are evident before depression reaches its lowest point. The transition is so gradual in most

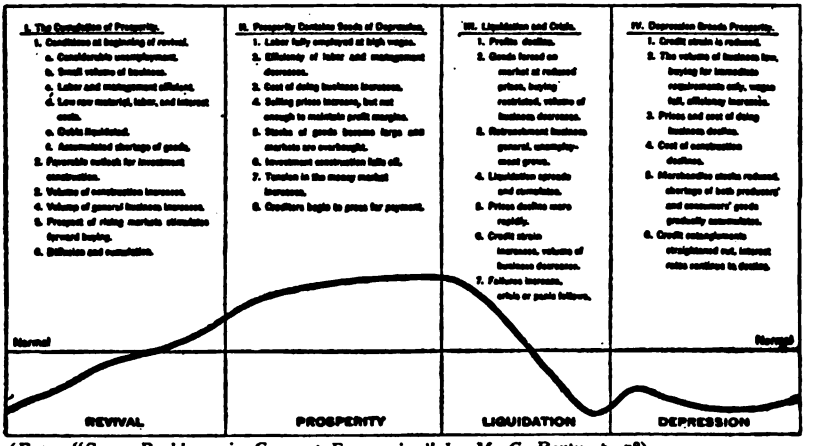


(From "Harvard Business Review," Vol. 1, No. 2, p. 158, as prepared by Statistical Division of The American Telephone and Telegraph Company)

The Trend of Business Conditions.

cycles that the exact point at which, for instance, depression ends and recovery begins is difficult of determination. Technically, decline does not stop until the low point of depression, and recovery does not end until the high point of prosperity. Yet, in discussing the cycle, the custom is to regard the earliest part of the positive phase—recovery—as occurring in the depression period, and the latter part in the prosperity period, thus leaving an arbitrary period of recovery when business is around normal levels, but still increasing. Likewise, the earlier part of the negative phase—decline—occurs in periods of prosperity and the latter part in depression, thus leaving an arbitrary period of decline when business is around normal but decreasing in volume. The four periods of the cycle are, therefore, arbitrary divisions of a completed upward and downward movement.

THE FORCES OF THE BUSINESS CYCLE



(From "Some Problems in Current Economics," by M. C. Rorty, p. 78)

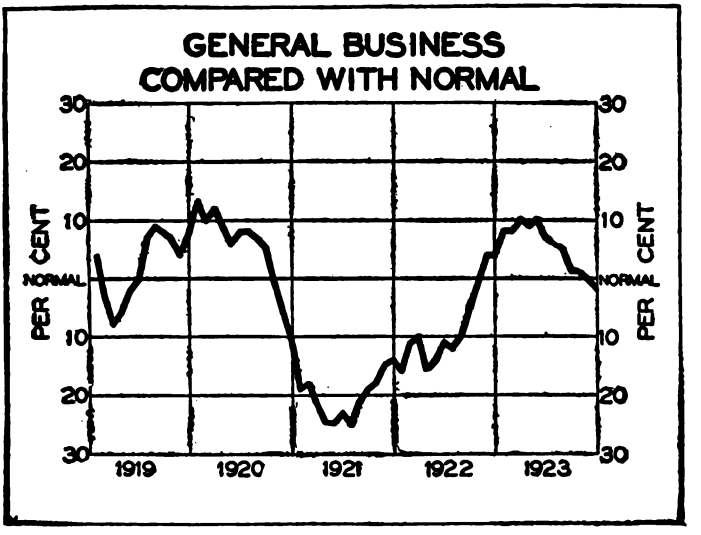
Cyclical Characteristics.

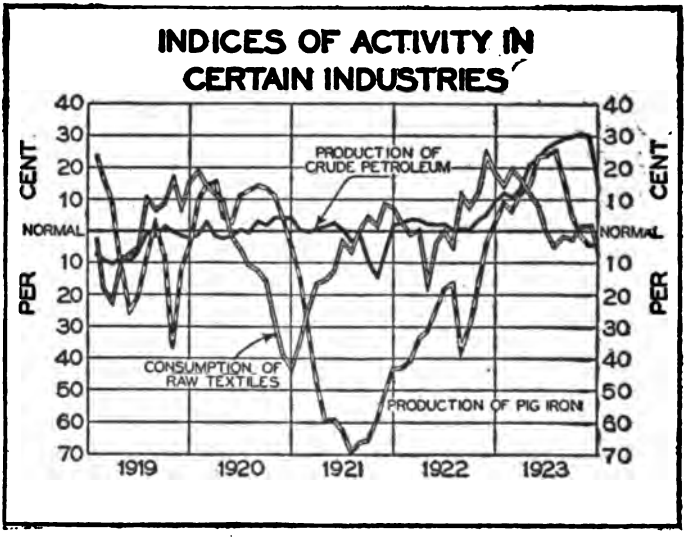
It may be stated that the distinguishing characteristic of the cycle is the sequence of developments rather than the uniformity in time, extent, or duration. Periods of prosperity are invariably followed by decline and then depression, from which recovery eventually develops. In order to permit ready understanding of the general characteristics of a business cycle, reproduction is made in these pages of graphic presentations

VARIOUS PHASES OF THE BUSINESS CYCLES, 1903–1914 *

Phase	*Nov.–Dec. 1903 to Nov.–Dec. 1907*	*Jan.–Feb. 1908 to July–Aug. 1910*	*Sept.–Oct. 1910 to Nov.–Dec. 1913*
	Months	*Months*	*Months*
Phase I: Depression.....	10	6	10
(*a*) Security prices begin to advance; speculative activity increases.			
(*b*) Commodity prices continue to decline; business activity is sluggish.			
(*c*) Rates on commercial paper decline; bank reserves increase.			
Phase II: Recovery.....	18	14	12
(*a*) Speculative activity is marked.			
(*b*) Business activity recovers; commodity prices begin to advance.			
(*c*) Rates on commercial paper begin to advance late in this phase of the cycle.			
Phase III: Business Prosperity.....	10	4	8
(*a*) Speculative activity is checked.			
(*b*) Business activity and commodity prices continue to increase.			
(*c*) Rates on commercial paper continue to advance while bank reserves decrease.			
Phase IV: Financial Strain.....	10	4	4
(*a*) Security prices decline sharply; speculative activity is depressed.			
(*b*) The upward tendency of business activity and commodity prices is checked.			
(*c*) Rates on commercial paper remain high or stiffen and the banking situation is strained.			
Phase V: Industrial Crisis.....	2	4	6
(*a*) Prices of securities reach bottom and speculative markets are panicky.			
(*b*) Commodities are liquidated, prices fall, and business activity slumps badly.			
(*c*) Rates on commercial paper reach maximum and bank reserves reach minimum. The crisis breaks.			
Length of complete cycle.....	50	32	40

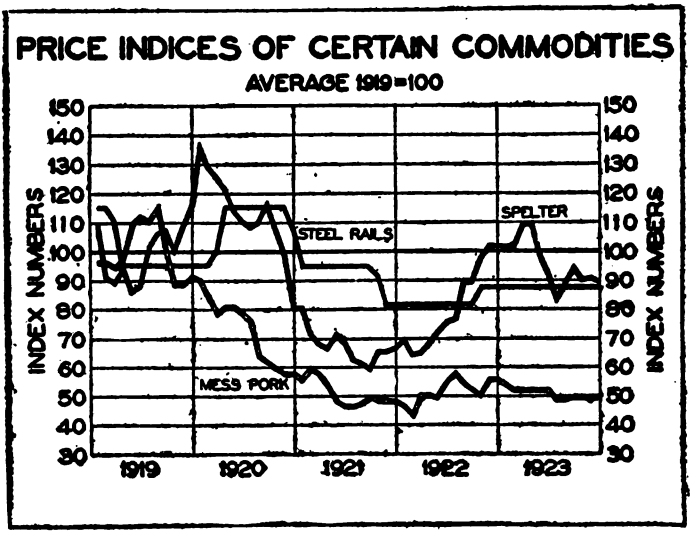
* Prepared by Prof. W. M. Persons of the Harvard University Committee on Economic Research.





selected from various sources. It should be recognized that the charts show general tendencies in all cycles rather than the exact operation of any single cycle. An analysis of an actual cycle is similarly presented.

A recent cycle.—An excellent illustration of cyclical movement is afforded in the period from 1919 through 1923. As is shown in the acompanying chart, business declined



sharply in the early part of 1919 following the Armistice. Recovery began in the spring months and continued until early in 1920. Then reaction came and the ensuing decline ran until midsummer of 1921. Recovery followed until the spring of 1923 with subsequent decline during the remainder of the year.

The second chart shows the effect of this cycle upon the relative activity in the production of pig iron and petroleum and the consumption of raw textiles. Petroleum was little affected; textiles more so; and pig iron was extremely disturbed. It is obvious that the effect of the cycle varies with separate industries. Proper allowance for this tendency is imperative.

The third chart shows the effect upon prices of selected commodities. The lack of uniformity is again evident. It is interesting to note the tendency of the price of zinc to change before that of steel.[1]

Empirical laws of the business cycle.—Although current knowledge of the business cycle is admittedly imperfect, certain observations have been made which have gained acceptance as empirical laws.

[1] These charts appeared in an article by F. E. Richter, of The American Telephone and Telegraph Co., in *Bell Telephone Quarterly*, Vol. 3, No. 4, p. 232.

1. Cycles vary with respect to time, extent, and duration.
2. No periodicity has been definitely established. Cycles do not occur in conformity with any time schedule.
3. The effect of the cyclical movement upon the aggregate of all business activity probably does not exceed in either direction a 10 per cent variation from normal. In individual lines, however, the variation may run as high as 75 per cent.
4. The duration ranges between two and seven years. The average is about forty months. The positive (active) phase is longer, averaging about twenty-three months, and the negative (inactive) phase is shorter, averaging about seventeen months.[2]
5. Out of every ten-year period, three years are usually good business years, three are relatively poor, and the other four may be classed as fair to average.

Seasonal variation.—In few lines of business does the volume remain constant over the twelve months of the year. The extent to which these variations occur naturally depends upon the nature of the business. These changes will not usually affect the monthly total over 5 per cent either way; but, in extreme cases, such as in the building industry, the degree of variation exceeds 30 per cent. If an attempt is to be made to judge cyclical position on the basis of monthly figures, it is patent that allowance must be made for the effect of normal variation during the months under observation.[3]

[2] A recent study by the National Bureau of Economic Research indicated that over the period 1890–1923 the United States enjoyed 1.79 years of prosperity for each year of depression.

[3] An explanation of the methods used in the determination of seasonal variation appears in a subsequent chapter on "Short-Term Forecasting."

Chapter V.

MEDIUM-TERM FORECASTS (ONE TO FIVE YEARS)

Section Two: Business Barometers

Business barometers.—In order that the effect of cyclical movement may properly be gauged in a medium-term forecast, current position in the cycle must be determined. The determination will be an approximation rather than an accurate allocation. But this limitation is not particularly objectionable, since the purpose is to foresee the sequence of future developments rather than just when, for how long, or to what extent they will operate. The sequence is quite invariable, whereas time, duration, and extent are subject to many variations, as has been stated. The first step in adjustment for cyclical movement, therefore, is the determination of current position.

The determination of current position in the cycle requires the use of so-called business barometers. Commercial activity is measurable, not in the aggregate, since no comprehensive records are maintained, but in the representative. Statistics are available which show activity in the principal lines of trade. These records are assumed to be representative of general conditions. For example, pig-iron output is the barometer of activity in production; freight-car loading, of activity in distribution; and interest rates, of money conditions. Although any record of actual transactions is of value in this respect, some are more useful than others, either because of a larger scope or a greater sensitiveness to changing conditions. The records which are used for the purpose of measuring general conditions, therefore, are termed business barometers.

No uniform agreement exists as to the best barometers of business. Literally hundreds are available, and selection is primarily a problem in elimination. Business men of the

old school, whose experience with business cycles antedates the origin of the term, still regard pig-iron production and bank clearings as the most useful, not improbably because no other or better yardstick was at their service in former years. Merchants of the newer school would substitute composite indexes of production in a group of industries for one in pig iron alone, and employ bank debits in preference to bank clearings. The barometers used in the present study are the ones selected by the writer for his professional use after considerable experimentation with many others. Moreover, the list is neither complete nor final as it now stands. Research into the problem of the business cycle has only begun.

Current position in the cycle is determined through the use of business barometers, somewhat as navigators employ sextants, and meteorologists utilize thermometers. The utilization may be based upon: (1) a comparison with normal expectation as of the time of determination; or (2) a peculiar tendency noted in past cycles. Freight-car loadings will serve to illustrate the "normal" method; security prices, the "analogy" method.

The "normal" method.—Allocation by the normal method requires the comparison of current data with an estimated normal expectation. If the current record is well in excess of normal, the prosperity period is indicated; if well below normal, the depression stage is inferred. If the present state is around normal, but was recently much lower, the recovery period is indicated; if the recent position was higher, the decline period is inferred. Regardless of comparison with normal, increasing values indicate the positive, and decreasing values, the negative, phase of the cycle. But the positive phase extends from the low point of depression to the peak of prosperity, and the negative phase from the peak of prosperity to the low point of depression. Hence, it is not enough to know only if the positive or negative phase obtains, if current position is to be approximated. Some idea of location in the phase is necessary. This refinement is made possible through comparison with an estimated normal, in the method now to be shown.

A study of railroad statistics from 1900 through 1924 shows a rate of growth in freight traffic of about 3½ per cent annually, based on revenue ton-miles. As car loading records

do not antedate 1918, an arbitrary starting point for the trend line has been established by averaging the annual totals for the five-year period, 1920–1924, and allowing the average to represent normal for the middle year, 1922. This amount is increased or decreased at the rate of 3½ per cent annually to get normal for the following or the preceding years.

Index numbers of seasonal variation are determined through the use of methods explained in a later chapter. The index numbers are: January, 91; February, 91; March, 95; April, 91; May, 96; June, 101; July, 101; August, 108; September, 112; October, 118; November, 104; December, 93. For each month, the weekly average trend position, as determined in the prior paragraph, is adjusted for seasonal variation by applying the proper index percentage and the product becomes the estimated normal for that month. The percentage which the *actual* weekly average is of the *estimated* weekly average becomes the index of cyclical position for the month. An illustration may help. The trend position for January, 1925, has been determined as 950,000 cars; the seasonal variation index for January is 91 per cent; the estimated normal, therefore, is 865,000 cars. The actual record for January, 1925, was 890,000 cars; the percentage of actual to estimated was 103, which becomes the index for the month.

FREIGHT-CAR LOADINGS

COMPARISON WITH NORMAL FROM 1920 TO 1925

	WEEKLY AVERAGE—UNIT 1,000 CARS				
Month	*Trend A*	*Seasonal Index B*	*Estimated Normal C(AXB)*	*Actual Loadings D*	*Adjusted Index (D/C)*
1920					
Jan.	803	91	731	820	112%
Feb.	805	91	733	776	106
Mar.	807	95	767	848	111
Apr.	809	91	736	739	99
May	811	96	779	805	103
Jun.	813	101	821	851	104
Jul.	815	101	823	870	106
Aug.	818	108	883	963	109
Sep.	820	112	918	949	103
Oct.	823	118	971	995	102
Nov.	825	104	856	877	102
Dec.	828	93	770	785	102

FREIGHT-CAR LOADINGS (*Cont.*)

Month	Trend A	Seasonal Index B	Estimated Normal C(AXB)	Actual Loadings D	Adjusted Index (D/C)
	WEEKLY AVERAGE—UNIT 1,000 CARS				
1921					
Jan.	831	91	756	683	90
Feb.	833	91	758	683	90
Mar.	836	95	794	698	88
Apr.	838	91	763	698	91
May	840	96	806	758	94
Jun.	842	101	850	762	90
Jul.	844	101	852	750	88
Aug.	846	108	914	812	89
Sep.	848	112	950	840	88
Oct.	850	118	1003	929	93
Nov.	853	104	887	756	85
Dec.	856	93	796	682	86
1922					
Jan.	859	91	782	734	94
Feb.	861	91	784	768	98
Mar.	864	95	821	827	101
Apr.	866	91	788	727	92
May	868	96	833	782	94
Jun.	870	101	879	851	97
Jul.	872	101	881	828	94
Aug.	875	108	945	873	92
Sep.	877	112	982	934	95
Oct.	880	118	1038	992	96
Nov.	882	104	917	947	103
Dec.	885	93	823	838	102
1923					
Jan.	887	91	807	847	105
Feb.	890	91	810	848	105
Mar.	892	95	847	916	108
Apr.	895	91	814	941	115
May	897	96	861	978	114
Jun.	900	101	909	1005	111
Jul.	902	101	911	989	109
Aug.	905	108	977	1039	106
Sep.	908	112	1017	1039	102
Oct.	910	118	1074	1073	100
Nov.	913	104	950	976	103
Dec.	916	93	852	822	96
1924					
Jan.	918	91	835	858	103
Feb.	921	91	838	908	108
Mar.	924	95	878	914	104
Apr.	926	91	843	880	104
May	929	96	892	895	100

FREIGHT-CAR LOADINGS (*Cont.*)

Month	*Trend A*	*Seasonal Index B*	*Estimated Normal C(AXB)*	*Actual Loadings D*	*Adjusted Index (D/C)*
	WEEKLY AVERAGE—UNIT 1,000 CARS				
Jun.	932	101	941	906	96
Jul.	934	101	943	894	95
Aug.	937	108	1012	974	96
Sep.	940	112	1053	1037	98
Oct.	942	118	1112	1095	98
Nov.	945	104	983	994	101
Dec.	948	93	882	873	99
1925					
Jan.	950	91	865	890	103
Feb.	953	91	867	905	104
Mar.	956	95	908	911	100
Apr.	959	91	873	930	106
May	962	96	924	983	106
Jun.	965	101	975	975	100
Jul.	968	101	978	972	99
Aug.	971	108	1049	1080	103
Sep.	974	112	1091	1074	98
Oct.	977	118	1153	1107	96
Nov.	980	104	1019	1023	100
Dec.	983	93	914	925	101

The estimate of normal expectation in March, 1920, was 767,000 cars. The actual weekly average of cars loaded during the month was 848,000, or 11 per cent above normal. The allocation would be the prosperity period and near the peak, since this index shows extreme variations of about 15 per cent from normal.

In April, 1921, actual data of 698,000 compared with estimated normal of 763,000, or 9 per cent below normal. As previous months showed larger percentages, the negative phase was indicated. As 15 per cent below normal usually marks the low point of this index, the cycle had probably entered the depression stage.

In November, 1922, actual data of 947,000 compared with estimated normal of 917,000, or 3 per cent above normal. As preceding months showed smaller percentages, the positive phase was indicated. As the index regained normal, the assumption might be that it would retain its position on a more or less stable basis. Such, unfortunately, is seldom the case. Business, recovering from depression, is not content to

rest at normal. The stimulation of rising markets gives an impetus to commerce which carries activity into abnormally high levels. In other words, the regaining of normal is but a passing phase. In this case, five months later, April, 1923, found the index at the peak position of 15 per cent above normal.

Allocation by the "normal" method is probably the soundest method of forecasting cyclical movement. It is in no way dependent upon empirical observation, as is the case in many of the barometers used in the "analogy" method. It is logical, simple to understand, and relatively easy to put into practice. It is based upon the fundamental assumption that the progress of the country is steady and continuous; that interruptions and recessions are only temporary and chiefly serve to make the business current stronger by reason of the accumulated force; that periods of boom and prosperity work out their own undoing through overproduction and overexpansion; that periods "below normal" are bound to be followed by recovery; and that periods "above normal" are certain to be followed by decline.

The "analogy" method.—Allocation by the "analogy" method is the application of a tendency observed in past cycles whereby a certain development seems to forecast subsequent events. The most popular barometer of this class is that of security prices which will be used as an illustration; but there are many others, including the price of zinc, the percentage of blast furnaces in operation, the price of scrap iron, an advance of a certain amount in interest rates following the previous low point, an advance in commodity price indexes through a certain maximum, and the number of business failures.

Security prices, especially in the case of industrial stocks, are widely believed to be excellent business barometers. The theory is that advancing prices precede business recovery and that declining prices forecast business decline, the respective movements being caused by the purchases and sales of forward-looking speculators. Business, of course, does not recover simply because security prices advance, nor does business decline because security prices fall. So whatever merit the barometer may have is not necessarily fundamental. Holders may sell securities, because they believe adverse business con-

ditions are ahead, but such unfavorable development is not certain to happen despite the liquidation. One may more logically predict that business will decline when it has gained a position well above normal than when security prices decline. Security prices are a good barometer only when the opinions of the sellers are vindicated. At other times, the opinions prove untenable and the barometer fails to function. Yet its record for accuracy is good enough to warrant its inclusion in any selected list.

In November, 1919, the Dow-Jones average of twenty industrial stocks reached a high point of 119.62 and then sharply declined. This downward tendency at the close of 1919 was interpreted to signify business reaction during 1920. The interpretation was only too true. The decline in the averages continued until August, 1921, when a low point of 63.90 was reached. From this point, prices advanced, forecasting business recovery in 1922 which developed quite in accordance.

In March, 1923, the average attained 105.38 after months of gradual advance, and then declined, thereby forecasting business reaction during the fall months, which proved accurate. An advance in the averages during the latter part of 1923 foreshadowed the recovery of the first half of 1924, just as the advance in the average during the latter part of 1924 indicated the activity of early 1925.

The reader is cautioned that the cases cited are examples where the stock market barometer functioned satisfactorily. The record, even in recent years, is not perfect. A definite decline in the averages at the end of 1922 preceded one of the most active industrial years. Moreover, the recovery in stock prices in the early part of 1921, although sustained for several months, proved ineffectual as a basis for forecasting, since the stock market had reversed its position by midsummer.

Chapter VI

MEDIUM-TERM FORECASTING (ONE TO FIVE YEARS)

Section Three: A Selected Group of Barometers.

Barometric fundamentals.—A business barometer is usually a statistical instrument by which current trade activity is measured. In the field of mechanics, the effect of a certain force is determined by calculating its intensity over a given period of time. It is a simple problem in mathematics to forecast the position of a moving force, such as a train or an automobile, if the present location, the rate of speed, and the direction are known. Intelligent business forecasting is based upon similar procedure. Commercial activity is a moving force. Where business will be to-morrow depends largely upon where it is to-day and where it was yesterday. The problem of business forecasting becomes a matter of determining what are the principal trade currents; what is their present position; what, their rate of acceleration; and how long the current movement has been in development.

The measurement of commercial activity in a country as large as the United States is a task of great magnitude. No attempt is made to collect comprehensive statistics except in the large industries. The assumption that what is true of the big, obtains in the case of the small, enterprise is an arbitrary one, not free from criticism. But since comprehensive figures are not available, representative ones must be used for the purpose at hand.

The four great factors in business activity are the conditions relative to production, distribution, consumption, and credit. The records of trade are carefully searched to find in each of these major fields one or more ways in which the degree of activity can satisfactorily be measured. From a theoretical aspect, four index numbers should suffice, one for

each of the factors. From a practical viewpoint, it is necessary to include a greater number and even then fall short of adequacy. The production records are fairly comprehensive, but the records of distribution are relatively few, and the records of consumption quite non-existent. In order to make a complete forecast of probable economic development, it would be necessary to know on a comprehensive scale the volume of all orders being placed, the total output of all productive and facilitating agencies, the volume of unfilled orders, the total of all distributive transactions, the extent of daily consumption of commodities and services, and commodity stocks on hand held by the producer, the distributor, and the consumer. Only a small fraction of this information is available, and on that decidedly limited fund of knowledge economic predictions must be based.

A natural interdependence will exist within any group of representative business statistics. Changes in the volume of production will find subsequent reflection in the volume of distribution, and changes in both will influence the condition of the money market. If the same causal factor operated uniformly to influence business activity, it would be easy to arrange the various factors in sequential fashion, with production first and the money market fourth, for example. But the interrelationship is circular rather than vertical. The condition of the money market at times directly influences the volume of production, and so it happens that the order of presentation herein follows the logical, rather the invariable, trend of sequence.

Suggested barometers.—In view of the many hundred indexes of business movements which are being compiled and published daily, weekly, monthly, and yearly, the principal problem in the selection of a group for barometric purposes is the determination of what to include. Since the desire is to obtain a complete perspective of the situation, the natural tendency is to use as many as possible. But because an approximate result is the best that can be expected, and because the use of relatively few indexes seems to be as effective for the purpose as the use of many, a limited group is suggested.

The test of efficiency in a practical business barometer is the extent to which it may be accepted as authentic, representative, and timely. It must be reliable. If the information does not

come from an official source, as does, for example, the Bureau of Labor Statistics Index of Wholesale Prices, the figures must be trustworthy. It must be representative. For instance, the totals of cars loaded weekly on the leading railroads of the country reflect nation-wide business, whereas sales of mail-order houses are more limited in scope. It must be timely. Information should be received within thirty days for barometric purposes.

By applying these tests to the numerous indexes available, and after eliminating obvious duplications, it is possible to select a limited group which will serve satisfactorily. The selection must necessarily be arbitrary, and cannot, therefore, be immune from criticism. The barometers used in this chapter are as follows:

Barometers of production.—

1. General manufacturing activity.
2. Pig-iron production.
3. Unfilled steel orders.
4. New building operations.

Barometers of distribution.—

5. Freight-car loadings.
6. Wholesale commodity prices.

Barometers of finance.—

7. Interest rates.
8. Federal Reserve ratio of reserves to liabilities.
9. Industrial stock prices.

1. *General manufacturing activity* has been selected, because the state of industrial operations indicates not only current sentiment but also future prospects. The adaptability with which manufacturing operations can be regulated to meet changing conditions makes this index exceptionally valuable.

2. *Pig-iron* production is included, despite the admitted fact that it is one of the component parts in the preceding

index. Three reasons for the duplication may be offered: (1) it is one of the oldest and best known indexes; (2) it is available several weeks before the general index; and (3) it is representative of activity in the basic industry of the United States.

3. *Unfilled steel orders* are stated, primarily, because they are an index of advance orders rather than of current production.

4. *New building operations* are included, because of the magnitude of the building industry, and because of the marked effect of changes in constructive activity on general business.

5. *Freight-car loadings* are included, because they give an authentic picture of the volume of current business movements. Whereas, the first four indexes bear chiefly upon the industrial life of the country, this index is influenced by agricultural activity as well.

6. *Commodity prices* vary with changes in conditions of demand and supply for goods, thereby automatically reflecting fundamental factors in the trade situation.

7. *Interest rates* reflect the condition of the money market. The cost of borrowing is always an important factor, due to the extensive use of credit in business.

8. *Federal Reserve ratio* of reserves to liabilities indicates concisely the condition of our national banking system with especial regard to the extent to which the available credit facilities are being employed. Although less important than interest rates as a barometer, it supplements rather than duplicates the former.

9. *Industrial stock prices* generally move in advance of the trend of business, influenced by the discounting operations of speculators.

Barometric interpretation.—Proper interpretation of any business barometer must be based upon a liberal appreciation of its limitations. No index of business now available is absolutely accurate, and most of them fall far short of their purported significance. The price index prepared by the Bureau of Labor Statistics is most carefully computed, but it admittedly contains a 10 per cent margin of probable error. And, what is more important than the relative accuracy of preparation, no index has yet been discovered which has proved an infallible guide to the future. Such limitations

emphasize the need of caution in the interpretation of barometers without destroying their utility.

The function of a business barometer is to indicate the position of business activity with respect to an estimated normal. If the indicated position is far above normal, an unfavorable interpretation of the future is warranted; if the current position is far below normal, a favorable forecast would be justified. Such deductions seem, at first thought, inconsistent. But, from a fundamental viewpoint, and from past experience, it is reasonable to believe that commerce has what might be termed a normal zone of activity. Periods above normal are as certain to be followed by reaction as periods below normal are to be followed by recovery.

The establishment of this normal zone for any separate business index must be the first step in the interpretation of the barometer. If the indexes were all reported on the basis of 100 per cent for normal, it would be easy to say that in one instance the normal zone would be between 90 and 110 per cent, and in another, between 80 and 120 per cent. But many are not, because the establishment of 100 per cent for normal in any series is difficult and subject to many varying opinions.

Of the nine barometers discussed in this chapter, only three are stated on a "percentage of normal" basis, and all of these three are "unofficial," in the sense that they represent individual, rather than collective, opinion. In all nine cases, the opinion of the author is given as to what may be accepted as the approximate normal, under existing conditions. Such opinion is frankly given for what it is worth, in the belief that it may be helpful to the business man who would like a definite expression of opinion from some informed source. The reader more analytically inclined is encouraged to form an opinion of his own in this respect rather than to accept as authoritative the tentative conclusions here stated.

The next step after the determination of approximate normal, whether it be represented by 100 per cent, or by a definite physical quantity, such as 3,200,000 tons of pig iron, is to set up the normal zone of fluctuations. It is well known that the degree of business activity in any line varies daily, weekly, and monthly, without necessarily changing the average over a certain period. So it happens that monthly changes

in the output of pig iron within the zone from 85 to 115 per cent are not particularly significant, except when the trend is consistently in one direction. But because of greater stability of demand, the normal zone for variations in the volume of car loadings is within the much narrower range of 95 to 105 per cent.

The third step is the comparison of the current position with relation to the normal zone. The current position of 112 per cent for car loadings in January, 1920, clearly indicated a high position of the cycle, just as 88 per cent in March, 1921, indicated a low position; both interpretations being based upon a normal zone between 95 and 105 per cent. In connection with this third step, it is always important to observe the tendency over the preceding six months apart from the comparison with the normal. The car loading index in October, 1923, was exactly 100 per cent of normal, which was significant, in that it marked the sixth successive month of declining activity and hence had a more unfavorable aspect than the casual observation that activity was currently about normal.

Although the various barometers are discussed separately in this chapter, it is not the thought that they should be used individually. The position of the stock market, for example, might warrant a forecast entirely out of keeping with the indications of the other barometers. It is suggested that they be used collectively, so that the influence of unusual conditions in one or two of the indexes may be clearly offset by the conditions of the others.

THE INDEX OF GENERAL MANUFACTURING ACTIVITY

Specific Title .....Adjusted index of composite manufacturing.
Unit of Measurement.....Percentage of normal estimate for given month.
Source of Information.....*Harvard Economic Service.*
Basis of Compilation.....Monthly.
Date of Publication.....Last week of following month.

The first index used in this chapter for barometric purposes is that of general manufacturing activity as compiled monthly by the Harvard University Committee on Economic Research and published monthly in the *Harvard Economic Service.*

To indicate the items which are used in this compilation, a statement is here given to show the manner in which the index number of 108 was determined for the month of December, 1924:

	Per Cent
Equipment and Vehicles	109
Automobiles Produced	107
All Basic Materials	109
Pig-Iron Produced	98
Steel Ingots Produced	111
Lumber Group	126
Cotton and Wool Group	109
Leather Group	88
Paper, Tonnage Produced	108
Cement, Portland	125
All Consumption Goods	106
Food Group	109
Cattle Slaughtered	107
Hogs Slaughtered	143
Wheat Flour Produced	102
Cane Sugar Melted	97
Tobacco Group	102
Footwear	91
Carpets and Rugs	110
Newsprint Consumed	102
Gasoline Produced	119
The Adjusted Index Number	**108%**

In the first post-war cycle (A) the peak of this index (p. 60), 115 per cent, was reached in January, 1920. This was one of the first barometers to show a decline during the great deflation movement in 1920. January, 1921, was a month when business was still declining from the 1920 peak; the index number at 81 per cent reflects this retrogression. The low point of 72 per cent was reached in May, 1921, during the depression period. It is further significant to note that this index was one of the earliest to show the change in the trend of business during 1921.

The second post-war cycle (B) began in the summer of 1921. Recovery was clearly in evidence in June, 1922, when the index registered 99 per cent. The peak in the subsequent prosperity period came in March, 1923, with the index at 117 per cent, or slightly higher than the peak of Cycle A (115 per cent in January, 1920). When the index number had reached its former peak, the assumption was reasonable that the current movement had attained its apex and that decline might be expected. Just as at the high and low points of Cycle A, this index was among the first to show a definite change in trend, so again it worked out at the point of Cycle B. Business declined during the latter part of 1923 as shown by the index of 101 per cent in December. The subsequent low point of 86 per cent occurred in July, 1924.

The third post-war cycle (C) began in the late summer of 1924. In November, recovery had progressed so rapidly that the index was at 98 per cent. During 1925 and 1926 the index remained consistently above 100, thus indicating a period of general prosperity which has yet to reach its end as this chapter is written.

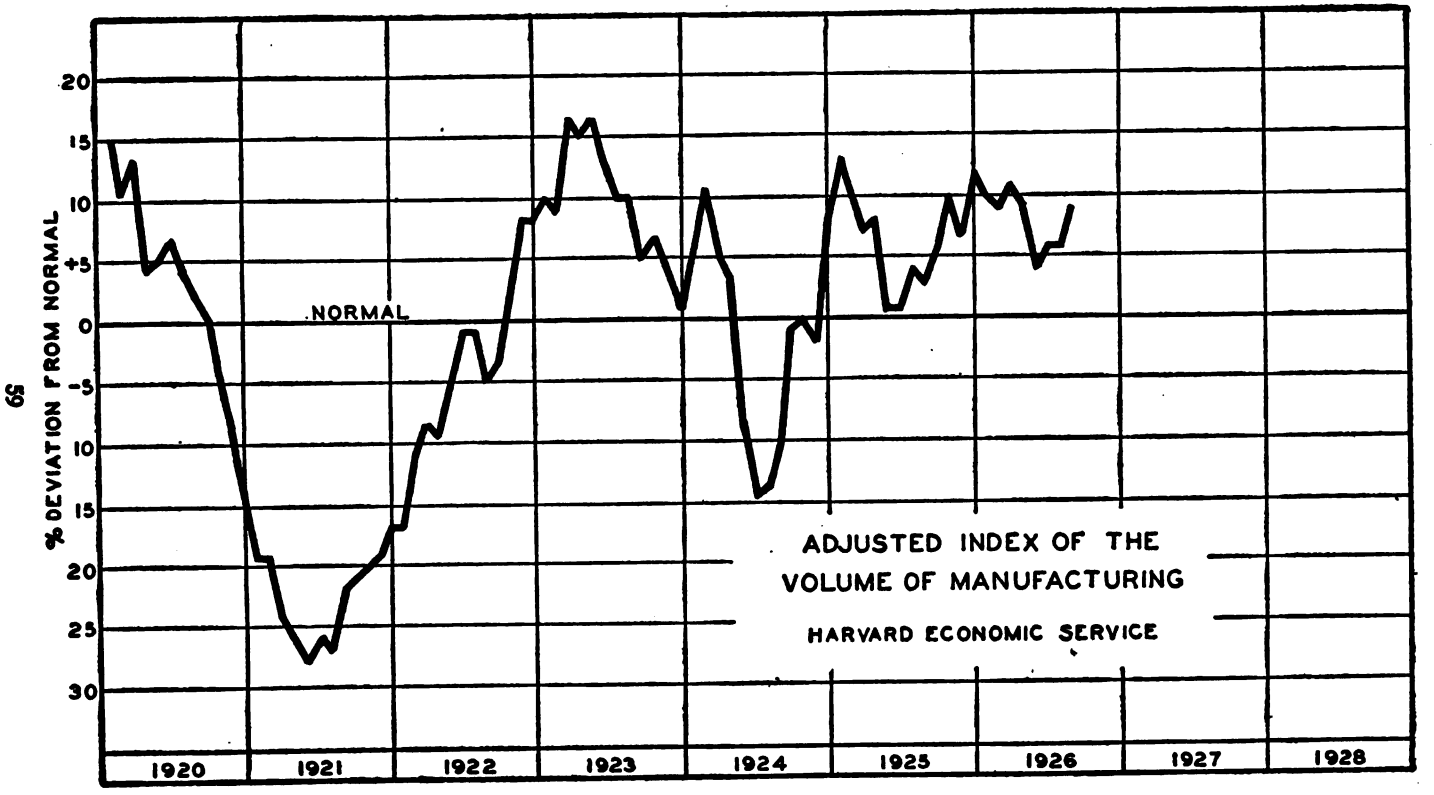
Not only has this index functioned as a satisfactory criterion of current manufacturing activity during recent years, but also it has proved one of the most sensitive barometers of changing conditions. Its superiority in this latter respect will become increasingly evident as the other barometers are discussed.

ADJUSTED INDEX OF THE VOLUME OF MANUFACTURING

(*Harvard Economic Service.*)

(Normal—100)

Month	1920	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	115	81	83	110	106	113	110	—	—
Feb.	111	81	89	109	111	110	109	—	—
Mar.	113	76	92	117	105	107	111	—	—
Apr.	104	74	91	115	103	108	109	—	—
May	105	72	95	117	92	101	104	—	—
Jun.	107	74	99	113	86	101	106	—	—
Jul.	104	73	99	110	87	104	106	—	—
Aug.	102	78	95	110	90	103	109	—	—
Sep.	100	79	97	105	99	106	112	—	—
Oct.	96	80	102	107	100	110	108	—	—
Nov.	92	81	108	104	98	107	105	—	—
Dec.	86	83	108	101	108	112	105	—	—



Period		Depression	Recovery	Prosperity	Decline
Condition		Low	Increasing	High	Decreasing
Cycle A	Date	.....	.....	Jan., 1920	Jan., 1921
	Index	.....	.....	115%	81%
Cycle B	Date	May, 1921	June, 1922	Mar., 1923	Dec., 1923
	Index	72%	99%	117%	101%
Cycle C	Date	June, 1924	Nov., 1924	.....	.....
	Index	86%	98%	.....	.....
Cycle D	Date	.....	.....	.....	.....
	Index	.....	.....	.....	.....

Interpretation of the index of general manufacturing activity.—The normal zone for this index is between 90 and 110 per cent.

A position above 110 per cent indicates that the cycle is near the top and that it would be unreasonable to expect much further expansion in business.

A position above 115 per cent indicates a dangerously high position and that reaction is close at hand.

A position below 90 per cent indicates that the cycle is near the bottom and that it would be reasonable to expect a check to further declines.

A position below 85 per cent indicates that the cycle is about at the bottom of its swing and that some improvement is close at hand.

A position between 90 and 110 per cent is significant only when it continues a definite trend in either direction.

The cyclical positions indicated are as follows:

110% and Over ..... Prosperity
110% Downward to 90% ..... Decline
90% and Below ..... Depression
90% Upward to 110% ..... Recovery

THE INDEX OF PIG-IRON PRODUCTION

Specific Title .....Pig-iron output of blast furnaces.
Unit of Measurement.....Tons produced during given month.
Source of Information.....*Iron Age.*
Basis of Compilation.....Monthly.
Date of Publication.....First week of following month.

The second barometer is that of pig-iron production. There are about four hundred blast furnaces in the United States, with a monthly capacity of about 4,500,000 tons. As pig iron is the basic material used in industrial operations, the volume of monthly output has long been regarded as "the barometer of industry." The experience of recent years, notably in 1920, does not evidence that pig iron is always a reliable index of industrial conditions. It seems to move somewhat in advance of the cycle on the upswing and to lag behind on the decline.

This index served more appropriately when the modern composite index numbers were not available. The composite manufacturing index clearly gives a better picture of general industrial activity and moves more uniformly with the business cycle. Yet the pig-iron index has the distinct advantage of being available several weeks ahead of the composite index.

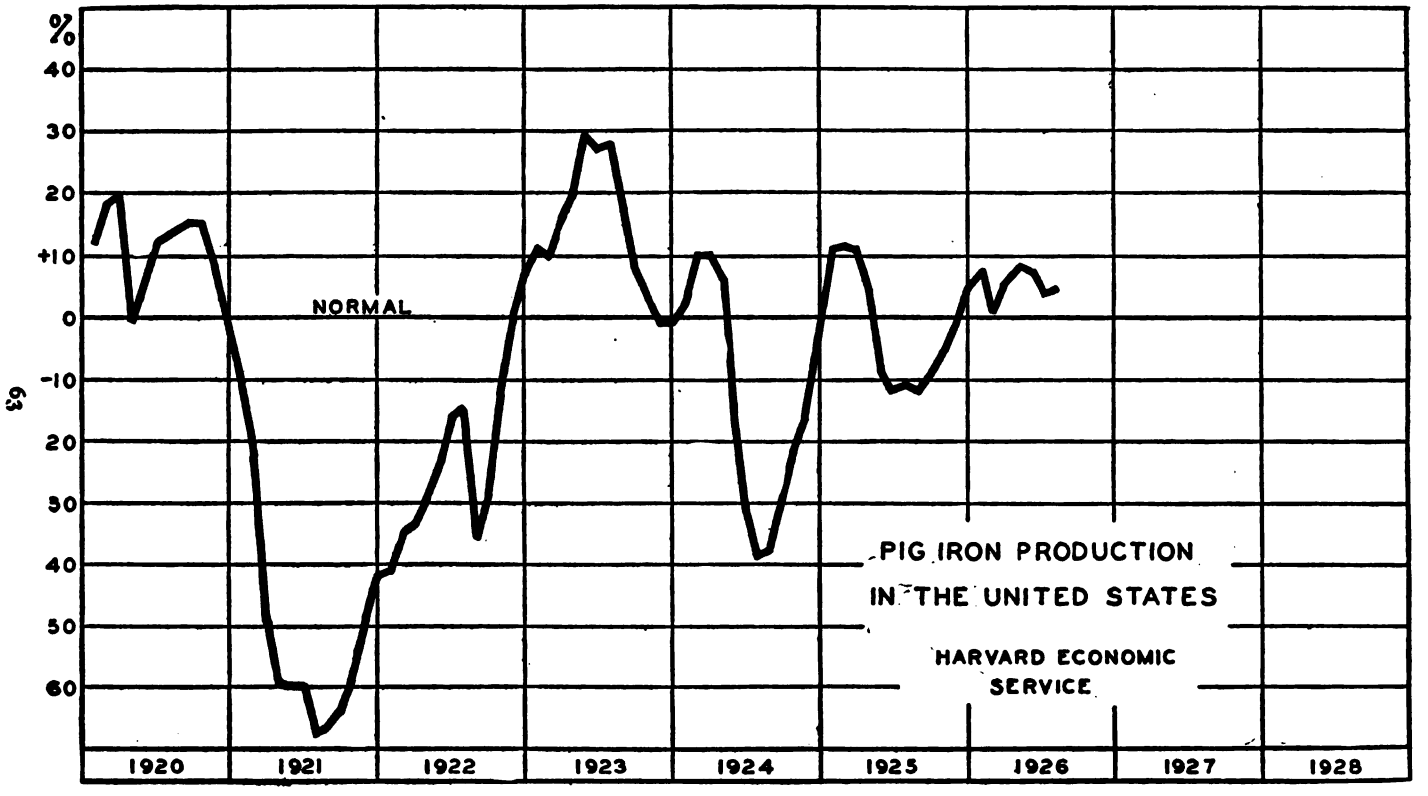
PIG-IRON PRODUCTION IN THE UNITED STATES (Iron Age)

(Unit—1000 tons)

Month	1920	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	3015	2416	1645	3229	3018	3367	3316	—	—
Feb.	2978	1937	1630	2994	3074	3214	2923	—	—
Mar.	3375	1595	2036	3523	3446	3522	3442	—	—
Apr.	2739	1193	2072	3549	3233	3259	3450	—	—
May	2985	1221	2307	3867	2615	2931	3481	—	—
Jun.	3043	1065	2361	3676	2026	2673	3235	—	—
Jul.	3067	865	2405	3678	1785	2664	3223	—	—
Aug.	3147	954	1816	3449	1887	2704	3200	—	—
Sep.	3129	986	2034	3125	2053	2729	3136	—	—
Oct.	3292	1247	2638	3149	2477	3023	3334	—	—
Nov.	2934	1415	2850	2894	2509	3015	3236	—	—
Dec.	2703	1649	3087	2920	2961	3261	3091	—	—

EXPRESSED AS PERCENTAGES OF NORMAL (Harvard Economic Service)

Month	1920	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	113%	88%	59%	112%	103%	112%	108%	—	—
Feb.	118	77	65	110	111	113	101	—	—
Mar.	120	52	67	116	111	112	106	—	—
Apr.	99	41	71	120	106	105	109	—	—
May	106	40	77	129	84	92	108	—	—
June.	113	40	84	127	69	88	104	—	—
Jul.	114	33	86	128	62	89	105	—	—
Aug.	115	34	64	117	63	88	102	—	—
Sep.	116	37	72	108	70	91	102	—	—
Oct.	116	41	88	104	79	95	103	—	—
Nov.	108	51	100	99	84	99	107	—	—
Dec.	98	58	107	99	98	105	110	—	—



Period		Depression	Recovery	Prosperity	Decline
Condition		Low	Increasing	High	Decreasing
Cycle A	Date	.....	.....	Mar., 1920	Jan., 1921
	Index	.....	.....	3375	2416
Cycle B	Date	Jul., 1921	Jun., 1922	May, 1923	Dec., 1923
	Index	865	2361	3867	2920
Cycle C	Date	Jul., 1924	Nov., 1924	.....	.....
	Index	1785	2509	.....	.....
Cycle D	Date	.....	.....	.....	.....
	Index	.....	.....	.....	.....

The trend of pig-iron production has closely paralleled the trend of general business conditions.

It is significant to point out, however, that a better indication of changing conditions has been afforded by the composite manufacturing index than by pig-iron alone. In 1920, the peak of the composite index came *two months before* that of pig-iron; in 1921, the low point of the composite index came *two months before* the low point of pig-iron; in 1923, the peak of the composite index came *two months before* the peak in pig-iron; in 1924, the valley in the composite index was *one month before.*

Interpretation of the index of pig-iron production.—As the output of pig iron in the United States is increasing at the rate of about 4 per cent annually, the normal volume tends to grow from year to year. For the year 1926, the normal output might fairly be estimated at 3,000,000 tons monthly; for 1927, at 3,120,000 tons monthly; for 1928, at 3,250,000 tons monthly; and continuing to increase at that rate into the future.

The normal zone of fluctuations is between 85 and 115 per cent.

A position above 115 per cent indicates the approximate top of the cycle.

A position below 85 per cent indicates a position definitely under the normal zone, from which subsequent recovery may be expected.

A position above 120 per cent indicates a rate of activity which can be sustained for a relatively short period.

A position below 75 per cent indicates a period of underproduction from which fairly rapid betterment is likely to develop.

A position between 85 and 115 per cent is significant only when it continues a definite trend toward increased or decreased output.

The cyclical positions indicated are as follows:

115% and Over	**Prosperity**
115% Downward to 85%	**Decline**
85% and Below	**Depression**
85% Upward to 115%	**Recovery**

THE INDEX OF UNFILLED ORDERS

Specific Title ..... **Unfilled orders of United States Steel Corporation.**
Unit of Measurement..... **Tons.**
Source of Information..... **United States Steel Corporation.**
Basis of Compilation..... **Unfilled tonnage at end of month.**
Date of Publication..... **Tenth of following month.**

The third barometer is that of unfilled steel orders. The main reason for including this particular index which seems, and actually does, to a large extent, to duplicate the pig-iron index, is to get into the picture some reliable source of information on the volume of new orders being placed. One of the outstanding limitations upon the development of economic forecasting is a lack of information in this most interesting field.

Even this index does not give definitely what is most desired. As no information is given as to the volume of shipments during the period, it is possible that an increase in unfilled tonnage occurs in a month when orders actually decreased, or vice versa.

It will be noted, of course, that this index covers the operations of the Steel Corporation only, and therefore represents some 40 per cent of the entire steel industry.

Period		Depression	Recovery	Prosperity	Decline
Condition		Low	Increasing	High	Decreasing
Cycle A	Date	.....	.....	Jul., 1920	Jan., 1921
	Index	.....	.....	11118	7573
Cycle B	Date	Feb., 1922	Jun., 1922	Apr., 1923	Dec., 1923
	Index	4141	5636	7879	4445
Cycle C	Date	Jul., 1924	Nov., 1924	.....	.....
	Index	3187	4023	.....	.....
Cycle D	Date	.....	.....	.....	.....
	Index	.....	.....	.....	.....

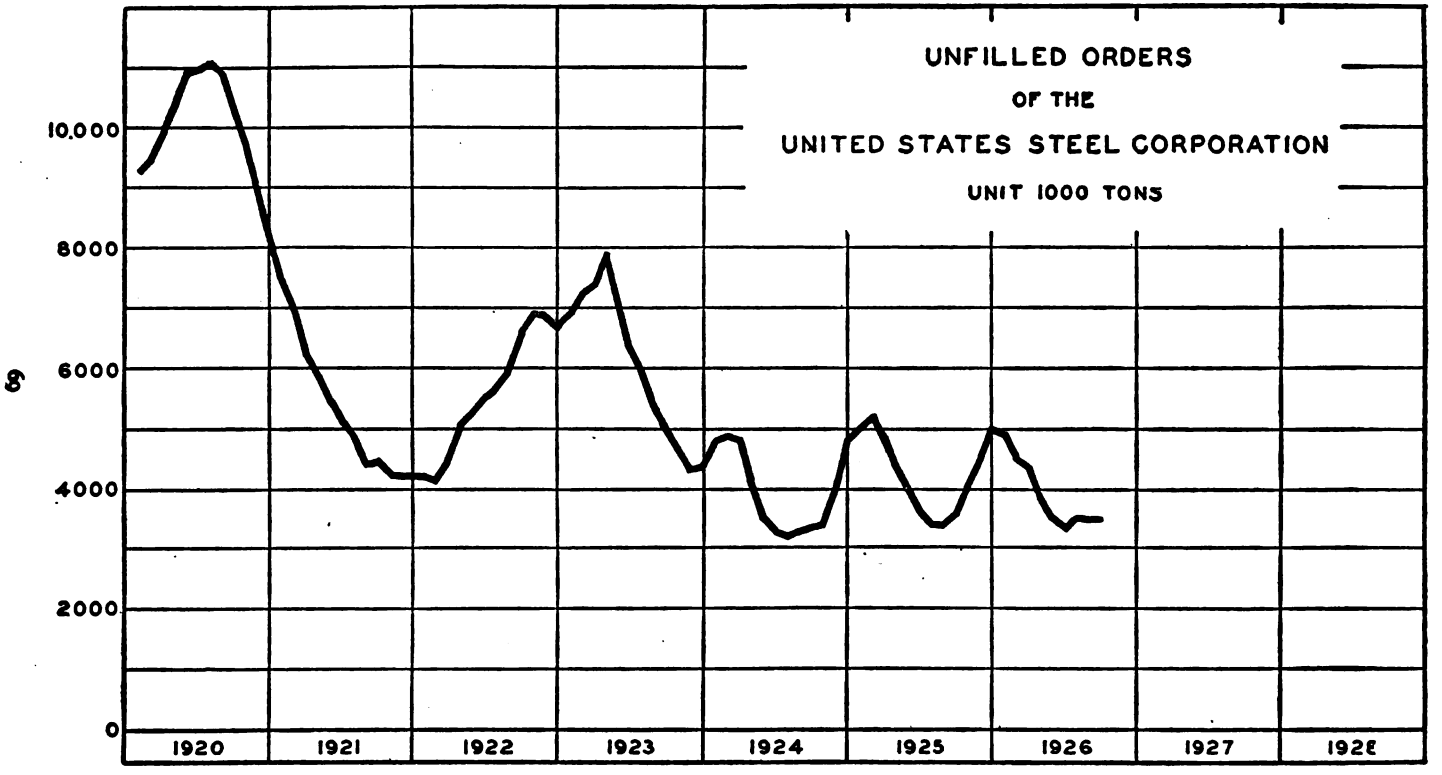
The volume of unfilled orders undoubtedly moves up and down in accordance with the general cyclical movement of business. This index has not proved so sensitive as that of pig-iron production, nor as that of the composite manufacturing index. In Cycle A, the peak in unfilled orders came *six months after* the composite and *four months after* pig-iron. In Cycle B, the low point came *nine months after* the composite and *seven months after* pig-iron; the high point came *one month after* the composite and *one month before* pig-iron. In Cycle C, the low point came *one month after* the composite and the *same month* with pig-iron. It would seem, therefore, that, although this index can be accepted as a satisfactory criterion of changing conditions, it is more likely to move after than before the two barometers previously discussed.

UNFILLED ORDERS OF THE UNITED STATES STEEL CORPORATION

(At the end of each month)

(Unit—1000 tons)

Month	1920	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	9285	7573	4242	6911	4798	5037	4882	—	—
Feb.	9502	6934	4141	7284	4913	5285	4616	—	—
Mar.	9892	6285	4494	7403	4783	4864	4379	—	—
Apr.	10360	5845	5097	7879	4208	4447	3867	—	—
May	10947	5482	5254	6981	3628	4050	3649	—	—
Jun.	10979	5118	5636	6386	3262	3710	3478	—	—
Jul.	11118	4830	5776	5911	3187	3539	3602	—	—
Aug.	10805	4532	5950	5415	3290	3513	3542	—	—
Sep.	10375	4561	6692	5036	3474	3717	3593	—	—
Oct.	9837	4287	6902	4672	3525	4109	3683	—	—
Nov.	9021	4251	6840	4369	4032	4582	3807	—	—
Dec.	8148	4268	6746	4445	4817	5033	3960	—	—



Interpretation of the index of unfilled steel orders.—The normal zone for this index is between 4,000,000 and 5,000,000 tons.

A position above 5,000,000 tons indicates the high phase of the cycle.

A position below 3,500,000 tons indicates the approximate bottom of the cycle.

A position between 4,000,000 and 5,000,000 tons is significant only to evidence the continuation of an upward or downward trend.

The cyclical positions indicated are as follows:

5,000,000 Tons and Over	Prosperity
5,000,000 Tons Downward to 4,000,000 Tons	Decline
4,000,000 Tons and Under	Depression
4,000,000 Tons Upward to 5,000,000 Tons	Recovery

THE INDEX OF NEW BUILDING OPERATIONS

Specific Title .....**Value of building permits in 180 leading cities.**
Unit of Measurement.....**Dollars.**
Source of Information.....***Bradstreet's.***
Basis of Compilation.....**Monthly.**
Date of publication.....**First week of following month.**

The fourth barometer is that of new building operations.

Available statistics on building operations are patently incomplete. The "Bradstreet" compilation used herein is open to criticism, in as much as it covers only the large urban centers and includes projects which may not be undertaken. The "F. W. Dodge" monthly summary of contracts awarded covers only thirty states. Despite these limitations, either of these compilations will give a fair idea of the trend of building activity.

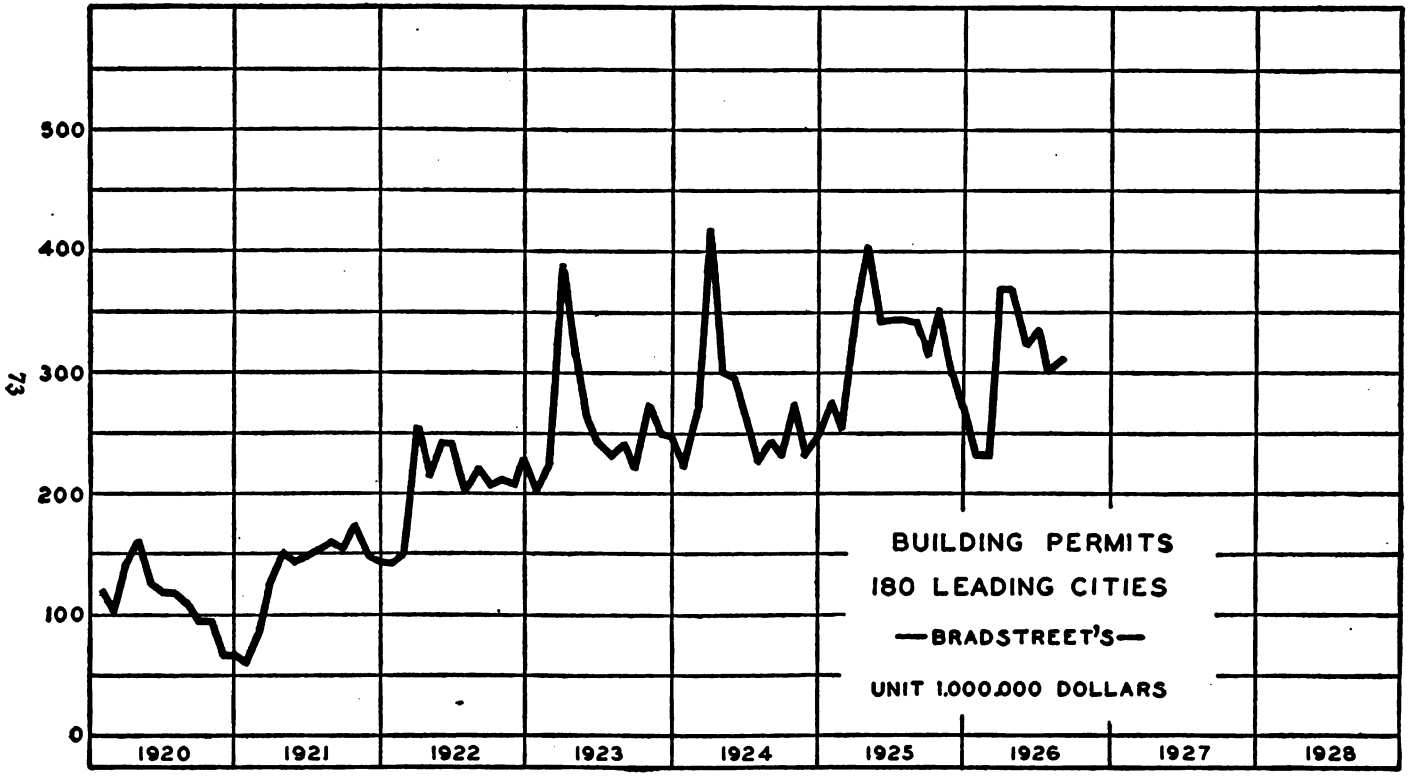
The interrelationship between the building industry and business in general is readily appreciable, particularly because of the wide variations in construction operations over given periods of time. The post-war building boom was one of the main supports to the high business activity which carried over the years immediately following 1922.

BUILDING PERMITS IN 180 LEADING CITIES

(*Bradstreet's*)

(Unit—$1,000,000)

Month	1920	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	118	61	142	203	222	275	234	—	—
Feb.	106	85	149	227	274	254	235	—	—
Mar.	139	124	256	388	418	354	370	—	—
Apr.	167	150	215	315	301	409	370	—	—
May	129	144	242	265	297	342	324	—	—
Jun.	119	147	243	241	263	344	338	—	—
Jul.	118	152	203	203	231	345	302	—	—
Aug.	109	160	223	241	244	342	316	—	—
Sep.	93	154	210	221	237	317	275	—	—
Oct.	92	173	215	273	277	353	350	—	—
Nov.	65	148	212	250	234	298	257	—	—
Dec.	67	142	230	248	251	276	371	—	—



Interpretation of the index of building permits.—The normal zone for this index is between $200,000,000 and $300,000,000 monthly. This margin covers not only ordinary fluctuations but also allowance for seasonal influences which exert great influence in this field.

A position above $300,000,000 monthly represents a degree of activity which cannot be sustained over any prolonged period.

A position below $200,000,000 monthly indicates the accumulation of a certain shortage of facilities which will eventually tend to stimulate activity.

Fluctuations between these amounts are without particular significance except, as in the case of the preceding barometers, to evidence the continuation of an upward or a downward trend.

Obvious difficulties are involved in an attempt to forecast what will prove the normal level of building operations after the present boom has spent itself. The range here stated represents solely the opinion of the writer and is suggested in tentative fashion subject to later revision as necessary.

The cyclical positions indicated are as follows:

$300,000,000 and Over	Prosperity
$300,000,000 Downward to $200,000,000	Decline
$200,000,000 and Under	Depression
$200,000,000 Upward to $300,000,000	Recovery

THE INDEX OF FREIGHT-CAR LOADINGS

Specific Title .....Loadings of revenue freight cars.
Unit of Measurement.....Cars.
Source of Information....American Railway Association.
Basis of Compilation.....Weekly.
Date of Publication.....Second week following reported week.

The fifth barometer is that of car loadings. The leading railroad companies report weekly the number of cars actually loaded with commodities for shippers. The totals are reported regularly in considerable detail both as to classes of commodities and as to regions. For the present purpose, the grand total only is used, on an average basis for the month.

The volume of car loadings is one of the more recently developed indexes, but already has gained wide recognition as an acceptable criterion of current activity in trade. When proper allowance is made for the effect of seasonal variation, as is elsewhere explained in showing the method of reducing this index to a percentage basis, a fairly reliable indicator is here provided.

This index provides a good example of a business thermometer put to barometric use. The volume of car loadings has no direct forecasting utility; indirectly, however, it is serviceable in determining current cyclical position which becomes the basis for a general forecast.

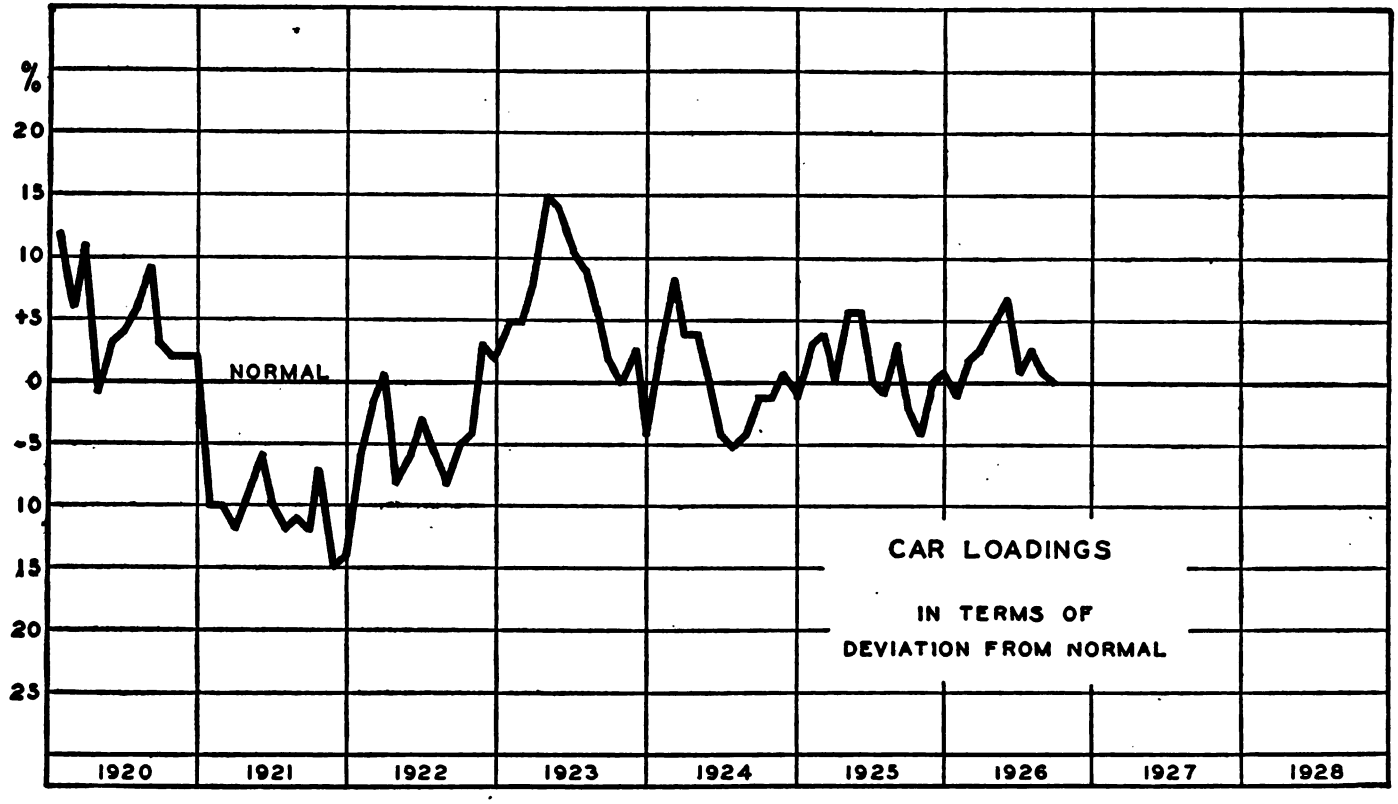
FREIGHT-CAR LOADINGS, WEEKLY AVERAGE

(Unit—1000 cars)

Month	1920	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	820	683	734	847	858	890	886	—	—
Feb.	776	683	768	848	908	905	919	—	—
Mar.	848	698	827	916	914	911	969	—	—
Apr.	730	698	727	941	880	930	949	—	—
May	805	758	782	978	895	983	1028	—	—
Jun.	851	762	851	1005	906	975	1028	—	—
Jul.	870	750	828	989	894	972	1048	—	—
Aug.	963	812	873	1039	974	1080	1104	—	—
Sep.	949	840	934	1039	1037	1074	1138	—	—
Oct.	995	929	992	1073	1095	1107	1201	—	—
Nov.	877	756	947	976	994	1023	1068	—	—
Dec.	785	682	838	822	873	925	922	—	—

EXPRESSED AS PERCENTAGES OF NORMAL

Month	1920	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	112	90	94	105	103	103	99	—	—
Feb.	106	90	98	105	108	104	102	—	—
Mar.	111	88	101	108	104	100	103	—	—
Apr.	99	91	92	115	104	106	105	—	—
May	103	94	94	114	100	106	107	—	—
Jun.	104	90	97	111	96	100	101	—	—
Jul.	106	88	94	109	95	99	103	—	—
Aug.	109	89	92	106	96	103	101	—	—
Sep.	103	88	95	102	98	98	100	—	—
Oct.	102	93	96	100	98	96	100	—	—
Nov.	102	85	103	103	101	100	101	—	—
Dec.	102	86	102	96	99	101	97	—	—



Period	Depression	Recovery	Prosperity	Decline
Condition	Low	Increasing	High	Decreasing
Cycle A Date	.....	.....	Jan., 1920	Jan., 1921
Index	.....	.....	112%	90%
Cycle B Date	Nov., 1921	Jun., 1922	Apr., 1923	Dec., 1923
Index	85%	97%	115%	96%
Cycle C Date	Jul., 1924	Nov., 1924	.....	.....
Index	95%	101%	.....	.....
Cycle D Date	.....	.....	.....	.....
Index	.....	.....	.....	.....

A study of the cyclical movement in car loadings shows a definite correlation between this index and the swing of general business conditions. The peaks and valleys in loadings compare closely with the high and low points of the business cycle. It is not to be expected that this index would in any way tend to precede the general trend since it is inherently a measure of the volume of current trade. Its utility for barometric purposes lies in its use as a criterion of present position in the cycle. In other words, the volume of car loadings is not a direct forecasting agent. The function is indirect, as is the case in the preceding barometers. The relative volume of car loadings aids in the determination of current position in the cycle.

The volume of car loadings has proved an acceptable indicator of the degree of existing activity in trade. Although experience with this index has been limited to recent years, it has been an invaluable check upon opinion as to the general state of trade. More than once during the past several years pessimistic beliefs have been quite refuted by the convincing testimony of relatively large car loadings.

In Cycle A, the high point (112 per cent) came in January, 1920, coincidently with composite manufacturing, and before any of the other barometers with the exception of security prices. In Cycle B, the low point (85 per cent) came in November, 1921, lagging somewhat behind the general cycle. The following high point (115 per cent) came in April, 1923, concurrently with the turn of the general swing. In Cycle C, the low point (95 per cent) came in July, 1924, again in harmony with the business cycle.

Interpretation of the index of freight car loadings.—The normal zone for this index is between 95 and 105 per cent.[1]

A position above 105 per cent indicates that the cycle is in high territory. If the upward movement should continue and break through 110 per cent, the assumption would be justified that reaction is close at hand.

A position below 95 per cent indicates that the cycle is in low territory. If the downward movement should fall as low as 90 per cent, there would be justification for the belief that definite recovery is not far ahead.

The cyclical positions indicated are as follows:

105% and Over	Prosperity
105% Downward to 95%	Decline
95% and Below	Depression
95% Upward to 105%	Recovery

[1] The reports of the American Railway Association give the actual number of cars and not percentages of normal. Elsewhere in this volume, a detailed explanation appears of the method used in reducing the "crude" data to a percentage basis in the case of car loadings. The percentages here used conform with the illustration.

THE INDEX OF COMMODITY PRICES

Specific Title .....Index of wholesale commodity prices.
Unit of Measurement.....Percentage of 1913 average.
Source of Information.....Bureau of Labor Statistics, Washington.
Basis of Compilation.....Monthly (average of four weeks).
Date of Publication.....About twentieth of following month.

The sixth barometer is that of wholesale commodity prices. The index number used here is the one compiled by the Department of Labor and is believed to be representative of prices throughout the country.

The price index is one of the most popular indicators of business conditions. Advancing prices are regarded as favorable factors for two reasons: (1) they reflect an increasing demand for goods; and (2) they create increased confidence in the immediate outlook. Declining prices act conversely.

Emphasis is placed upon the thought that the business man should not expect to find in the trend of commodity prices the most serviceable barometer of business. The prices of separate commodities, particularly raw materials, often do give advance notice of fundamental changes in the business structure, so notably demonstrated in the case of silk and cotton in 1920. But price changes are probably more often the effect of changes in business conditions than the cause thereof. Price level changes chiefly reflect fluctuations in aggregate conditions of demand and supply. Of course, rising prices do encourage optimism and thus stimulate further activity. But the initial impetus originates outside the money market. In short, price indexes are more serviceable as barometers of the continuity of the business trend than as precursors of an impending change.

Period		Depression	Recovery	Prosperity	Decline
Condition		Low	Increasing	High	Decreasing
Cycle A	Date	.....	.....	May, 1920	Jan., 1921
	Index	.....	.....	247	170
Cycle B	Date	Jan., 1922	Jun., 1922	Mar., 1923	Dec., 1923
	Index	138	150	159	151
Cycle C	Date	Jun., 1924	Nov., 1924	.....	.....
	Index	145	153	.....	.....
Cycle D	Date	.....	.....	.....	.....
	Index	.....	.....	.....	.....

Probably no index of business conditions is watched more carefully or exercises greater influence upon commercial opinion than the trend of prices. While it is true that prices are determined by conditions of demand and supply and that variations in conditions of supply therefore affect prices, it is probably likewise true that as a general rule conditions of demand vary more widely than conditions of supply. Accordingly, a rise in price levels usually indicates an increased demand for commodities just as a fall in prices reflects a decreased demand. An augmented demand for commodities signifies either the existence or the expectation of greater activity in business and a slackened demand has the opposite connotation. So it happens that rising prices are considered to be a favorable factor in the business situation and that declining prices are construed unfavorably.

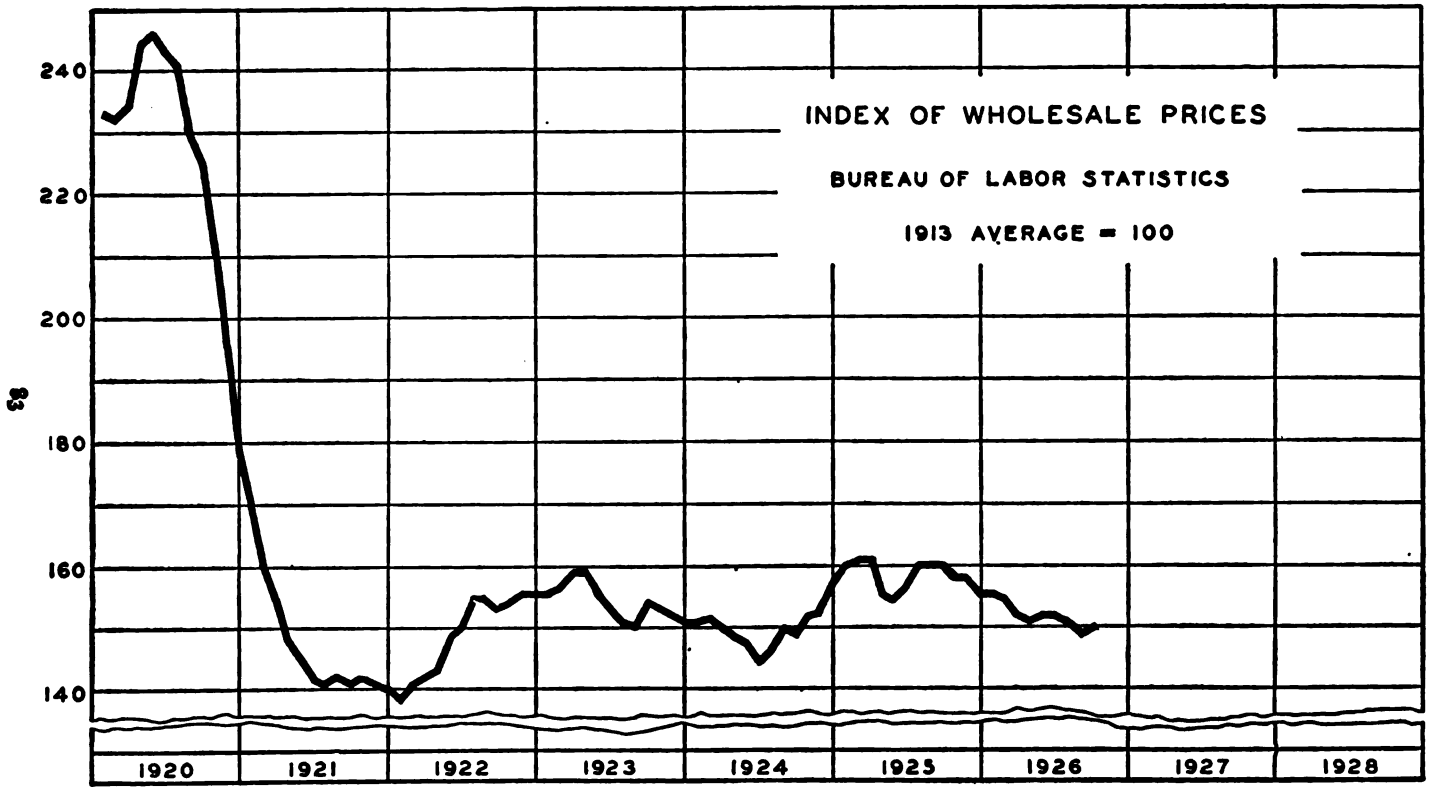
A study of the movement of prices over recent years verifies the expected correlation with the business cycle. In Cycle A, the peak came in May, 1920 (247), *four months after* car loadings and the composite manufacturing index, and *two months after* pig-iron production. In the Cycle B, the low point came in January, 1922 (138), *eight months after* composite manufacturing, *six months after* pig-iron production, and *two months after* car loadings. The subsequent peak came in March, 1923 (159), *concurrently* with composite manufacturing, *one month before* car loadings and *two months before* pig iron. In Cycle C, the low point came in June, 1924 (145), again *coincidently* with composite manufacturing, and *one month before* pig iron and car loadings.

WHOLESALE PRICES, INDEX NUMBERS

(Bureau of Labor Statistics)

(1913—100)

Month	1920	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	233	170	138	156	151	160	156	—	—
Feb.	232	160	141	157	152	161	155	—	—
Mar.	234	155	142	159	150	161	152	—	—
Apr.	245	148	143	159	148	156	151	—	—
May	247	145	148	156	147	155	152	—	—
Jun.	243	142	150	153	145	157	152	—	—
Jul.	241	141	155	151	147	160	151	—	—
Aug.	231	142	155	150	150	160	149	—	—
Sep.	226	141	153	154	149	160	150	—	—
Oct.	211	142	154	153	152	158	150	—	—
Nov.	196	141	156	152	153	158	148	—	—
Dec.	179	140	156	151	157	156	147	—	—



The more recent experience shows a closer time correlation with the business cycle. This tendency should continue. In Cycle A, inflation had been carried so far that prices were advanced well beyond conservative warrant. In the subsequent deflation which carried far into Cycle B, it was some time before a new price level could be established. This level proved to be at about 150.

The prewar experience indicated that, in normal times, the general average of prices tends to fluctuate with relatively narrow limits above and below an established equilibrium. Although the balance of opinion inclines to the belief that prices are likely to show a gradual downward tendency over the next decade, it now appears that a post-war equilibrium at about 150 per cent of the 1913 average has been established. A zone of normalcy for price movements might arbitrarily be established between 6 per cent above and 6 per cent below this level. The interpretation would be that an advance above 159 would indicate relatively high prices, and a time for cautious buying. Conversely, a decline below 141 would signify relatively low prices, and a favorable time for purchasing.[1]

[1] See Harvard Economic Service, Vol. IV, Weekly Letter No. 7, p. 50.

Interpretation of the index of wholesale commodity prices.—The normal zone for this index, based upon the post-war experience, is between 145 and 155 per cent.

At 150, the price index would be at approximate normal.

From 150 up to 155 the index would represent the upper part of the normal zone of fluctuations, and from 150 down to 145, the lower part of the zone.

Above 155, the index would show that the cycle was in a high position.

Below 145, the index would show that the cycle was in a low position.

If the index should break above 160 it would indicate the probable existence of an unhealthy period of overexpansion. On the other hand, if the index should break through 140 it would indicate that prices were lower than could permanently be justified.[2]

The cyclical positions indicated are as follows:

155 and Over	**Prosperity**
155 Downward to 145	**Decline**
145 and Below	**Depression**
145 Upward to 155	**Recovery**

[2] In as much as price changes are accomplished through variations in the value of the dollar as well as in the value of commodities, the criteria here stated must be subject to later revision as monetary conditions change.

THE INDEX OF INTEREST RATES

Specific Title .....Interest rates on 4–6 months commercial paper.
Unit of Measurement.....Percentage.
Source of Information.....*Financial and Commercial Chronicle.*
Basis of Compilation.....Weekly (averaged for the month).
Date of Publication.....Saturday.

The seventh barometer is that of interest rates.

The cost of borrowing money, better known as the rate of interest, plays an important part in business operations. Few enterprises are able to finance themselves without outside assistance. If the capital is sought for permanent investment, such as new buildings or equipment, long-term bonds are issued through investment bankers. If the money is desired for temporary use, such as seasonal carry-over, commercial bank loans are arranged. Low interest rates thus tend to encourage activity and high rates to discourage operations. There is that school of economic thought which ascribes to conditions in the money market the chief causal factor in changing business conditions. One may not agree with this opinion and yet find in the condition of the money market a serviceable barometer.

Interest rates vary not only with cyclical changes in business but as well according to the season of the year, the responsibility of the borrower, the nature of the collateral, the duration of the loan, and the purpose of the commitment. For barometric use, short-term commercial paper rates are probably the most serviceable.

The relationship of interest rates to business conditions is fairly obvious. The major part of the business of the country is transacted on a credit basis, and is financed through commercial bank loans. An increase in the volume of business is normally followed by an increased demand for loans. The increase in the demand for credit is naturally followed by a rise in the cost of borrowing. In times of prosperity, loans are generally expanded and interest rates are relatively high. In fact, the increasing cost of borrowing becomes one of the deterring factors to further business expansion and definitely contributes to the subsequent recession. As activity declines, loans contract, and, with the falling off in the demand for accommodation, interest rates move downward. In times of

depression, reserves are large, the demand for credit is small, and interest rates are relatively low.

It may be noted that the Federal Reserve discount rate is not given a place among the suggested barometers. The inference is, not that it lacks importance, but rather that inexperience renders it difficult of interpretation. Ultimately it should become one of the most important barometers, but now it is in the experimental stage. The rate is available, not to the business public, but to member banks of the Federal Reserve system. It is a central bank rate, and, as such, should reflect fundamental credit conditions in the country. More recently, it has been in the nature of a psychological tool by which the Federal Reserve Board has exercised a paternal control over the trend of business activity.[3]

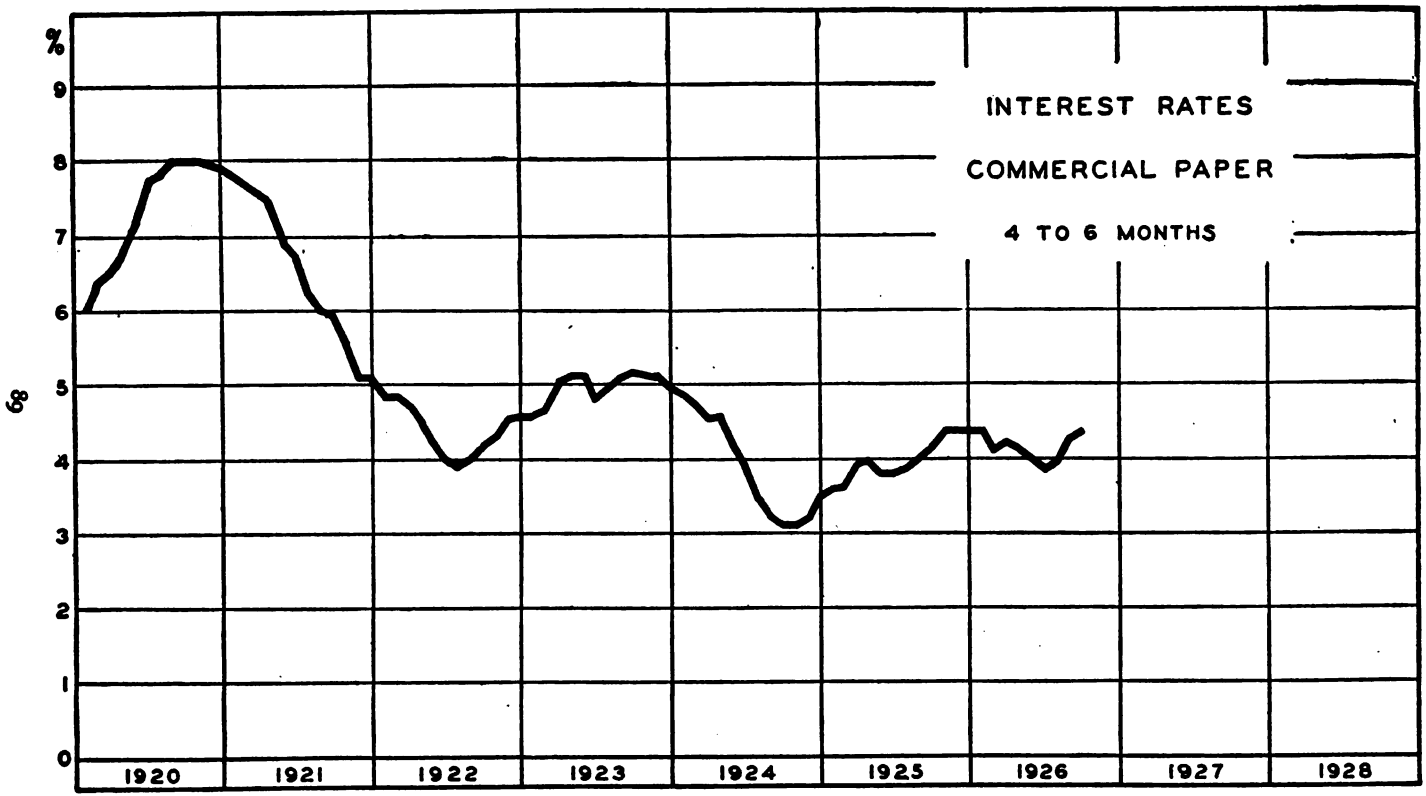
[3] "Time is of the essence of success in matters of credit and currency regulation by central or reserve banks. There are times on an upward trend of industry when the intervention of the Federal Reserve system by suitable discount policy can stimulate a forward movement in industry by maintaining a low rate; and later on by an advance of rate restrain the speculative extension of industry and thus serve to maintain a good condition of activity and prosperity. On a downward trend of industry, when the thing most to be feared is hasty liquidation under the fear of monetary stringency, Federal Reserve banks through their rate policy can do much to make the inevitable liquidation gradual and orderly by lowering rates."—Speech of A. C. Miller, Federal Reserve Board, at Boston, Mass., Nov. 16, 1925.

INTEREST RATES, COMMERCIAL PAPER

(Four to Six Months.)

(U. S. Department of Commerce.)

Month	1920	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	6.00	7.81	4.88	4.63	4.88	3.63	4.38	—	—
Feb.	6.44	7.75	4.88	4.69	4.78	3.66	4.13	—	—
Mar.	6.63	7.63	4.78	5.06	4.59	3.94	4.28	—	—
Apr.	6.81	7.53	4.56	5.13	4.63	3.97	4.20	—	—
May	7.25	6.88	4.25	5.13	4.23	3.88	4.00	—	—
Jun.	7.75	6.75	4.00	4.88	3.91	3.88	3.88	—	—
Jul.	7.85	6.30	3.94	4.94	3.53	3.93	3.95	—	—
Aug.	8.00	6.00	4.03	5.10	3.25	4.00	4.31	—	—
Sep.	8.00	5.95	4.25	5.16	3.13	4.19	4.43	—	—
Oct.	8.00	5.63	4.38	5.13	3.13	4.40	4.50	—	—
Nov.	7.94	5.13	4.60	5.09	3.25	4.38	4.44	—	—
Dec.	7.88	5.13	4.63	4.97	3.56	4.38	4.38	—	—



Period		Depression	Recovery	Prosperity	Decline
Condition		Low	Increasing	High	Decreasing
Cycle A	Date	.....	.....	Aug., 1920	Jan., 1921
	Index	.....	.....	8.00	7.81
Cycle B	Date	Jul., 1922	Nov., 1922	Sep., 1923	Dec., 1923
	Index	3.94	4.60	5.16	4.97
Cycle C	Date	Sep., 1924	Nov., 1924	.....	.....
	Index	3.13	3.25	.....	.....
Cycle D	Date	.....	.....	.....	.....
	Index	.....	.....	.....	.....

Since interest rates are primarily an effect and not a cause of changing conditions, the reasonable expectation is that a lagging tendency should be observed in the cyclical movement. Such has proved to be the case. The peak in Cycle A came in August, 1920. In Cycle B, the low point came in July, 1922, and the high point in September, 1923. In Cycle C, the low point came in September, 1924. In comparison with the peaks and valleys of the other barometers, it becomes plainly evident that interest rates lag many months after the general trend. So definite is this lag, that the cycle of interest rates seems to run almost a complete phase behind the general cycle.

Interpretation of the index of interest rates.—The normal zone for this index is between 4 and 5 per cent.

A position above 5 per cent indicates that the cycle is fairly well advanced and that the negative phase is not far distant.

A position above 6 per cent, if rates go so high, indicates that the cycle is close to, or possibly beyond, its peak.

A position below 4 per cent, under ordinary conditions, indicates that the cycle is in low territory.

A position between 4 per cent and 5 per cent, as with the previous barometers, is of significance only when it reflects a continuing trend.

The cyclical positions indicated are as follows:

5% and Over	**Prosperity**
5% Downward to 4%	**Decline**
4% and Under	**Depression**
4% Upward to 5%	**Recovery**

THE FEDERAL RESERVE RATIO

Specific Title .....Ratio of reserves to liabilities of all Reserve banks.
Unit of Measurement.....Percentage.
Source of Information....Federal Reserve Board, Washington.
Basis of Compilation.....As of Wednesday of each week.
Date of Publication.....Friday of each week.

The eighth barometer suggested is the Federal Reserve ratio of legal cash reserves to net note and deposit liabilities.

This ratio is of importance, in that it reflects the condition of our central banking system which comprises about 70 per cent of the banking resources of the nation. The member banks are required to keep on reserve with the Reserve banks an amount which varies with localities, but which averages about 10 per cent of their deposits. In turn the Reserve banks are required to keep 35 per cent in cash against deposits of member banks and 40 per cent in gold against notes in circulation. The margin over this legal minimum of between 35 and 40 per cent shown in the current ratio reflects the available unemployed credit facilities of the system.

An experience of ten years has thus far proved inadequate to establish a definite idea of where the reserve ratio should be under normal conditions. So long as the Reserve banks are to be the chief custodians of the gold supply of the world, the reserve ratio may be expected to remain close to its present high position of about 75 per cent. If a readjustment of the gold holdings is to be made under an international plan whereby a substantial part of the present holdings will be exported, the future reserve ratio will be materially lower.

While experience with this index is still too limited to permit its wide acceptance as an established sensitive barometer, it undoubtedly does serve even now as a worth-while indicator. With reserves fairly constant, an increase in the ratio is indicative of declining business, and a decrease, of more active business. Under present conditions, a ratio over 80 per cent signifies a subnormal position of the cycle, just as a ratio under 70 per cent signifies an above-normal position. But, since changes in the amount of cash reserve have greater effect upon the ratio than do changes in the total liabilities, it is necessary to make allowance for this factor in the suggested interpretation. From a current economic viewpoint, changes in liabilities at the Reserve banks are more significant than changes in the amount of cash reserve.

Period		Depression	Recovery	Prosperity	Decline
Condition		High	Decreasing	Low	Increasing
Cycle A	Date	.....	.....	Apr., 1920	Jan., 1921
	Index	.....	.....	42.4	49.0
Cycle B	Date	Jul., 1922	Nov., 1922	Mar., 1923	Jan., 1924
	Index	79.2	76.4	75.5	81.3
Cycle C	Date	Jul., 1924	Nov., 1924	.....	.....
	Index	83.0	77.4	.....	.....
Cycle D	Date	.....	.....	.....	.....
	Index	.....	.....	.....	.....

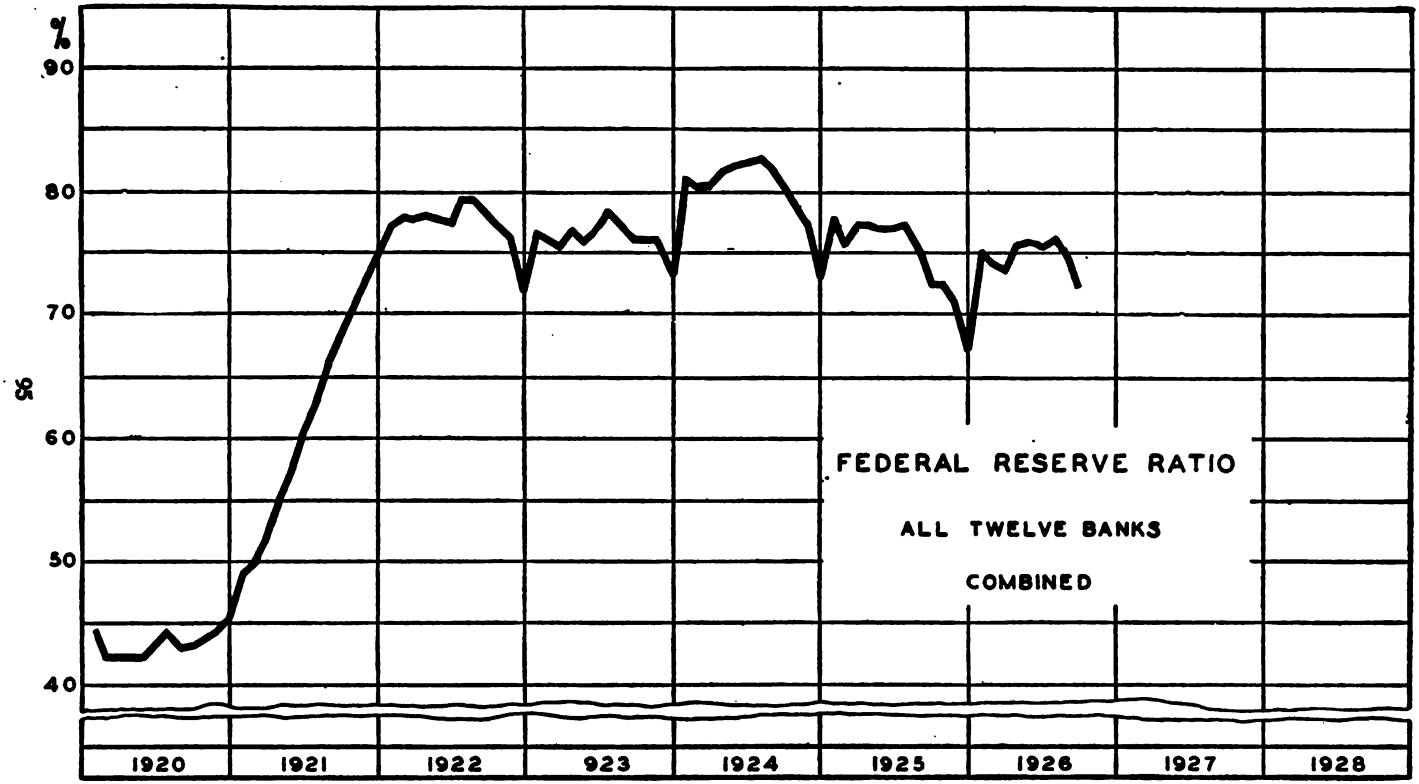
Despite the influence of the unusual factors which have operated in the Federal Reserve system, the reserve ratio has shown a definite cyclical movement over recent years. Unlike the tendencies of the barometers previously discussed, the ratio is low when business is active, increasing as business declines, high when business is depressed, and declining as business recovers. In Cycle A, the low point (42.3) came in April, 1920. In Cycle B, the high point (79.2) came in July, 1922, and the low point (75.5) in March, 1923. In Cycle C, the high point (83.0) came in July, 1924. As in the case of interest rates, the more recent experience is in better concurrence with the business cycle.

FEDERAL RESERVE RATIO

(All twelve banks combined.)

(At end of month.)

Month	1920	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	44.5	49.0	77.2	76.9	81.3	78.0	75.0		
Feb.	42.5	50.1	78.1	76.2	80.6	75.8	74.0		
Mar.	42.7	52.0	77.8	75.5	80.8	77.3	73.4		
Apr.	42.4	54.8	78.3	77.0	82.0	77.3	75.7		
May	42.7	58.1	78.0	76.1	82.7	77.0	76.0		
Jun.	43.6	60.8	77.5	76.9	82.8	77.0	75.3		
Jul.	44.2	63.7	79.2	78.2	83.0	77.3	76.3		
Aug.	43.2	66.8	79.2	77.5	82.3	75.0	74.4		
Sep.	43.6	68.8	78.4	76.4	80.4	72.5	72.6		
Oct.	43.1	70.6	77.6	76.3	78.6	72.5	73.6		
Nov.	44.4	72.7	76.4	76.4	77.4	71.1	72.2		
Dec.	45.4	70.2	72.1	73.3	73.0	67.3	70.1		



Interpretation of the Federal Reserve ratio.—The normal zone for this index is between 70 and 80 per cent.

A position below 70 per cent indicates the high phase of the cycle.

A position above 80 per cent indicates the low phase of the cycle.

Under conditions which obtain as this book is written, the reserve ratio will ordinarily fluctuate between these positions. Warrant exists for the belief, however, that these conditions will not prove permanent and that some revision of these percentages will be necessary at a later date.

The cyclical positions indicated are as follows:

70% and Under	**Prosperity**
70% Upward to 80%	**Decline**
80% and Over	**Depression**
80% Downward to 70%	**Recovery**

THE INDEX OF INDUSTRIAL STOCK PRICES

Specific Title .....Dow-Jones average price of twenty industrial stocks.
Unit of Measurement....Dollars.
Source of Information...*Wall Street Journal.*
Basis of Compilation....Average of daily closing prices.
Date of Publication.....Daily.

The last of the suggested barometers is that of industrial stock prices.

The stock market is probably the most popular business barometer. When stock prices advance, the impression is that it foretells increased business activity. The prospect of larger earnings encourages the purchase of stocks just as the opposite outlook acts contrariwise.

No other barometer of business shows so great a fluctuating tendency as the stock market. Upward and downward trends are interrupted by reactions which make highly difficult the interpretation at any given time. But it is usually possible to discern whether the market is relatively high or low and how far the current trend has developed. Such an approximation will serve for the present purpose.

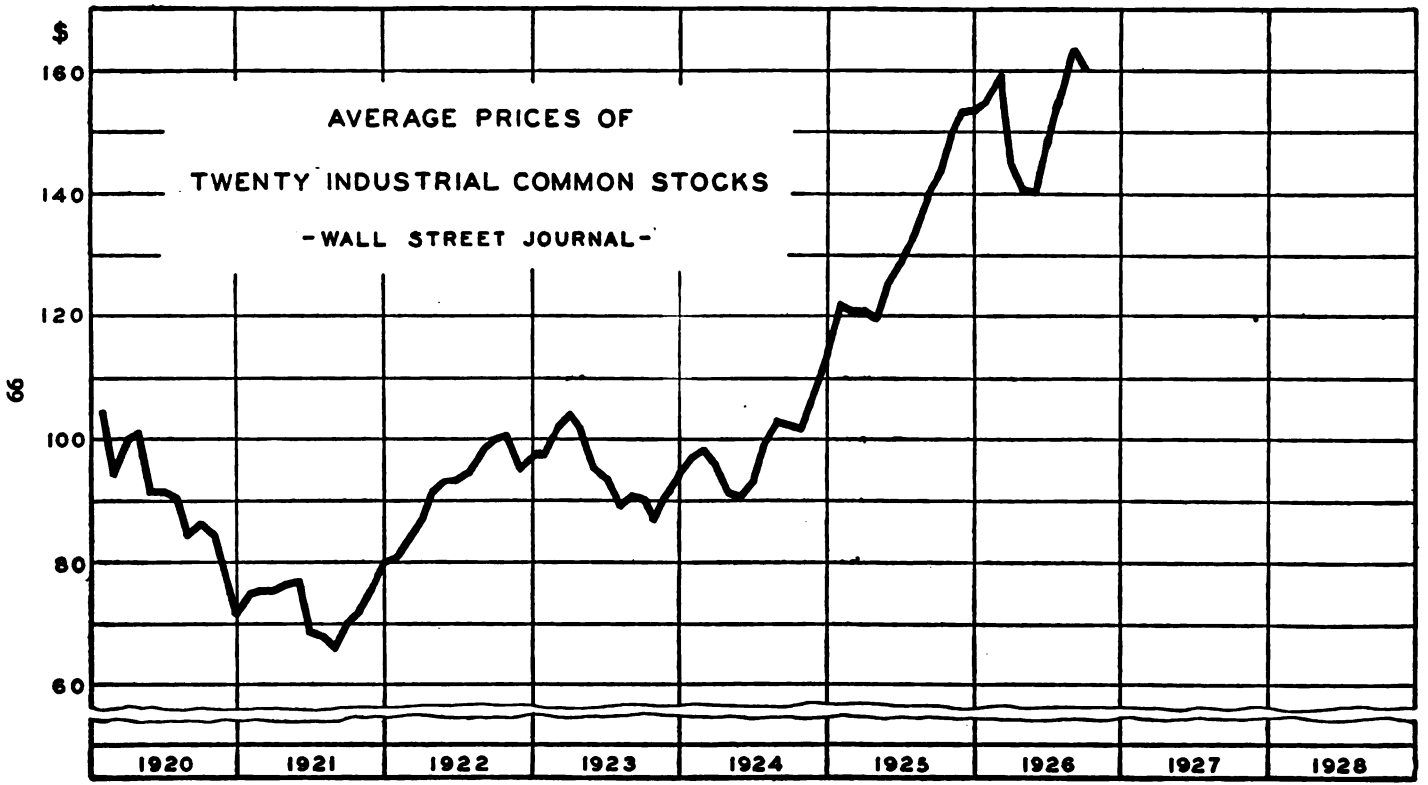
Although the general statement has been made that no barometer now in use has proved an infallible forecaster of the future, it may be well specifically to include the stock market barometer in this category. This barometer is recognized, not because it has been invariably correct, but because it is more often right than wrong.[4]

[4] Taken over the whole list of stocks their fluctuation discounts not what a few men know, however well informed they may be, but the sum of all that everybody knows. It includes all that a jobber knows about the condition of the textile trade, all that the best banker knows about the future movements of money, because it includes all that all the bankers know. It includes the best informed company president's full knowledge of his own business, together with the knowledge of all other businesses. It sees the general conditions of transportation in a way that the president of no single railroad can ever see. It is better informed on crops than the farmer or even the Department of Agriculture. It has the sum of practical knowledge of everything bearing on our finance, both domestic and foreign influences, reduced to what has been called the bloodless verdict of the market place.—W. P. Hamilton, in *The Wall Street Journal,* April 18, 1925.

AVERAGE PRICES OF TWENTY INDUSTRIAL COMMON STOCKS

(Dow-Jones average; *Wall Street Journal*,)

Month	1920	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	104.6	75.1	80.9	97.9	97.4	122.2	156.6	—	—
Feb.	94.4	75.5	84.0	101.8	98.8	121.1	159.2	—	—
Mar.	99.6	75.4	87.3	104.3	96.3	120.9	146.4	—	—
Apr.	100.8	76.7	91.7	101.5	91.7	119.8	140.5	—	—
May	91.4	77.2	93.6	96.2	90.5	126.1	140.2	—	—
Jun.	91.4	69.1	93.4	93.7	92.6	128.8	149.2	—	—
Jul.	90.6	68.5	95.2	89.3	98.3	133.6	156.6	—	—
Aug.	85.4	66.8	98.3	90.8	103.3	139.6	163.2	—	—
Sep.	87.0	70.2	99.8	90.3	102.8	144.0	160.1	—	—
Oct.	84.9	71.3	100.4	87.7	102.0	149.9	151.2	—	—
Nov.	78.4	76.0	95.8	91.0	108.2	153.9	154.5	—	—
Dec.	71.9	79.9	97.6	94.1	114.2	154.2	159.3	—	—



Period		Depression	Recovery	Prosperity	Decline
Condition		Low	Increasing	High	Decreasing
Cycle A	Date	.....	.....	Nov., 1919	Jan., 1921
	Index	.....	.....	119.62	75.1
Cycle B	Date	Aug., 1921	Jun., 1922	Mar., 1923	Dec., 1923
	Index	66.8	93.4	104.3	94.1
Cycle C	Date	May, 1924	Nov., 1924	.....	.....
	Index	90.5	108.2	.....	.....
Cycle D	Date	.....	.....	.....	.....
	Index	.....	.....	.....	.....

The stock market barometer, while not infallible, has generally proved a fairly reliable barometer of business. Its cyclical movement is even more pronounced than is usually the case in the trade indicators. In Cycle A, the peak (119.62) came in November, 1919, *two months before* composite manufacturing and car loadings, *five months before* pig iron, *six months before* commodity prices, and *ten months before* interest rates.

The subsequent record has been interesting. In Cycle B, the low point (63.90) came in August, 1921, *three months after* composite manufacturing, *one month after* pig iron, *three months before* car loadings, *five months before* commodity prices, and *eleven months before* interest rates. The succeeding high point (105.38) came in March, 1923, *concurrently* with composite manufacturing and commodity prices, *one month before* car loadings, *two months before* pig iron, and *six months before* interest rates.

In Cycle C, the low point (88.00) came in May, 1924, *one month before* composite manufacturing and commodity prices, *two months before* pig iron and car loadings, and *four months before* interest rates. As this chapter is being written the index number has reached a new high point of 166.64 in Cycle C. As this is far above the preceding highest record, 119.62, in November, 1919, the assumption is reasonable that the peak of Cycle C has been attained and that the next movement of the index is likely to be downward.

Interpretation of the index of industrial stock prices.—The normal zone for this index was between 80 and 100 prior to the recent great advance in prices.

Although confirmation is still in the future as this book is being written, there is justification for the assumption that possibly a new level of stock prices will develop out of the recent advance. It would be illogical to contend that a position of about 160 can long be sustained, in view of the fact that the highest previous peak was below 120. Yet it seems difficult to believe, in view of the development of the country, that industrial stock prices can return to their former levels. There is a certain hazard in predicting that a new higher level will develop, but one can be more confident on that score than on a guess as to where, approximately, that level may be.[5]

For the time being, at least, these tentative suggestions are offered with respect to cyclical indication:

120.00 and Over	Prosperity
120.00 Downward to 100.00	Decline
100.00 and Under	Depression
100.00 Upward to 120.00	Recovery

[5] Certain substitutions are made from time to time among the twenty industrial companies whose common stocks are used for this purpose. These changes are made necessary by variations in market popularity, capitalization, etc. The companies included at the time of writing are: American Can, American Car and Foundry, American Locomotive, American Smelting and Refining, American Sugar, American Telephone and Telegraph, American Tobacco, General Electric, General Motors, International Harvester, Kennecott Copper, Mack Trucks, Sears-Roebuck, Texas Company, United States Realty, United States Rubber, United States Steel, Westinghouse Electric, Western Union, Woolworth.

Chapter VII

SHORT-TERM FORECASTING (UP TO ONE YEAR)

Underlying factors.—Two basic factors form the foundation for forecasts over a single year. The first of these is cyclical movement and the second is seasonal variation. The predetermination of cyclical movement is much more difficult than the prediction of seasonal variation. The former is something of an adventure into psychology and involves consideration of imponderable forces as well as those which are susceptible of precise measurement. The latter is a problem in mathematics with a variation in results depending upon the selected data and the method of computation. As cyclical movement has been discussed in connection with medium-term forecasts, greater emphasis in this chapter will be placed upon seasonal variation.

Cyclical movement.—The methods employed in the adjustment of medium-term forecasts for cyclical movement of business conditions obtain similarly in the adjustment of short-term forecasts. The first stage of the problem is the determination of current position in the cycle. When present position has been allocated, the future cyclical movement may be predicted with a reasonable degree of accuracy from the empirical laws of the cycle. As has been previously emphasized, however, the cyclical prediction is more likely to be accurate with respect to the *sequence* of later developments than with respect to their exact time, duration, and extent.

As the average business cycle has a duration of about forty months, and as four successive stages must be accomplished during this period, it is unlikely that any given phase of the cycle will continue unchanged over twelve successive months. Since short-term forecasts cover a period up to twelve months, it is imperative that careful consideration be given to the almost certain assumption that there will be a change in the tone of business before the period is completed. General commercial activity is more likely either to increase or to decrease than to remain at its existing level. The most satisfactory

method of estimating in advance in what direction business will move is through the determination of whether the business cycle is in a positive, or a negative, phase, and how far the cycle has moved through the existing phase.

For demonstration purposes, the business cycle may be compared with the familiar time clock. At 12 o'clock the cycle is at its highest point, at 3 o'clock midway through the period of decline, at 6 o'clock at the low point of depression, and at 9 o'clock midway through the period of recovery. From twelve to six is the negative phase and from six to twelve is the positive phase. Through the use of the barometers described in the previous chapter, the current position of business in the existing cycle is determined as being at 4 o'clock, 8 o'clock, or 12 o'clock, as the case may be.

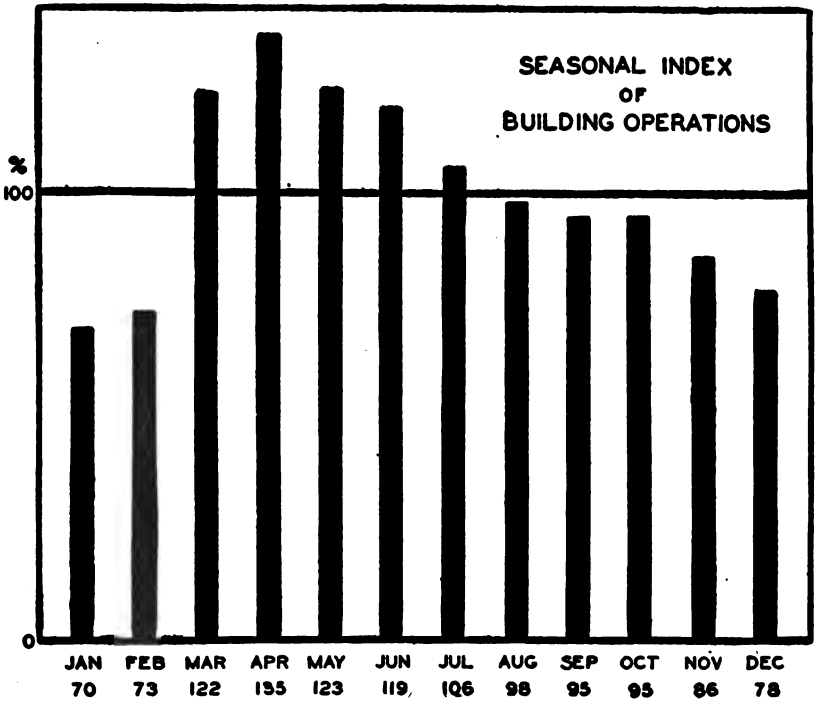
If business is at 4 o'clock, the assumption is reasonable that a period of depression is likely in the months immediately ahead, bringing with it the customary characteristics of dull times, low prices, and lethargic markets. If business is at 8 o'clock, the expectation is warranted that over the next twelve months trade will grow more active, prices will advance, and orders and production will increase. If business is at 12 o'clock, it is clearly a time for caution, as the probabilities now favor a slowing down in trade, declining prices, and recession in industry.

While a strict mathematical construction of the average duration of the business cycle would indicate a total duration of forty months, with ten months for each of the four periods, such uniformity never exists. A period of prosperity may continue for more than a year; on the other hand, a period of depression may not be sustained over six months. Yet experience shows that it is usually advisable to assume that the business cycle will move from its current position into the succeeding phase during the subsequent twelve months.

Seasonal variation.—Short-term forecasts which involve either monthly or quarterly estimates should be made with due allowance for the effect of seasonal influences. In some lines, seasonal influence is most potent, and in other lines relatively unimportant. Business, as a whole, is subject to seasonal movements, as any merchant or manufacturer will readily testify. An increase in activity during the spring and fall months, with a decrease during the summer and winter months, is

widely regarded as a normal tendency in business. Psychology combines with climatic conditions to accomplish these seasonal movements.

For the purpose of the present discussion, seasonal variation may be defined as the tendency of conditions in each of the twelve months of the year to depart from average conditions throughout the entire year. An illustration is afforded in the volume of new building under construction. During the winter months, adverse weather conditions cause building operations radically to be reduced. As is shown in the accompanying chart, January operations are usually only 70 per cent of the average monthly total for the year. February is only slightly better, with 73 per cent. A great stimulation comes with the spring months, however, March being 122 per cent, April 135 per cent, May 123 per cent, and June 119 per cent. Building activity thereafter declines, as indicated by the index of 106 per cent in July, 98 per cent in August, 95 per cent in September and October, 86 per cent in November, and 78 per cent in December.



The determination of the index numbers for seasonal variation is accomplished by the application of mathematical formulae to past experience. Actual data over a period of years are selected and an average condition for each month is determined. Care is necessary in the selection of both the period under observation and the method of calculation. Under ordinary conditions, the experience of the past ten years is a fair criterion. A period of less than ten years would tend to overemphasize the effect of one or two abnormal years; a period exceeding ten years would tend to diminish the effect of the more important recent years. In some instances a simple arithmetical average gives a satisfactory index; in others, a more complicated calculation, the link-relative method, is necessary.[1]

It is obvious that the degree of seasonal variation depends upon the nature of the subject. Retail sales of jewelry are highest in December, a month in which building operations are relatively low. No single set of index numbers, therefore, is available for all lines of activity. A separate calculation is required in each instance. Indeed, in numerous cases, no marked effect of seasonal influence is present, and, therefore, an index number, although mathematically calculable, is not practical. In the ensuing compilation, seasonal index numbers of a few selected items are presented. It is interesting to note the varying effects between the items, and the range in the individual items.

INDEX NUMBERS OF SEASONAL VARIATION

Month	*Bank Clearings*	*Building Permits*	*Pig-iron Production*	*Business Failures*	*Electric-Power Production*
January	109	70	102	142	107
February	91	73	93	99	96
March	102	122	104	99	102
April	100	135	101	95	97
May	97	123	101	92	99
June	97	119	97	89	97
July	98	106	98	94	97
August	91	98	101	88	98
September	94	95	98	86	97
October	108	95	103	98	102
November	105	86	102	99	103
December	108	78	100	118	105

[1] For an explanation of various methods employed, the reader is referred to any recent book on statistical method, such as "Economic Statistics," by G. R. Davies, or "Handbook of Mathematical Statistics," published by Houghton Mifflin Co.

DETERMINATION OF SEASONAL VARIATION INDEXES BY LINK-RELATIVE METHOD

MONTHLY MERCHANDISE EXPORTS OF THE UNITED STATES

	Jan.	*Feb.*	*Mar.*	*Apr.*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*
1911		89.2	92.0	97.5	97.0	92.6	90.2	112.9	135.7	107.5	95.8	111.5
1912	90.0	98.2	103.4	87.2	97.8	78.8	107.6	112.6	119.0	127.4	109.4	90.0
1913	90.6	85.4	96.5	106.6	97.4	83.9	98.6	116.6	116.2	124.4	90.4	95.0
1914	97.6	85.2	107.8	86.7	99.4	97.2	98.1	71.6	141.5	124.7	105.6	119.2
1915	109.0	111.9	99.0	99.3	93.1	97.9	100.2	97.0	115.0	109.1	99.8	109.6
1916	91.8	121.6	102.1	97.1	119.0	97.9	95.7	114.8	100.9	95.6	104.7	101.4
1917	117.1	75.2	118.5	95.6	103.7	104.2	65.0	131.1	93.4	119.0	89.9	121.5
1918	85.1	81.4	127.1	95.8	110.0	87.8	104.9	103.9	104.5	91.1	104.0	108.2
1919	110.1	94.0	103.0	118.5	84.5	153.7	61.2	113.5	92.0	106.0	117.4	91.9
1920	104.5	89.3	128.5	83.6	108.8	84.4	103.4	88.8	104.5	124.2	90.2	106.5
Median	97.6	89.3	103.2	96.4	101.5	94.9	98.4	112.8	109.7	114.1	101.9	107.3
Chain relative.....	100.0	89.3	92.2	88.9	90.1	85.5	84.1	94.8	104.0	118.9	120.9	130.0
Adjusted	100.0	87.5	88.6	83.8	83.1	77.4	74.8	82.6	88.6	99.4	98.9	104.2
Index	112.1	98.1	99.5	94.0	93.3	86.7	83.9	92.6	99.4	111.4	110.9	117.0

Limitations in seasonal indexes.—The fact that the determination of seasonal indexes is a pure mathematical problem may easily cause an overestimation of their accuracy. Even when no criticism of the selected period or methodology is warranted, the result often requires qualification. In the first place, the index may prove to be a correct mathematical average, which is not confirmed by parallel uniformity in the actual data. For example, it may seriously be questioned if there is any true seasonal variation in copper production, although it can scarcely be disproved that a decided variation exists in building operations. In the second place, new causal factors may operate to change entirely the seasonal experience of former years. Seasonal variations in interest rates were radically changed after the development of the Federal Reserve system. In the third place, the indexes reflect a mathematical accuracy which is quite out of accordance with the facts. The index number for United States merchandise exports for the month of January is 112.1, although a more accurate statement would be that it is normal for the volume of January exports to amount to between 110 and 115 per cent of the average month for the entire year.

Application of seasonal indexes.—The adjustment of a short-term forecast for seasonal variation is accomplished by making the proper percentage deduction or addition to the previously determined estimate for each month. If it is assumed that the total volume of business estimated over a single year is $240,000, and that seasonal index numbers are as shown, a monthly forecast of the sales would be as shown:

Month	*Monthly Average for the Year*	*Seasonal Index*	*Adjusted Forecast*
January	$20,000	98	$19,600
February	20,000	93	18,600
March	20,000	105	21,000
April	20,000	102	20,400
May	20,000	104	20,800
June	20,000	99	19,800
July	20,000	98	19,600
August	20,000	100	20,000
September	20,000	98	19,600
October	20,000	104	20,800
November	20,000	99	19,800
December	20,000	100	20,000

Chapter VIII

PRACTICAL UTILIZATION OF LONG-TERM FORECASTS

Methods in use.—This is the first of three chapters which contain practical illustrations of forecasting methods as employed by representative American companies. The examples have been selected from all classes of enterprise, including railroads, public utilities, and industrials. The illustrations have been grouped in three chapters, according to the time involved in the forecast, to conform with the previous treatment. Beyond this time similarity, no attempt has been made at coherence between the cases. The grouping is purely one of convenience, as the examples are mutually independent.

It is the exceptional enterprise which looks beyond the next five years. The very large companies are almost compelled to do so, in view of the time required to plan and provide additional facilities on an immense scale. The smaller companies, however, are beginning to consider more seriously their position five and ten years in the future. One of the great causes of economic waste is the investment of capital in enterprises whose immediate future is promising, but which find the more distant horizon much less attractive.

All of the examples represent an intelligent attempt to coördinate corporate policy with future development. Criticism of the methods must be tempered with due appreciation of the fact that this is a field in which there is little experience to draw upon. No claim of scientific exactness is made, nor is it believed that, in any case, present knowledge is beyond the experimental stage. These methods are being used, however, with results, if not entirely accurate, at least sufficiently satisfactory to warrant continuance.

Forecasting telephone growth.—The method employed in forecasting the demand for telephone service is based upon the broad assumption that the trend during recent years will con-

tinue into the future. Four factors are taken into consideration:[1]

1. A statement and analysis of the existing market and sales, including an analysis of sales by market classes, service classes, and local sectional areas.
2. A forecast of the market for telephone service at a future date or dates.
3. Estimates of the amount of service that will be sold in the areas under consideration at a future date or dates, under specified price or rate conditions.
4. An analysis of the relation between revenues and investment and expense resulting from the estimates of sales under the various price schedules to be tested, and finally the selection of the most satisfactory commercial basis.

The first step of this method is the preparation of a survey of existing conditions. For this purpose a representative community having a population of 1,000,000 is chosen. The territory is divided into three sections: (1) the central business region; (2) the neighborhood business section; and (3) the residential region. In the first section, a survey establishes the percentage of actual users of telephone service to the potential customers subdivided according to the lines of business. Although the grand average may show a realized percentage of 87 per cent, the detailed analysis may show separate percentages ranging from below 10 per cent in small warehouses to a full 100 per cent in department stores. The same method is employed in the analysis of the neighborhood business section. The grand average may be 58 per cent, ranging from 10 per cent in small retail stores to 100 per cent in drug stores. The classification in the residential section is on the basis of the monthly rental charge. The grand average may be 32 per cent, ranging from as low as 1 per cent in flats renting under $15 monthly to 96 per cent in private residences renting over $100 monthly. Through refinement of these statistics, data are made available showing the number of various classes of users per 1000 population, the extent to which each of these classes is a user of telephone service, and the nature of the service employed.

[1] *Harvard Business Review*, Vol. 1, No. 3, p. 270.

The second step is the estimate of population for future years. To the present population is added the expected increase based upon the experience of preceding decades. Allowance is made for the influence of factors which may cause future development to be either more or less rapid than in the past. A city with a population of 250,000 in 1920 may reach 350,000 in 1930, due partly to natural growth, partly to industrial expansion, and partly to minor influences. Another city with the same population in 1920 may have an estimated population of only 275,000 in 1930, due to a difference in tendencies.

The third step is the application of existing ratios to the estimated population for the years under observation. Qualification on an arbitrary basis is made for anticipated changes in present ratios. While there is no assurance that the estimated population will be realized, or that existing ratios will continue to hold good, forecasts of this nature serve as a guide to management much more efficiently than would an uneducated guess or a disposition to let expansion plans wait upon the actual development of the community.

Forecasting factory expansion.—Factory expansion programs should be planned several years in advance, if full advantage is to be taken of favorable conditions. In the first place, from one to two years is ordinarily required from the day actual expansion operations begin until production can be accomplished. In the second place, the additional capital required must be provided in advance of construction. In the third place, advantage may be taken of periods in the business cycle favorable to building operations. In the fourth place, the danger of overexpansion of departments through deceptive temporary increases in orders is lessened. In the fifth place, the factory is put in a position to give satisfactory delivery dates at all times.

Unless such planning is undertaken, many difficulties and inconveniences are almost certain to arise. If expansion is undertaken, as is usually the case, only when forced by accumulated unfilled orders, the results leave much to be desired. First, the demand existing at the time expansion is started is measurably slackened by the time added production is available. Second, expansion may be desired but impossible, due to inability to finance at the time. Third, expansion is

likely to be undertaken at a time when building costs are abnormally high. Fourth, unless a careful survey is made of the volume of probable orders over the ensuing ten years, expansion may be authorized to meet a temporary bulge in orders. Fifth, the factory is not in a position to give satisfactory service on deliveries when orders increase beyond past experience. Delayed shipments are often caused, not by the time required for manufacture but by inadequacy of factory capacity.

Three factors are involved in planning for expansion. The first is the determination of existing conditions, which requires a study of capital invested and output capacity. The second is a forecast of departmental sales volume annually over a period of years. The third is a comparison between existing conditions and prospective requirements.

A careful study is made on a departmental basis of invested capital and output capacity. Invested capital includes the book value of physical property utilized by the department, both equipment and supplies. Output capacity is computed on an annual basis in terms of sales prices. It does not represent the maximum capacity under the most favorable conditions, as these conditions never exist concurrently. Labor difficulties, machinery breakdowns, delays in shipments, lack of uniformity and balance in orders, all tend to prevent the achievement of such a maximum. It is customary to regard 80 per cent of the maximum as a fair measure of output capacity. A plant operating at "70 per cent of capacity" is working at about 56 per cent of maximum. Both invested capital and output capacity are reduced to "dollars per square foot" of floor space for convenience in estimating.

The methodology is shown in the accompanying table. It may be assumed that the plant has five departments—A, B, C, D, E. Department A has 20,000 square feet, $100,000 investment, $280,000 annual sales capacity. The investment is $5 per square foot and the annual sales capacity $14 per square foot. An increase of $42,000 in sales capacity would require 3,000 additional square feet of floor space at a cost of $5 per square foot, or an added investment of $15,000. The estimated sales for Department A for the year 1927 are $200,000, for 1928, $220,000, for 1929, $242,000, for 1930 $266,000, for 1931, $294,000. These estimates are pre-

FACTORY EXPANSION BUDGET (1927–1931)

Dept.	Floor Space	Capital Investment		Annual Capacity —at Sales Prices—		Sales Budgets				
	(sq. ft.)	$	(per sq. ft.)	$	(per sq. ft.)	1927	1928	1929	1930	1931
A	20,000	100,000	$ 5.00	280,000	$14.00	$200,000	$220,000	$242,000	$ 266,000	$ 294,000
B	10,000	80,000	8.00	120,000	12.00	120,000	[126,000	[132,000	[139,000	[146,000
C	30,000	600,000	20.00	300,000	10.00	[400,000	250,000	275,000	[350,000	[400,000
D	20,000	200,000	10.00	300,000	15.00	200,000	200,000	220,000	240,000	260,000
E	5,000	60,000	12.00	70,000	14.00	50,000	60,000	70,000	[80,000	[90,000
Total	85,000	$1,040,000	$12.25	$1,070,000	$12.80	$970,000	$856,000	$939,000	[$1,075,000	[$1,190,000

[In excess of present capacity.

1927..... No expansion. Dept. *C* deficit due to abnormal bulge in orders.
1928..... Expand Dept. *B* to $150,000 capacity ($150,000—$120,000 = $ 30,000÷$12 = 2,500 sq. ft.×$ 8 = $ 20,000 req.).
1929..... No expansion.
1930..... Expand Dept. *C* to $400,000 capacity ($400,000—$300,000 = $100,000÷$10 = 10,000 sq. ft.×$20 = $200,000 req.).
Expand Dept. *E* to $100,000 capacity ($100,000—$ 70,000 = $ 30,000÷$14 = 2,150 sq. ft.×$12 = $ 25,800 req.).
1931..... Expand Dept. *A* to $320,000 capacity ($320,000—$280,000 = $ 40,000÷$14 = 2,850 sq. ft.×$ 5 = $ 14,250 req.).

pared in accordance with methods outlined in the previous chapters. Usually independent estimates are set up, one by the general office and one by the sales force, and the discrepancies adjusted. The general office estimate is based upon past records and trends. The sales force estimate is based upon future prospects gained from direct contact with customers.

The analysis indicates that Department A has adequate facilities to take care of anticipated orders until 1931, by which time increased capacity will probably be necessary. As two years are required to bring new facilities on a production basis, a tentative memorandum is made on the 1929 agenda to consider an increase in Department A. The matter will be discussed in 1929 on the basis of revised forecasts, and a decision made at that time.

An analysis of Department B indicates that orders will be in excess of current capacity by 1928. As it is assumed that the study is being made in September of 1926, it is necessary now to authorize expansion of the department. To what extent should capacity be increased? Present facilities permit $120,000 yearly sales; the 1928 estimate is $126,000; the 1929, $132,000; the 1930, $139,000; the 1931, $146,000. In view of the rate of increase, the relatively low cost of expansion in this department ($8 per square foot), and the economy of sizable additions at each step, the decision is to increase the capacity to $150,000 and to authorize an appropriation of $20,000 for this purpose. ($150,000 minus $120,000 equals $30,000 divided by $12—sales capacity per square foot—equals 2,500 square feet; 2,500 multiplied by $8 equals $20,000.)

An analysis of Department C shows a most interesting situation. Sales for 1927 are estimated considerably in excess of existing capacity, yet estimates for 1928 and 1929 are below facilities. This condition is not unusual and may be due either to cyclical movement or to accidental causes. The value of long-term forecasts is herein shown. The ordinary impulse would be to increase facilities to take care of the expected business in 1927. But experience shows that the facilities cannot be provided in so short a time, and, furthermore, that such facilities would probably be idle for several years thereafter. Accordingly, the decision is to permit existing facili-

ties to remain unchanged, to get the greatest output possible in 1927, to get part of the business on the basis of early 1928 delivery, and to put off expansion until the permanent demand has approached present capacities. In this case, estimated orders will not permanently exceed existing capacities until 1930. Accordingly, expansion of Department C goes on the tentative 1928 agenda. The preliminary estimate calls for $400,000 capacity in 1930. As explained in the preceding paragraph, this will require $200,000, and this amount is carried into the preliminary financial requirement budget for 1928 ($400,000—new capacity—minus $300,000—present capacity—equals $100,000—capacity to be added—divided by $10—sales capacity per square foot—equals 10,000 square feet; 10,000 multiplied by $20—investment per square foot —equals $200,000).

An analysis of Department D indicates adequate capacity to meet estimated sales through the period under survey. A similar analysis of Department E shows expansion required by 1930, and, following previous procedure, gets on the 1928 agenda and tentative financial requirement budget for $14,250.

The aggregate totals afford an interesting study. Total capacity, at $1,070,000 annually, compares with estimated sales of $970,000 in 1927, $856,000 in 1928, $939,000 in 1929, $1,075,000 in 1930, and $1,190,000 in 1931. This would indicate that current capacity is adequate until 1931, and, therefore, that plant expansion should not be necessary for several years. Yet the departmental analysis shows that immediate provision should be made for the expansion of at least one department. This condition arises, because departmental space is seldom interchangeable, as idle space in one department can rarely be utilized for production of a nature different from the regular routine.

Financial requirement forecast.—Financial requirements should be estimated several years in advance, especially by companies that are enjoying a relatively rapid growth. Unless this is done, new capital may not conveniently be secured when needed. Moreover, financial embarrassment may be incurred from overexpansion. It is essential at all times that the financial position be strongly fortified and that an adequate degree of liquidity give assurance of sustained solvency.

The first step is the determination of capital requirement for

each year, which involves separate consideration of fixed capital and working capital. A study of past experience and present conditions will indicate a certain ratio between fixed capital investment and annual sales, which, in this instance, may be assumed to be one dollar in fixed capital to one dollar in annual sales. Fixed capital investment over the period is thus approximated from the estimated sales volume by applying a factor of 100 per cent. The amount of working capital is estimated in the same fashion in terms of the established ratio to annual sales. It may be assumed that, over the past ten years, cash on hand has averaged 10 per cent of annual sales, inventories have averaged 40 per cent, receivables have averaged 10 per cent, and payables have averaged 10 per cent. Thus, the total current assets have averaged 60 per cent of sales and the current liabilities 10 per cent, leaving net working capital at 50 per cent of sales. Working capital investment over the period may thus be approximated from estimated sales by applying a factor of 50 per cent. The amount required for fixed capital is then added to the amount required for working capital to get the total capital requirement for each year.

The estimate of available capital is made by adding to the capital at the beginning of each year the undistributed earnings of the current year. Undistributed earnings comprise the net earnings after the payment of all interest and dividend charges, and also include appropriations made for retirement, replacement, and depreciation reserves. The analysis of past operations may indicate that the amount of these undistributed earnings averages about 10 per cent of annual sales. This new capital, made available from within the industry, is termed "plowed-in-earnings." The total of the invested capital at the beginning of the year plus the undistributed earnings becomes the available capital to meet the requirements of the year.

The third step is the comparison of the amounts required with the amounts available. As is shown in the accompanying table, the difference is carried down as a surplus, or deficit. If a surplus is indicated for each year, a most satisfactory condition exists. But if a deficit is indicated, provision should be made well in advance of the emergency. In the illustration shown, a deficit of $58,000 appears for the year 1927,

FINANCIAL REQUIREMENT BUDGET (1927–1932)

	1927	1928	1929	1930	1931	1932
Total Sales Estimates	$ 970,000	$ 856,000	$ 939,000	$1,075,000	$1,190,000	$1,277,000
Capital Required:						
Fixed Capital:						
$1 Investment = $1 Sales	$ 970,000	$ 856,000	$ 939,000	$1,075,000	$1,190,000	$1,277,000
Working Capital:						
Cash (10% of Sales)						
Inventory (40% of Sales)						
Receivables (10% of Sales)						
Less Payables (10% of Sales)						
= 50% on Sales	485,000	428,000	469,500	537,500	595,000	638,500
Total Capital Required	$1,455,000	$1,284,000	$1,408,500	$1,612,500	$1,785,000	$1,915,500
Capital Available at Beginning of Year	$1,300,000	$1,397,000	$1,482,600	$1,576,500	$1,684,000	$1,803,000
Undistributed Earnings (including reserve appropriations) 10% on Sales	97,000	85,600	93,900	107,500	119,000	127,700
At End of Year	$1,397,000	$1,482,600	$1,576,500	$1,684,000	$1,803,000	$1,910,700
Surplus	.....	$ 198,600	$ 168,000	$ 71,500	$ 18,000	.....
Deficit	$ 58,000	.....	.....	.....	.....	$ 4,800

followed by prospective surpluses each year until 1932. Obviously, short-term financing should be undertaken to meet the 1927 situation. Continued deficits necessitate long-term financing either in stocks or bonds. It should be clearly noted that these are deficits in capital rather than in earnings. More than one company has found itself in a disturbing position, because it assumed that, if surpluses in earnings were achieved, surpluses in capital would be automatic.

Forecasting electrical power demand.—The electrical power companies, better known as the central stations, are constantly obliged to consider the future demand for their service. The problem is much more acute in this field than elsewhere, due to the rapid growth of the industry. The ordinary industrial company has a rate of growth of about 4 per cent annually, which condition permits a comfortable time margin in planning expansion. But with an annual growth of 10 per cent per annum compounded, the central stations are obliged to expand constantly to keep pace with the demand. The future must be studied, not only that adequate capacity may be available as it is needed, but also that financing may be economically administered and that engineering difficulties may be foreseen well in advance.

An example is afforded in the case of the Pacific Gas & Electric Company. Over the decade 1910-1920, operating data showed an annual rate of growth of 7.44 per cent compounded, and a load factor of 63 per cent. Load factor is the proportion of the average load during the day to the peak load of the same day, and is of prime importance in the adjustment of installed capacity to connected load. With this data as a basis, estimates have been prepared which show the anticipated output for each year, and the average load and the peak load on the system during each year.

The company, therefore, has been obliged to plan its expansion program to keep pace with this estimated demand. As the great bulk of the energy supplied by the company is generated from water power in the Sierra Nevada Mountains, and as the development of hydro-electric plants is both slow and expensive, long-term forecasts of this nature are essential. Appropriations for each year must be made in harmony with an integral development plan extending over a long period of years. So it happened that in 1922 the company

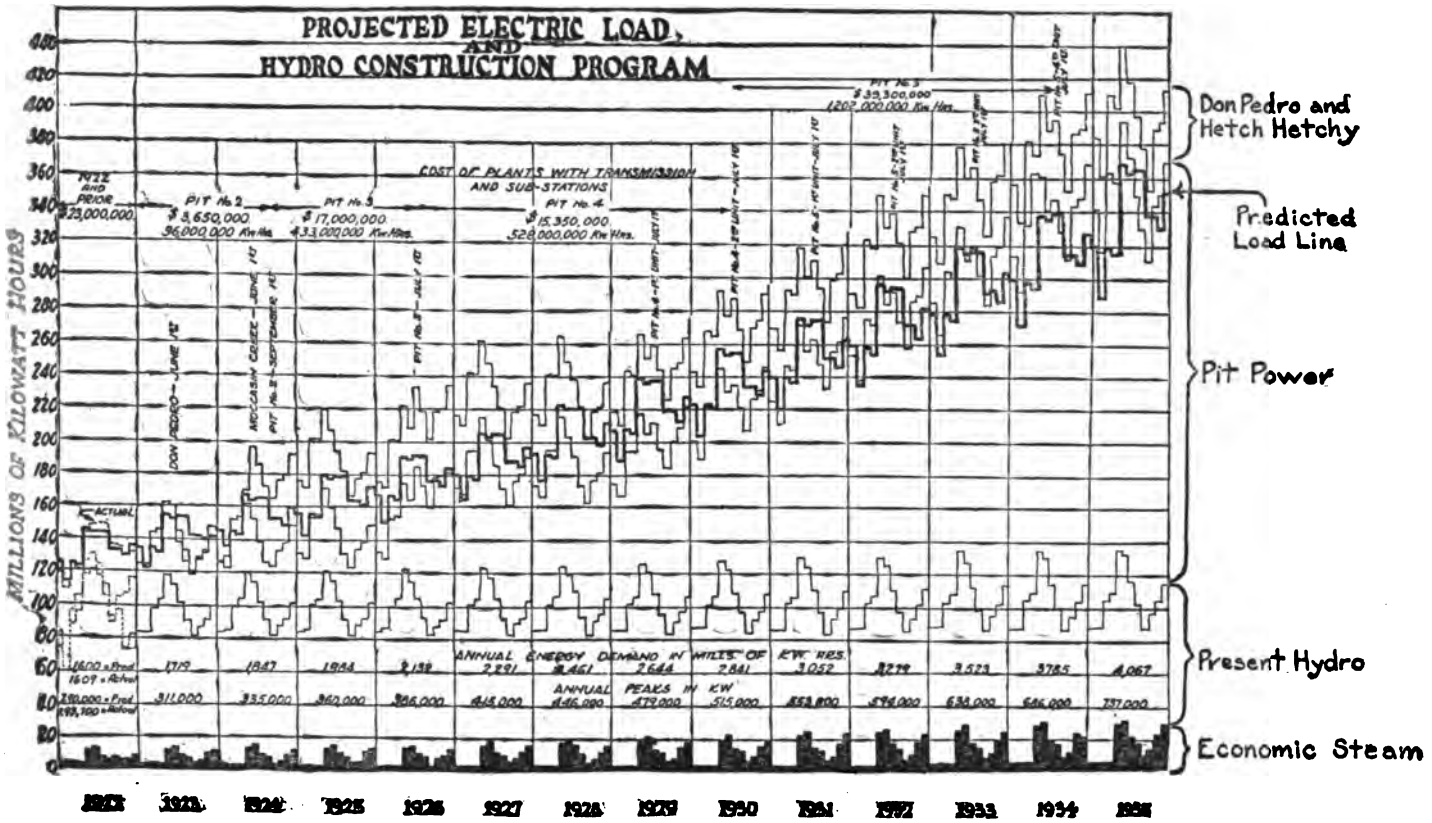


DIAGRAM OF THE EQUIPMENT BUDGET TO SHOW ITS RELATION TO OUTPUT

Pit power refers to power development on the Pit River. Don Pedro and Hetch Hetchy also refer to hydro-electric plants. Economic steam refers to steam power used as auxiliary to hydro power. Notice in the years 1925, 27, 28, 29, 30, 31 and 35 how output meets equipment. (From *Pacific Service Magazine* of the Pacific Gas & Electric Co.)

authorized a tentative budget extending into the year 1935, under which the installed capacity of the plants would be gradually increased to meet the growing demand at a total estimated cost of $75,300,000.

The accompanying table and chart show in considerable detail the methods employed in this study, which is believed to be one of the most scientific applications of forecasting thus far developed.[2]

ANTICIPATED GROWTH OF LOAD 1921 TO 1935, INCLUSIVE, FOR PACIFIC GAS AND ELECTRIC COMPANY

(Based on past ten-year rate of growth of 7.44 per cent and an annual load factor of .63)

Year	Millions of kw. hrs.	Average Load in kw. Total	Average Load in kw. Increase	—Peak Load in kw.— Total	—Peak Load in kw.— Increase
1920*	1475.7	168,000	——	259,000	——
1921*	1489.2	170,000	2,000	267,000	8,000
1922	1600.0	183,000	13,000	290,000	23,000
1923	1719.0	196,000	13,000	311,000	21,000
1924	1846.9	211,000	15,000	335,000	24,000
1925	1984.3	227,000	16,000	360,000	25,000
1926	2131.9	243,000	16,000	386,000	26,000
1927	2290.5	261,000	18,000	415,000	29,000
1928	2460.9	281,000	20,000	446,000	31,000
1929	2644.0	302,000	21,000	479,000	33,000
1930	2840.7	324,000	22,000	515,000	36,000
1931	3052.0	348,000	24,000	553,000	38,000
1932	3279.1	374,000	26,000	594,000	41,000
1933	3523.0	402,000	28,000	638,000	44,000
1934	3785.1	432,000	30,000	686,000	48,000
1935	4066.7	464,000	32,000	737,000	51,000

* Actual records.

In one of the preceding paragraphs reference is made to load factor as one of the variables which must be considered in central station long-term forecasting. A load factor of 100 per cent would be ideal, but is obviously impossible, due to the intermittent use of power by many consumers. The load factor at the present time, however, is much higher than was the case ten years ago, and this condition would lead to the natural assumption that improvement is likely in the years ahead.

[2] *Pacific Service Magazine*, Vol. 14, No. 12, p. 377.

In a letter to the author, Vice President A. H. Markwart, of the Pacific Gas & Electric Company, calls attention to the fact that the forecast is tentative and subject to change as conditions develop. Such changes might radically disturb these plans at any time.

Such a forecast appeared in a recent survey in this field which has attracted wide attention:

"The estimated capacity and kilowatt-hour generation (for 1950) reflect a marked further improvement in load factor. A capacity about three times that of 1922 stations is expected to provide an output nearly five and one-half times as great as in 1922. In other words, the use of the investment in stations will be nearly doubled in the 28 years." [8]

While it is quite possible that this forecast will be verified, it is more likely to come from another development, such as interconnection of plants, rather than from a substantial improvement in load factor. Despite the great improvement in this ratio previous to 1917, the census data for 1922 show a capacity factor, which is indicative of load factor, for central stations, of 32.2 per cent, which is exactly the same as in 1917. Moreover, the Detroit Edison Company, one of the representative companies in the territory surveyed, showed a load factor of 49.5 per cent in 1922 compared with 50.9 per cent in 1917. It would seem that improvement in load factors has reached a level of stability and that the Pacific Gas & Electric Company has greater warrant in assuming a continuation of the present load factor than in anticipating further betterment.

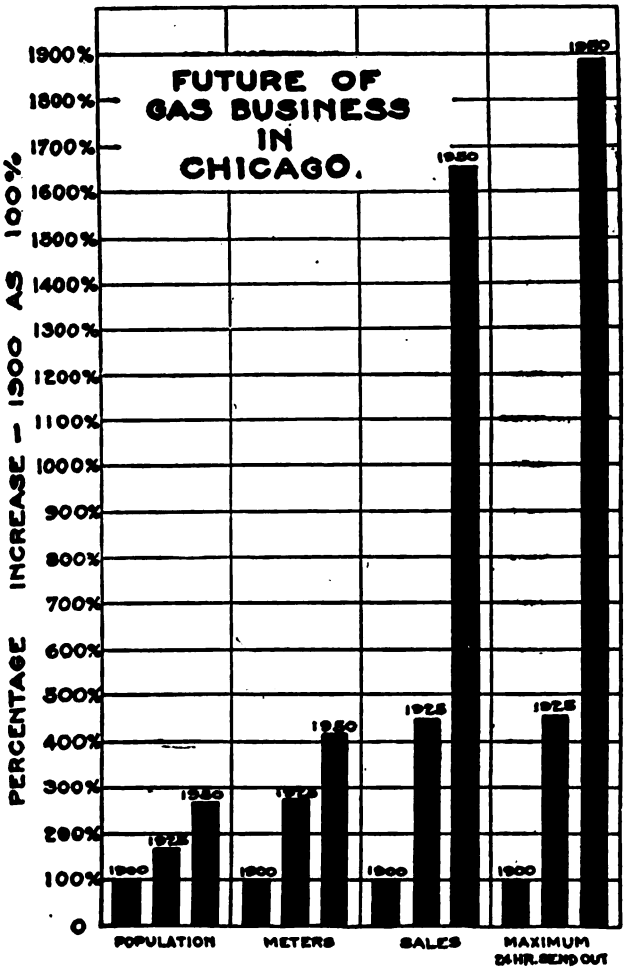
Forecasting demand for gas.—In a manner similar to that explained in forecasting the demand for electricity, the gas manufacturing companies are constantly surveying the future demand for this product. At one time it was thought that the superiority of electricity as an illuminant would mean the ultimate ruin of the gas industry. Increased use of gas for heating purposes has far offset the loss for lighting, however, and the companies look forward to continued expansion. The company which supplies the city of Chicago recently published the following:

"The company's production and distribution capacity is simply preparation for the future, as charted by engineering and statistical analysis of industrial and population trends. These gentlemen do not prophesy. They take what has hap-

[8] *Electrical Power Survey*, Great Lakes Division, N. E. L. A., Chicago, p. 24.

pened, combine it with what is happening, and then make mathematics play the oracle.

"The statistical forecast thus made for the city of Chicago alone predicts that total sales of gas by this company in 1950,



twenty-five years hence, will be 123,530,000,000 cubic feet. Total sales in 1925, largest in the company's history, were 32,500,000,000.

"The engineers and statisticians thus figure that sales of gas in Chicago alone will be almost multiplied by three in twenty-five years—an increase of 91,030,000,000 or 280.08 per cent.

During the twenty-five years, it is figured, the city's population will increase by 1,604,750 or 53.58 per cent. This forecast is illustrated in the graph entitled 'Future of Gas Business in Chicago.'

"If this forecast appears to be overoptimistic, bear in mind that the statisticians figure the cumulative effect, over the twenty-five-year period, of industrial and economic trends which are of comparatively recent birth. Intensive adaptation of gas to many processes in heavy manufacturing is one of them. Gas-fired house-heating is another. Closer figuring on the economic advantages of gas over other sources of heat is another. Some account is also taken of the growing pressure for conservation of coal and its constituents and for abatement of the smoke nuisance.

"But the basis of the forecast is the way use of gas has increased during the past twenty-five years in proportion to population. This has been going on at a faster rate than is generally realized. Since 1910, while the population of Chicago was increasing about thirty-eight per cent, the company's sales of gas increased more than twice that, or about seventy-eight per cent." [4]

Application in engineering studies.—Engineering studies which are made to determine the nature of expansion depend largely upon the nature of the anticipated demand. Cost of production is rarely a fixed amount, and rather fluctuates with the volume of output and the uniformity of demand. One cannot intelligently forecast, for example, the cost of producing electrical energy at any specified time without reasonably accurate knowledge of three variables—load factor, peak load, and annual output. Three alternative plans may be under consideration for the expansion of the plant, one of which calls for the entire addition to be water power, another to be steam power, and a third to be a combination of the two. Under one combination of the three variables, the first plan would be advisable; under another combination, the second plan would be preferable; and under a third combination, the third plan would be more suitable. A forecast must, therefore, be made of the three mentioned variables for each year under consideration. Upon the assumption that a load factor of 46 per cent,

[4] From 1926 Year Book of People's Gas Light & Coke Co., Chicago.

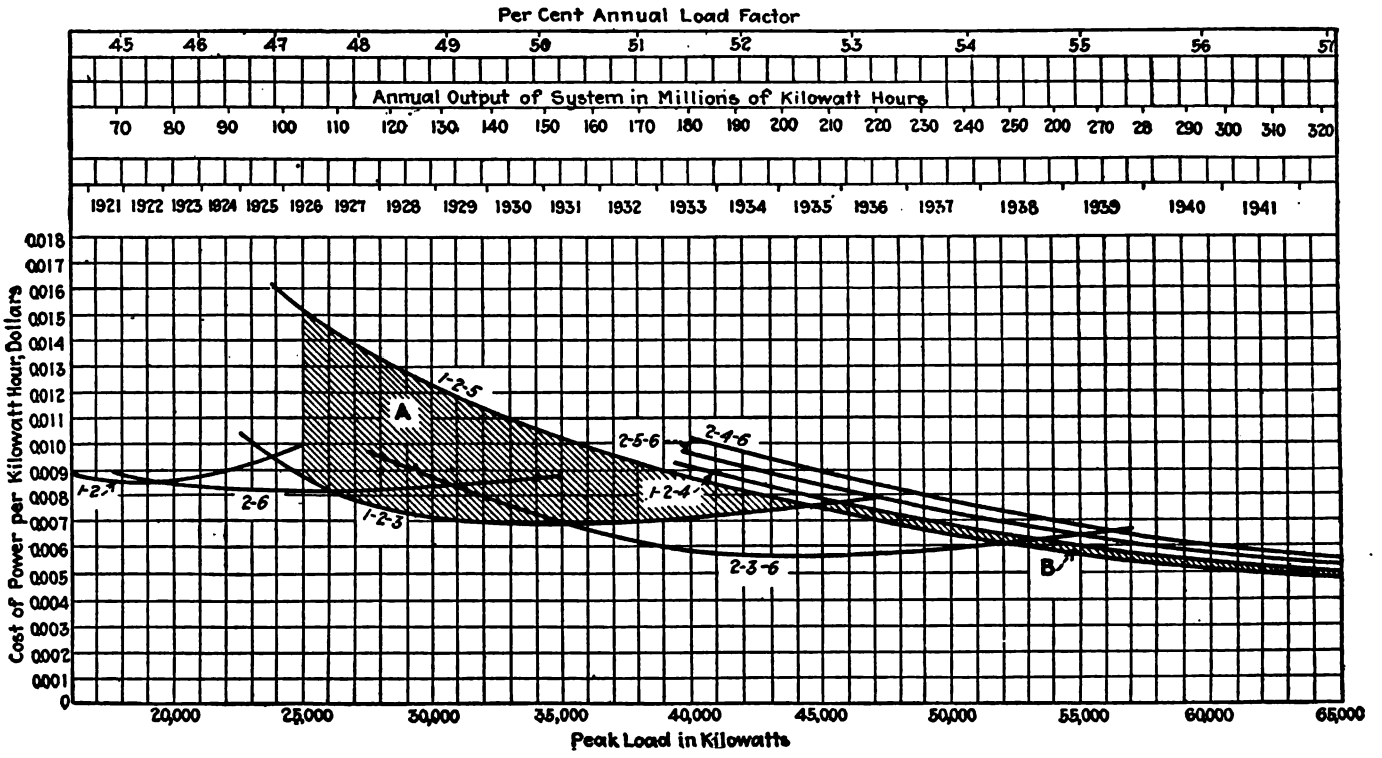
a peak load of 20,000 kilowatts, and an output of 80,000,000 kilowatt hours for the year 1922 will increase *pari passu* to a load factor of 56 per cent, a peak load of 60,000 kilowatts, and an output of 290,000,000 kilowatt hours in 1940, it becomes possible to draw comparable cost of production curves under each of the alternative plans for the entire period. An interesting development may be that the plan which seems most economical during the early years may prove the most expensive over the longer period.

It should be carefully noted that, in the final analysis, the value of the engineering study in this case depends upon the relative accuracy of the underlying forecast of conditions. Without such a forecast, an endless number of calculations would be necessary properly to provide for the innumerable permutations and combinations of the causal variables. An accompanying diagram shows the application of the cost curves to the forecast of conditions.[5]

Forecasting railroad traffic.—Despite the fact that the railroad industry is well beyond the development stage and has entered the "maturity plateau of stability," long-term forecasts of traffic must be made. Because of the relatively slower growth, due to what might be termed the saturation point in transportation service, the future demand for traffic facilities can be estimated much more readily and accurately than in the case of the public utilities, which still have a measurable part of the development stage to traverse. The purpose of a forecast of railroad traffic involves not so much the question of extension of present mileage as it does the matter of additional equipment and greater use of the available equipment. It is scarcely the part of wisdom for a railroad company to attempt to make current equipment take care of increasing requirements if the augmented demand is on a permanent basis.

An estimate prepared by the Committee on Governmental Relations to Railroad Transportation of the Chamber of Commerce of the United States in 1923 predicted that passenger traffic would increase from 40,000,000,000 passenger miles in 1923, to 50,000,000,000 in 1933, and that freight traffic would increase from 420,000,000,000 revenue ton miles in 1923 to 560,000,000,000 in 1933. To handle this increased traffic, the committee estimated that the railroads would be

[5] *Electrical World,* Vol. 81, No. 4, p. 220, article by Charles P. Dunn.



Estimating Power Plant Development.

Each number, 1 to 6, represents a present or proposed unit of production facilities. Area A shows the economic superiority of combination 1-2-3 over 1-2-5 during period 1926 to 1935. Area B shows the advantage of 1-2-5 over 1-2-4 during period 1935 to 1942.

compelled to add 38,350 miles of track, 13,200 locomotives, 725,000 freight cars, and 12,300 passenger cars during the intervening decade. The estimated cost of the facilities and equipment was placed at $7,870,000,000.

A study of past records of traffic would indicate that this forecast of increased transportation service is likely to be an underestimate. A simple projection, based upon the rate of growth since 1900, which has been about 4 per cent per annum, would indicate freight traffic at 610,000,000,000 revenue ton-miles in 1933. A more elaborate mathematical calculation based upon application to the Gompertz curve shows a forecast of 600,000,000,000 for the year 1933.[5] Although the application of the 560,000,000 forecast of the committee indicates that the enormous expenditure of nearly $8,000,000,000 will be required over the period, it would appear that the amount is more likely to prove an underestimate than otherwise.

It is further interesting to note that the study based upon the application to the Gompertz curve indicates that the rate of growth of freight traffic attained the maximum in 1925 in the Eastern District, in 1909 in the Western District, and will not attain the maximum until 2821 in the Southern District. In other words, the maximum rate of growth has been passed in the West, is just passing in the East, but will not be reached for many years in the South.

Forecasting competitive conditions.—One of the great problems in manufacturing is the adjustment of supply to demand. Numerous cases might be cited where producers have been misled by temporary increases in the demand to increase their production facilities beyond conservative warrant. Explanation is not hard to find. Normal competition for orders encourages the acceptance of a maximum volume of business at all times. Even apprehension that the current volume may prove temporary does not restrain expansion in capacity. Should a decline occur, the assumption is that the natural growth of the country will quickly restore the balance. There is reason to believe at the present writing that in many fields expansion has been overdone, not in the sense that consumptive demand will fail eventually to catch up, but

[5] *Journal of the American Statistical Association*, Vol. 19, No. 148, p. 476, article by Leroy E. Peabody.

that a long and costly interval must first elapse. In some lines, the situation is so obvious as to make recital of the data unnecessary. The soft coal industry, with a production capacity of some 20,000,000 tons weekly, compared with consumptive requirement of some 12,000,000 tons, is a striking illustration. The motor industry with a capacity of over 6,000,000 cars annually, compared with an estimated normal demand of about 4,000,000, is another. The steel industry, with an annual capacity of about 60,000,000 tons, compared with an estimated normal demand of some 40,000,000 tons, is a third.

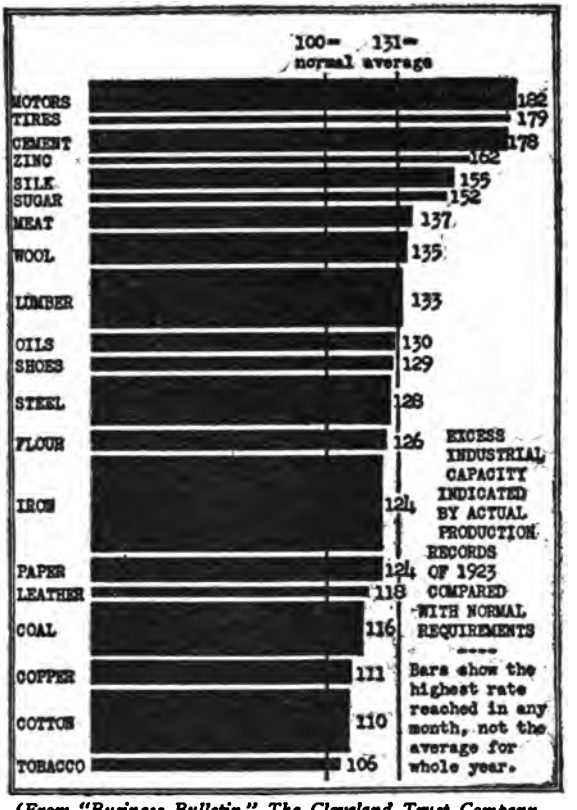
In relatively few lines is there available comparable information, such as that just stated. To determine the degree of overexpansion, if any, resort must be made to other methods of attack. An interesting method covering several basic lines of production is here described. A study is made of past records of production or consumption, and, utilizing methods previously described, a normal estimate is made for the given period. This normal is assumed to represent the point of balance between demand and supply. If the demand is greater, it is likely to prove a temporary condition and a decline should follow. If production is greater, it has reached a rate which is unlikely to be sustained.

This normal estimate, which makes due allowance for secular trend but not for seasonal variation or cyclical movement, is compared with the actual production or consumption record for the most active month in a period when business is patently at a high rate of speed. The assumption is that, at such a time, the plants are being operated at a maximum of capacity; not necessarily true, but fairly plausible for the purpose. The percentage by which the actual record exceeds the normal estimate is a fair measure of the degree of existing overexpansion in the industry.

Such a study was made recently, based upon the 1924 production records. Twenty basic industries were selected as shown in the accompanying diagram. The indicated percentages of excess capacity ranged from six in tobacco, to eighty-two in motors, and the average was thirty-one. Upon the postulation that the average rate of growth of American industry is 4 per cent per annum, the study would signify that

on an average basis the plants of the country in 1923 were some eight years ahead of the demand for their products.

An overexpanded condition of this kind is very likely to cause keen competition among producers, carried beyond the point which is most economical to the welfare of the country in the long run. "Foreign markets for surplus capacities"



(From "Business Bulletin," The Cleveland Trust Company, June 15, 1924)

Estimating Excess Industrial Capacity.

should not blind one to the fundamental mistake which was made in overdeveloping facilities.

Forecasting water supply.—One of the most interesting applications of long-term forecasts is found in the case of the Pennsylvania Water & Power Company. This company secures its power from the water flow in the Susquehanna River.

As the flow is not uniform either by years or by seasons, the company is obliged to make long-term forecasts of expected available power in order to stabilize earnings. Although this situation, with certain variations, is not uncommon in industry, the unusual manner in which the company has attacked the problem warrants attention.

"The Susquehanna River is one of variable flow and not only may the flow in one month differ from that of the preceding or the following month, but the total flow for one year may differ considerably from that of another year. In order to avoid the undesirable features of showing greatly fluctuating net earnings, occasioned by these variations in river flow, your company during the thirteen years of its operation has been building up a contingent fund for the purpose of smoothing out such fluctuations in net earnings. From records of river flow gaugings extending over a number of decades, it determines mathematically the average river flow to be expected for each of the twelve months of the year. If the actual river flow during any month exceeds such average, then the excess earnings therefrom are credited directly to the contingent fund; and if the river flow during any month is less than normal, necessitating steam generation, your company is in a position to withdraw from contingent fund an amount proper for such purposes of equalization. Thus the gross income indicated at the end of the year is that which would be obtainable from a year of normal river flow, there having been received from, or turned over to, contingent fund each month the amount necessary to compensate for deficient flow or excess flow during the month." [7]

In accordance with this plan, and because of the drought which occurred during the year, the gross income of the company for the year 1923 was arbitrarily increased $84,000 by withdrawal of this amount from the contingent fund. This method of averaging yearly results is based upon the same fundamental principle that is employed in industrial cost accounting, explained in a subsequent chapter, whereby overhead charges are kept uniform through averaging over good and bad years. This case is unique, in that the application is made to gross revenue rather than to production costs.

[7] "Annual Report," Pennsylvania Water and Power Company, 1923.

Summary.—The application of forecasting methods to long-term planning is a matter of (1) establishing present positions, (2) measuring the rate of growth, and (3) projecting the growth into the future. In making the future projections, allowance must be made for (1) a probable change in the existing trend, and (2) a zone of normal cyclical variation above and below the estimated average. Long-term forecasts are always tentative, and should be subject to review and revision at least once each year. Plans based upon such studies should contain enough flexibility to permit adjustment for developments which cannot be foreseen. Although a high degree of accuracy may never be gained in this field, the forecasts have definite value if long-range planning is to be intelligently considered.

Chapter IX

PRACTICAL UTILIZATION OF MEDIUM-TERM FORECASTS

Practical applications.—Commercial policies must be determined in accordance with the conditions that will prevail over the ensuing few years as well as in harmony with current activity. Cognizance must be taken of the normal growth of the industry if facilities are to keep pace with demand. Careful consideration must likewise be given to probable cyclical movement over the forthcoming several years, if earnings are properly to be safeguarded. As the general principles underlying medium-term forecasts already have been explained, the purpose of the present chapter is to present selected applications in American business practice. In fashion similar to the preceding chapter, the examples given afford more of a symposium of methods than a completely integrated presentation. Methodology differs according to the nature of the business and the desired result.

Secular trend.—Because of their rapidity of growth, public utility companies are obliged to give greater consideration to the effect of secular trend over medium-term periods than must the average industrial enterprises. A rate of growth of 10 per cent per annum is equivalent to a 60 per cent increase in five years and a 100 per cent increase in seven years. Facilities must be ever increased to meet this growing demand. In 1911 the Philadelphia Electric Company had 38,651 customers and a peak load of 57,940 kilowatts; in 1921, ten years later, the company had 196,260 customers and a peak load of 213,570 kilowatts. Constant study of the future becomes imperative in such cases.

The Southern California Edison Company in 1924 estimated that its rate of growth over the immediately subsequent years would be 11 per cent. Upon this basis a forecast

of output required was set up as shown and used as a basis for the expansion program:

Year	*Kilowatt Hours*
1924	1,600,000,000
1925	1,760,000,000
1926	1,920,000,000
1927	2,180,000,000
1928	2,430,000,000

The Commonwealth Edison Company of Chicago in 1924 estimated the maximum requirement (peak load) for the period 1924-1927 and then set up a plant expansion budget to assure adequate capacity as shown herewith:

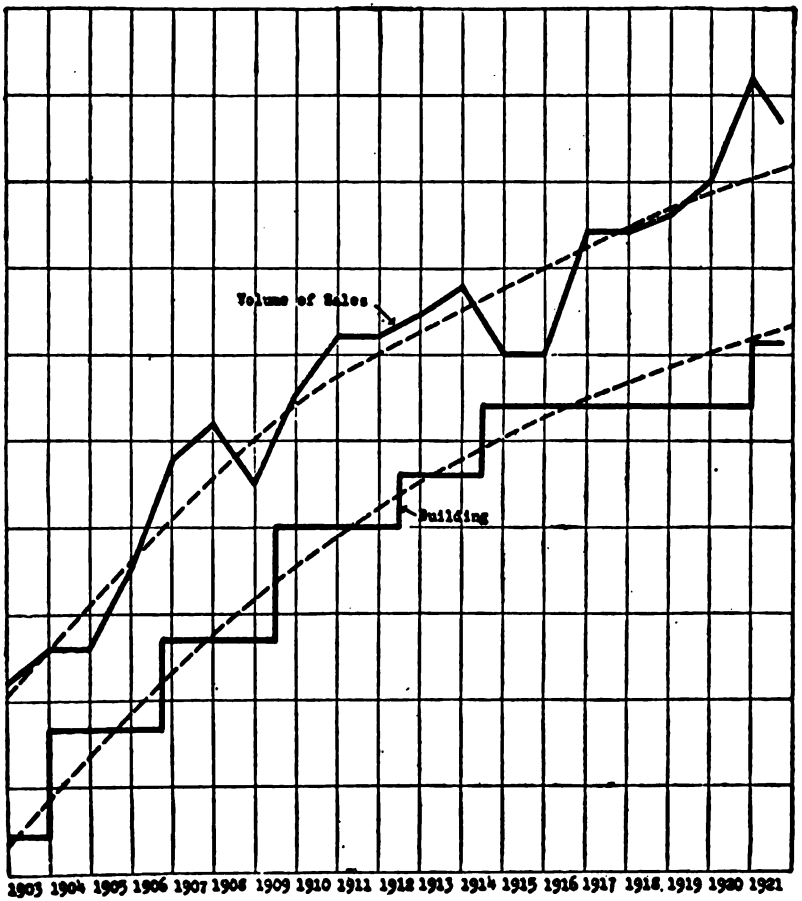
Year	*Peak Load (KW)*	*Installed Capacity (KW)*	*Expansion Budget*
1924	711,000	863,000	$17,000,000
1925	769,000	910,000	16,000,000
1926	824,000	907,000	21,000,000
1927	902,000	907,000	21,000,000

Building program.—Building programs should be planned with regard to both secular trend and cyclical movement. Two major considerations should underlie the determination of construction policy. The first is that additional space will normally be required at varying intervals to accommodate the natural growth of the business. The second is that out of every decade some years are favorable for building and others are distinctly unfavorable. The favorable years are those when business is relatively inactive, when labor and materials are easy to procure, and when costs are attractive due to low prices for material, labor, and money. The unfavorable years are those when business is abnormally active. At such a time labor is dear and inefficient, materials are high and difficult of procurement, and interest rates are restrictive. Despite the obvious wisdom of such considerations, most business building programs are initiated on a hit-or-miss plan.

Seldom is new construction planned with regard to normal growth. Yearly fluctuations above and below normal obscure the line of growth and easily lead one to believe that such a trend is non-existent. Accordingly, the building program generally waits upon actual development of the business. The general statement holds true that, in the United States, addi-

tional business facilities are provided only when forced by accumulated demand.

New construction is rarely planned with regard to the cyclical movement of business. In a year when conditions are



(From "The Journal of the American Statistical Association," March, 1922)

Building Program Related to Course of Sales.

favorable for building, the more obvious fact is that, currently, considerable idle space is available. Prevailing sentiment at such a time is pessimistic, which, coupled with existing idle facilities, causes the ordinary management to decide adversely on plant expansion. In a year when condi-

tions are unfavorable for building, the more obvious fact is that, currently, the volume of business is overtaxing the facilities, that competition is securing established customers, and that potential profits are being lost. Prevailing sentiment is optimistic, and so the usual decision is to build at once, despite the almost invariable experience that the rush will have subsided by the time the new facilities are ready.

It, therefore, becomes a matter of outstanding interest when at least one company is found which plans its expansion with regard both to secular trend and cyclical movement. A graphic representation of the manner in which the Dennison Manufacturing Company has applied these principles is shown herewith.

Expansion of building programs during periods of depression, and curtailment during periods of prosperity, has long been suggested as one of the most effective methods of checking the business cycle. Business men, therefore, will serve not only their own best interests, but that of the community at large in more intelligent planning of new building.[1]

Cyclical movement.—Forecasts based upon the effect of cyclical movement must always be made with careful reservations. Knowledge of the cycle and its movements is too limited to warrant more than a statement of probabilities. At the risk of criticism for repetition, let it again be stated that the study of cyclical movement has its justification in the *sequence* of developments rather than with respect to time, extent, or duration. "In times of peace, prepare for war" may be paraphrased into "In times of depression, prepare for prosperity," and "In times of prosperity, prepare for depression," to afford a homely illustration of the practical utilization of cyclical movement. Surely a policy based upon the probable movement of the business cycle has greater justification than one which would presume the permanency of existing conditions.

A popular application of cyclical movement to business

[1] "Planning production in advance and with reference to the business cycle, laying out extensions of plant and equipment ahead of immediate requirements with the object of carrying them out in periods of depression and carrying through such construction plans during periods of low prices in conformity with the long-time trend . . . will enable firms to make headway toward stabilization."—"Report of the President's Conference on Unemployment," 1921, p. 18.

policy is the ten-year "rule of thumb" followed by many business men. This rule is "that in every decade there will be three or four bad years and three or four good ones, the remainder being years in which, with an even break of luck, it is possible to earn just about the amount required for regular dividends." [2] In other words, business men should be prepared for at least three relatively poor years and three relatively good years scattered through each decade. In preparing for these good and bad years, careful study should be made of variations from the average in previous good and bad years. Stronger reserves will naturally have to be set up by those companies with wide fluctuations. In the depression of 1921, manufacturers of agricultural implements operated at but 35 per cent of capacity and machine-tool establishments at less than 25 per cent. On the other hand, food factories operated at about 75 per cent and clothing shops at about 70 per cent. In general, cyclical movement has greater effect upon private enterprise than upon public, upon the industrial companies than upon the utilities, upon production than upon distribution, and upon wholesale trade than upon the retail stores.

The best adjustment of a medium-term forecast for the effect of cyclical movement that seems possible is the assumption that the normal cyclical movement will follow from any given point. Under the normal cyclical movement business conditions go through four sequential stages—depression, recovery, prosperity, and decline—every forty months, or about ten months for each period. If business is definitely allocated in the period of prosperity, the pure cyclical forecast is that ten months later the position will be in the period of decline; twenty months later, depression; thirty months later, recovery. The same manner of interpretation would be followed from a given position in any of the other periods. While such a forecast is unlikely to prove more than approximately accurate, it should be correct so far as the general trend of business is concerned. The periods may prove longer or shorter than stated, but in any case the business man has been put in a position to prepare for the development in ample time to make effective the proper policy. The positive phase of the cycle

[2] Charles J. Bullock, "The Business Man and the Business Cycle," p. 2.

SUGGESTED BUSINESS POLICY (During each period of the business cycle)				
Department	**Depression**	**Recovery**	**Prosperity**	**Decline**
New Building	Begin	Finish	Postpone	Plan ahead
Production:				
(1) On order	Factory rate equal to incoming orders	Reduce unfilled orders	Up to capacity if orders are that large	Fill all orders as quickly as possible
(2) For stock	Build up stocks at low cost	About normal	Keep stocks at minimum	About normal
Inventories	Increase	Above normal	Decrease	Below normal
Purchases	Liberal	Liberal	Hand to mouth	Only as needed
Sales Prices	As low as possible	Increase slowly	Keep at normal profit margin	Cut sharply
Future Deliveries	Accept freely	Avoid long-term contracts	In accordance with capacity	Accept freely
Credits and Collections..	Liberal	Liberal	Stringent	Careful
Accounts Payable	Normal	Normal	Reduce	Below normal
Advertising	Normal	Liberal	Reduce	Normal
New Financing	Long-term bonds for expansion or refunding	Corporate stock for expansion	Don't borrow for expansion at this stage	Avoid at this stage
General	Zone for courage		Zone for caution	

warrants one set of policies; the negative phase, quite another program.

Determination of policy.—The determination of the proper policy to be adopted at each stage of the business cycle must necessarily be an individual problem varying with the nature of the business, the intensity of the existing cycle, and the extent to which the cycle has progressed through its current phase. The cycle of the manufacturer somewhat precedes the general cycle and the cycle of the retailer lags. In some cycles, as in the early part of 1920, the aberration from normal was so marked as to make advisable far greater precautions than in the following peak in early 1923. The policy, as a period of recovery ends, differs distinctly from that suggested as the period opens. But with allowances for these and other similar factors which make necessary certain qualifications, it is possible to draw up a suggested code of approved business conduct at each stage of the business cycle. Such a set of policies is offered on an accompanying page. It is freely conceded that exact compliance with these suggestions is often impractical, but they should be found serviceable within reasonable limits.

New building, as has previously been discussed at greater length, should be undertaken at favorable times—periods of depression and recovery—and postponed when conditions are unfavorable.

New financing in periods of depression should preferably be in long-term bonds to take advantage of prevailing low interest rates. In periods of prosperity, if financing is needed for current requirements, it should take the form of short-term notes. Financing expansion on borrowed money in a period of prosperity is almost "compounding a felony."

Sales prices will have to be low in depression periods to attract business. In fact, orders at cost have their advantage in helping to retain trained operating personnel. In periods of prosperity, prices should be set to give a reasonable margin on cost. When business declines, prices should be cut sharply to counteract the normal buyer's desire to wait. A characteristic Ford policy is promptly to meet a buying slump with a substantial price reduction.

Sales commitments should be scanned carefully to avoid long-term contracts on a rising market. Moreover, in times

of prosperity, orders should not be accepted with a desire to get all the available profit. Factory capacity should be the determining factor.

Quite different from the usual practice, credit and collection policy should be liberal when times are dull, and stringent when conditions are extremely good.

Production policy will depend upon orders and capacity. Manufacturing for stock should be used as a balance wheel to help stabilize operations.

Inventories should be large as the positive phase begins and small as the negative phase begins. Hence, stocks should be increased during depression and reduced during prosperity.

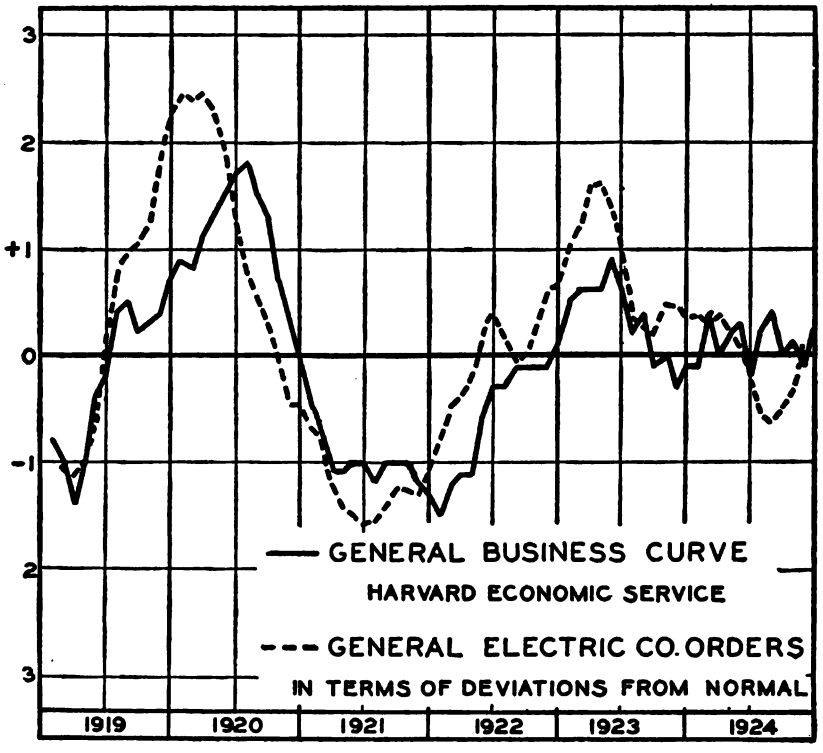
The purchasing policy should be liberal in times of depression and recovery; but more cautious as the period of prosperity approaches its peak.

Accounts payable should be reduced substantially during periods of prosperity to take advantage of "low value" dollars and to avoid embarrassment should the condition of the money market grow unfavorable later.

The advertising dollar spent in a period of recovery should be especially productive, as it is expended at a time when both buyer and seller are in a receptive mood. Such a happy combination is not so true at the other stages of the cycle.

Individual business cycles.—The general business cycle is an aggregate average covering all lines of trade. For this reason, it seldom holds that any industry will move in exact parallel with the general cycle. The variation may be in time or extent. It becomes highly desirable, therefore, to work out the comparative movements. Under one assumption, it may develop that the individual cycle of the particular industry moves ahead of the general cycle. Such a condition will give the management a direct forecast of what general business conditions may be expected to show later. Under another assumption, the individual cycle may tend to lag behind the general cycle. This condition permits the management to derive a forecast of its own orders from the current state of trade. The variation may exist with regard to extent as well. The general cycle is believed to move with limits of 10 per cent below and 10 per cent above an average normal. In some industries, the variation may run from 75 per cent below, to 90 per cent above, normal.

Comparisons of this nature are made by utilizing one of the published index numbers of general business conditions and by preparing a special similar index number for the industry or for the particular company. In this case, the index of general business activity published by the *Harvard Economic Service* (the *B* curve on the chart) is used to show the business cycle. A comparable index has been prepared covering the orders received by the General Electric Company. In both cases, monthly positions have been determined in percentages of normal, after allowance for secular trend, seasonal variation, and, in the case of General Electric orders, for price changes.



Presidential years.—The belief has become rather widespread that the presidential elections occurring every fourth year usually bring business depression. Attention is called elsewhere in these pages to the effect of similar reasoning

upon corporate bond maturity dates. That there is little ground for this belief is clearly evident from reference to the chart of American business since 1877 which appears in a preceding chapter. Some presidential years have been poor and others have been good. The conclusion seems inescapable that business conditions are as likely to be good in such a year as in any other year. In fact, business conditions are more likely to affect the political situation than vice versa.

Summary.—The application of forecasting methods to medium-term planning comprises (1) adjustment for probable cyclical movement, and (2) allowance for normal growth over the period. As every five successive years usually include one complete swing of the business cycle, and as the cyclical movements ordinarily follow a definite sequence, knowledge of current position in the cycle should permit the formation of a future policy to conform with probable developments. The individual practices will vary, but a general policy of caution toward the future should prevail when the cycle is in its active phase, and of courage when in the inactive phase.

Chapter X

THE PRACTICAL UTILIZATION OF SHORT-TERM FORECASTS

Use of short-term forecasts.—Forecasts covering a period of from one to twelve months are more popular, but unfortunately less reliable, than those which cover longer periods. Their popularity is due both to the speculative aspect and to the proximity of verification. Manufacturers have limited interest in a two-months' forecast, for example. Their commitments as to production and inventories have already been made, and consequently the forecast comes too late to be of particular value. The speculator, however, is decidedly interested in such a forecast; in the stock market, a one-day warning is adequate; and in the commodity markets, a one-week forecast is of great importance.

As has been explained, short-term forecasts must take into consideration the effect of seasonal variation and cyclical movement. Numerous other factors are necessarily involved, according to the nature of the problem; but such factors are individual and not common to all short-term forecasts as are the two mentioned. From a business viewpoint, as distinguished from the operations of speculators, short-term forecasts have their chief utility in the determination of current production and purchase policies.

Seasonal variation.—The normal way in which business men adjust their plans to meet seasonal variation is too well known to warrant extended discussion at this point. Except in the relatively few lines of trade which do not experience a marked variation in business with the different seasons of the year, there exists a well-established procedure to meet these changing conditions. Jewelry stores increase their stocks during the fall months in anticipation of holiday purchasing. Department stores hold "sales" to stimulate trade during inactive months. Clothing manufacturers prepare their production schedules in accordance with regular busy and dull months

of the year. Operators of coal mines are prepared for the annual slump in orders which comes with the summer months. Such illustrations might be continued indefinitely. Less appreciated is the tendency for prices in many lines to show a distinct seasonal influence. The price of grain is at its lowest level at the height of the harvest season and normally increases between harvests, due to the cost incidental to storage. Yet these variations are often great enough to warrant careful consideration by buyers.

In surprisingly few instances have merchants tried to stimulate orders during dull seasons of the year by giving seasonal price reductions. For many years, this custom has been followed in the retail coal trade, where a rather small discount is given for purchases and deliveries during the spring and summer months. Department stores have long followed the practice of holding annual sales at substantial price reductions to meet this problem, but not with the success that might be desired. Some customers postpone purchases at normal times to take advantage of the sale; others form the idea that goods offered during sales are not the regular store stocks.

At least one industrial company has attempted to apply a seasonal variation price corrective. The American Radiator Company has a definitely established "period price schedule," under which the price depends upon the month of purchase. The price during months in which business is normally dull is lower than in months when orders are large. The schedule is as follows:

January	102.5
February	100.0
March	100.0
April	100.0
May	102.5
June	102.5
July	102.5
August	105.0
September	105.0
October	105.0
November	102.5
December	102.5

As a result of this policy the seasonal variation in orders has been substantially reduced, thereby effecting the economies gained from more uniform operation of the factory.[1]

[1] *Printer's Ink*, October, 1924, p. 18.

Seasonal variation index numbers are used in forecasting annual results from the operations of part of a year. Obviously, it would be unfair to consider the operations of any one month as being representative of one-twelfth of the year, if there was a normal deviation from the average during that month. As an illustration, railroad net earnings may be taken. If the January income should be multiplied by twelve, the indicated result for the year would be misleading. Due to adverse climatic conditions and the usual midwinter slump in business, January earnings are far below the monthly average for the year. A company with a January index of 74 and with January earnings of $148,000 has an indicated annual return of $2,400,000 ($148,000 divided by 74 per cent equals $200,000, indicated average month, times 12 equals $2,400,000) rather than $1,576,000. A representative set of seasonal index numbers for railroad earnings follows:

January	74
February	63
March	90
April	89
May	103
June	109
July	100
August	116
September	121
October	123
November	111
December	95

A calculation such as this might more happily be termed an indication rather than an estimate or a forecast, since many other factors, especially the cyclical movement of business, may intervene to prevent the result being as determined.

An interesting example of how producers regulate stocks to meet seasonal variation in demand is afforded in the case of cement. As this commodity is used chiefly in building, the demand is greatest at the beginning of the spring months and smallest at the beginning of the winter season. The manner in which the producers meet this situation is shown in the

following seasonal variation index numbers of cement stocks on hand:[2]

January	116.5
February	131.8
March	133.1
April	132.4
May	126.9
June	112.9
July	95.9
August	76.2
September	60.3
October	48.5
November	67.2
December	98.3

Cyclical movement.—The adjustment of short-term forecasts for cyclical movement follows the procedure discussed in the preceding chapter. In forecasts extending over one year, a certain flexibility of policy is possible, in as much as plans can be revised to some extent in accordance with actual developments. Such control is less convenient when the period under observation is only a few months distant.

The principal uses of short-term forecasts are in the fields of purchasing and production. Under normal conditions, the purchasing problem is one of adjusting inventories to meet the anticipated demand; and even this involves a forecast of production requirements. Since conditions almost constantly change in accordance with the cyclical movement of business, the question of the right time and the definite quantity to buy becomes almost as important as the determination of the volume actually needed for near-by operations.

The problem has several phases. The estimated production requirement is one, the present inventory condition is a second, the transportation situation is a third, the cyclical position of business is a fourth, and the current price of the particular commodity is a fifth. Other factors are involved, especially the financial condition of the company; but the five mentioned are particularly concerned in the field of forecasting.

Production requirement and inventory position are considered together under the usual practice. The principal commodities purchased should be listed on special forms de-

[2] *Survey of Current Business*, Department of Commerce, No. 32, p. 27.

signed to give the desired information in the most convenient manner. One of such forms is here reproduced.

PRODUCTION REQUIREMENT AND INVENTORY POSITION—COMMODITY STOCKS

		Avg. Mo. Use		—On Hand—		—On Order—		—Total—	
Item	*Unit*	*Past*	*Future*	*Quantity*	*Mos.*	*Quantity*	*Mos.*	*Quantity*	*Mos.*
Crude rubber...	lb.	3,100	6,200	76,800	12½	16,800	2½	93,600	15
Pig Tin	lb.	9,600	9,200	25,100	2¾	22,000	2¼	47,100	5

It will be noted that the inventory position is stated in terms of number of months' requirement based upon expected consumption over the months immediately ahead. The average monthly use is calculated over the past three months and estimated over the next three months, both being moving averages. Under normal conditions, inventories are carried on at least a quarterly basis, allowing two months' supply on hand and one on order. Rarely is the stock of any item under a three months' supply; usually the stock runs from three to six months. It is for this reason that the ordinary short-term forecast running up to six months is of little value in determining the purchasing position, since commitments have already been made for that period. It borders on the absurd to advise a manufacturing company "to cover raw material requirements over the next three months." The purchasing department wants advice about six months in advance, if it is to be in a position to take advantage of the counsel.

The survey of the transportation situation covers a study of current shipping conditions, railroad facilities in use, and the probable demand for cars. If shipments are being delayed, commitments and stocks will have to be increased to prevent material shortage at the plant. If the situation and outlook are favorable, commitments and stocks may be carried safely even below ordinary requirements.

Consideration of cyclical position is the fourth step. In periods of depression, prices are low and purchases can be made on a liberal basis. In normal cases when a three months' supply is warranted, stocks can be readily increased up to six months, and even beyond, if the current price seems unusually favorable. At such a time, long-term contracts with open

delivery dates can be placed to excellent advantage. But even if the current price is quoted for early delivery, large orders can be placed, provided the price concession is adequate to cover cost of storage and loss of interest on invested capital. In periods of recovery, the same liberal purchasing policy can be followed. In periods of prosperity, the opposite policy should be pursued; purchases should be restricted until accumulated stocks are low, and then should be made on what has been termed a "stream-line" basis, that is, from hand to mouth. One of the great lessons of the deflation year of 1920 was the danger involved in carrying large inventories and commitments in periods of prosperity. Losses sustained by individual companies in inventory depreciation amounted to millions of dollars.

The fifth step is the individual analysis of the various commodities. Due to seasonal variation, to cyclical movement, or to peculiar conditions in demand and supply, separate commodity prices are continually fluctuating. At times, the price is so low as to make large purchases advisable; at other times, the price is so high as to warrant the acquisition of the minimum requirement. Large consumers of commodities study these movements carefully and find the results highly profitable. Both the American Radiator Company and the Dennison Manufacturing Company have gained a wide reputation for advantageous purchasing based upon such studies. So successful has the American Radiator Company been in buying pig iron at bottom prices, that the placing of orders, or even of inquiries, by this company, is usually capitalized as a sales argument in the trade. It is thought that a rather detailed account of the methods employed by this company will be both interesting and helpful at this point.[8]

"To go back to the beginning, we first became interested in the theory of the business cycle after the panic of 1893. Study convinced us that it was more than a theory. It was a fact. We noted the technique of the Marshall Fields, Andrew Carnegies, and others who did their big building immediately following panics. Our company slowly developed a scheme of working under the principles of the business cycle,

[8] From article by C. M. Woolley, President of the American Radiator Company, in the *New York Evening Post*, October 26, 1921.

and by 1899 we had put into effect a system of charting from the available statistics of business and financial movements.

"Pig iron is one of the chief elements of our finished product. In August, 1907, our charts showed us that the price of pig iron had risen from a low point of approximately $10 a ton in 1904 to a little over $26 a ton. Interest rates had also risen to a prohibitive point and the general price structure was up in the clouds.

"At a meeting of our board of directors August 2, 1907, we took account of these facts that our charts showed us so graphically and decided that we would set our house in order for the coming storm. For it was plain to us from our charts that inflation had gone to such an extent that a panic was imminent. The banking system of that period, lacking the essential element of elasticity, was rapidly reaching the breaking point. It was obvious that the credit burden was soon to become disproportionate to the ability of that system to stand the strain.

"We proceeded immediately to liquidate our inventories, cut down production, pay our debts, and buy only on a day-to-day basis. The panic came in October, three months after we had been able to predict it. The end of the year found us with our debts paid and our inventories relieved of the load of high cost material. We not only came through the storm, but we were ready to take advantage of the first signs of revival and to help the revival along. And if the number of business concerns employing this method of stabilization can be increased it will check the dangerous peak of supposed prosperity and lessen the tragic dip into depression.

"After the 1907 panic pig iron went down to $14 a ton and remained substantially at that figure until early in 1915. The war had come on in the meantime, bringing depression with it. People were saying that the depression would last indefinitely, at least for the period of the War. The iron and steel business was especially hard hit. But our charts showed us that, although the price of pig iron remained stationary, production was increasing. In other words, in the face of the pessimistic prophecies the demand was growing.

"We decided that then was the time to buy pig iron. In February, 1915, we converted a large part of our cash reserves into pig iron reserve. We bought pig iron and stored it.

Two weeks after we had made our contracts the price of pig iron jumped 50 cents a ton and from then on it advanced steadily until it reached $55 a ton. We bought in the market for our day-to-day needs, only nibbling at our reserves until the price reached $44 a ton, when we began using our reserve stock.

"When America entered the War and the Government controlled certain commodity prices pig iron went back to $33 a ton, where it stood when Government control ended. After the Government ceased price control, pig iron went down to $26.75, and then up again until it stood at the general level of $46 a ton in July, 1920. We knew of instances in which bonuses brought the price up to $56 a ton, but our charts showed the general level of $46 a ton. At the same time we saw interest rates at 8½, 9, and 10 per cent, and prices generally greatly inflated.

"Once more our directors decided that depression was in sight. Once more we liquidated our inventories, paid our debts, cut down production, and got ready for the storm. We had come, by experience which brought understanding, to place implicit reliance upon our ability accurately to forecast the logical trend of finance and business by skilful interpretations of our economic charts. The business cycle was no longer a theory. It became for us a veritable compass to guide us through the gathering mists of depression."

In the determination of the purchasing policy which should be adopted with respect to individual commodities, a graphic record which carries forward price fluctuations will be found quite helpful. The experience may be studied and, from this analysis, an assumption of normal price position may be drawn. A commodity is not cheap or dear upon the sole hypothesis that its price has not risen so high, or has risen higher, than the general average of prices over a given period. Between 1897 and 1913, the general average of wholesale prices advanced from an index number of 67 to 100, but over that period commodities such as pig tin, pine, and cotton advanced more rapidly, whereas other commodities, such as sugar and cement, actually declined. In 1924, average commodity prices were about 50 per cent higher than in 1913, but two important commodities, copper and rubber, were lower. Moreover, this

change in the trend of prices militates against the use of a long-term average price as estimated normal. Allowance for this long-term trend can best be made by charting the actual fluctuations and adapting, in accordance, a trend line of normalcy. If current prices are close to the normal line, the regular volume of purchase commitments should be placed. To the extent that the current price goes above the estimated normal line, increasing caution should be observed. Conversely, as the current price goes below the estimated normal position, a more liberal policy may be followed. Purchase zones may be established by drawing parallel lines to the estimated normal at a distance dependent somewhat upon the ordinary month-to-month fluctuations, but roughly at about 5 per cent above, and 5 per cent below. When the current price breaks above the upper zone, a policy of buying for immediate needs only should be adopted, or, what has been termed a "hand-to-mouth" policy. When the price breaks below the lower zone, a liberal policy may be followed in buying, with allowance, however, for carrying costs over the period during which the material must be stored.

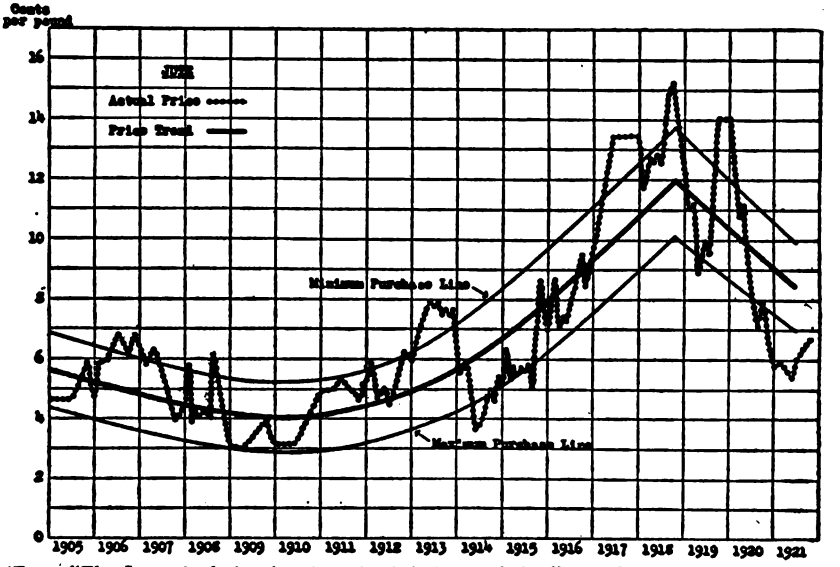
An illustration of the practical use of a policy such as this is afforded in the case of the Dennison Manufacturing Company:[4]

"The purchasing agent must be interested in cycles for two reasons: first, in order to gauge the purchasing requirements, and second, in order to gauge prices. For his purchase requirements he will have to depend largely on the planning department, but within certain limits he will vary his actual purchases according to existing prices.

"Before the war we started to try out an interesting experiment in our purchasing department. Unfortunately, the unusual conditions of the war-time period interfered somewhat with the development and extension of our plan, but now we are getting it under way again. Briefly, our idea is this: We have figured out roughly the maximum and minimum inventories of each important raw material which we are willing to carry at different periods of the cycle. Then we have charted over a long period the prices of the principal

[4] Article by H. S. Dennison, in the *Journal of the American Statistical Association*, Vol. 18, No. 137, p. 23.

commodities that we purchase, and through this we have drawn a line showing the secular trend. Approximately parallel to, and a certain distance above and below, this line of secular trend, we have drawn what we call our minimum and maximum purchase lines. Then we vary our actual purchases according to the position of actual prices relative to these three lines. The minimum purchase line represents the smallest amount we dare carry for current needs, and the maximum



(*From "The Journal of the American Statistical Association," March, 1922*)

Price Fluctuation Chart.

purchase line represents the most that we consider it wise to invest in inventories. Suppose, for instance, that on a certain material our standard quantity to order is six weeks' supply. If prices are below the line of secular trend we may buy up to twelve weeks' supply, but if prices are above the line of secular trend we may buy not more than two weeks' supply. We make no attempt to gauge the actual turning point, because we believe that it is impossible to hit it exactly. Most purchasing agents who wait for the actual turning point buy too late or too much."

Summary.—The application of forecasting methods to short-term planning includes (1) adiustment for seasonal

variation, and (2) allowance for probable cyclical movement. Commitments over the period from one to twelve months in advance should be made to take advantage of seasonal and cyclical movements during the period. In both cases, a working basis is provided in present knowledge of these movements. In the purchase of cotton for future delivery, for example, consideration must be given to the seasonal influence in the delivery month and to the probable interim movement of the business cycle, as well as to the ordinary factors of current demand and supply.

CHAPTER XI

AGRICULTURAL FORECASTING

The importance of agriculture.—The general prosperity of the country depends largely upon the economic condition of the farmers. When agricultural purchasing power is good, all lines of trade feel a stimulation either directly or indirectly; and when farmer buying is poor, the deterring influence is widely noticeable. The business community, therefore, is vitally interested in agriculture as one of the fundamental factors which affect general business conditions.[1]

In addition to the members of the business community who are interested in agricultural conditions from a general aspect, there are a great many others directly engaged either in the production or utilization of farm products. These people are obliged to employ many methods of forecasting in their constant survey of the agricultural horizon. In one case, it may be the farmer who tries to decide how much acreage to plant. In another case, it may be the mill-owner, who, during the growing season, seeks information on the probable volume of the new cotton crop. In a third, it may be the meat-packer,

[1] Crops affect business by: (1) directly determining the ability of the farmer to buy factory products, his annual purchasing power through crops amounting to about $9,000,000,000; (2) by indirectly determining the amount of merchandise which persons employed in manufacturing and mercantile lines and all other non-agricultural pursuits can purchase, for if they must pay high prices for food there will be less to spend for merchandise, and *vice versa;* (3) by determining the earnings of the railroads, for railroad traffic largely consists in hauling farm products or merchandise to be exchanged for farm products, and since the crops largely determine the ability of the railroads to buy new equipment and make improvements, it follows that crops thus indirectly determine the degree of prosperity in the iron and steel business, which is the basic industry of the country. Thus it is evident that activity in transportation, iron and steel, hardware, textiles, and all other lines of business finds its stimulative source—its fountain head—in the agricultural harvests of the country. Prosperity fundamentally depends upon the condition of the soil, and the business men of this country always adjust their commercial commitments to the prospects of the harvests to a greater extent than to any other one factor.—"Financial Forecasting," by James H. Brookmire, in *Moody's Magazine,* July, 1913, p. 19.

who endeavors to foresee, at the time of the corn harvest, the effect upon the price of hogs over the succeeding six months. In none of the three cases mentioned is it longer necessary for decision to be based upon blind chance. Forecasting methods, admittedly imperfect but giving serviceable results, now permit the substitution of fairly accurate criteria as bases for judgment.

But before entering upon the discussion of these methods, some general observations upon the relation of agriculture to business may be in order.

Business prosperity at any given time is not entirely contingent upon agricultural prosperity. The recovery in business during 1922 and 1923 from the depression of 1921 was in the face of acute distress in agriculture. Yet it may safely be stated that, unless the farmer does share eventually in the prosperity, its continuance will not be prolonged.

The increased value of short crops does not offset the economic superiority of large crops. The gain in price is not equally divided among the growers, since the few with large yields profit at the expense of the many with negligible crops. The increased cost of farm products to industrial workers reduces their expenditures for other products. Short crops mean reduced revenues to the railroad companies operating in agricultural districts.

The prices of agricultural products depend upon world, rather than upon domestic, conditions. This condition is true in all products where a large exportable surplus exists. Contrary to general opinion, foreign markets are of greater importance to the agriculturalist than to the industrialist. The domestic price of cotton, for example, is determined chiefly by the volume of foreign purchasing. Europe takes 11 per cent of the value of our agricultural production and less than 1 per cent of our manufactured production.

Agricultural production cannot be regulated with the facility found in industrial operations. The volume of the harvest depends upon the acreage planted, climatic conditions, and the effect of insect ravage and plant disease. Moreover, production cannot be hastened. The producer has practically no control over the output and must accept the developments as they occur. Consequently, the degree of agricultural prosperity is conditioned upon the influence of uncontrollable

forces which operate vicariously to make some years highly profitable and others much less so.

The policy followed by many farmers of increasing acreage when current prices are high, and decreasing when current prices are low is not especially commendable. In the long run, the individual farmer who desires to vary his acreage from year to year will fare better by increasing it after a year of poor profits and decreasing it after a year of good profits.[2]

Although the gain in the purchasing power of the farmers comes chiefly during the harvest months, this is more nearly true in cotton than in other crops. Progress is being made in the establishment of "orderly marketing" policies, which aim to prevent the repressing effect of selling a year's supply during the few months of the harvest season. The following table shows the proportion of the total of the three leading American crops ordinarily sold by the farmers during each month in the year.

WHEN FARMERS SELL THEIR CROPS*

Month	*Wheat Per Cent*	*Corn Per Cent*	*Cotton Per Cent*
January	6.1	13.8	9.0
February	5.3	10.8	5.9
March	4.0	6.7	5.2
April	3.6	5.1	3.7
May	3.9	6.8	2.2
June	3.7	6.3	1.6
July	12.4	4.7	1.1
August	13.5	6.1	1.2
September	15.5	6.1	14.1
October	13.8	6.3	21.8
November	10.0	11.4	19.8
December	8.2	15.9	14.4
Total	100.0	100.0	100.0

* *Monthly Crop Reports*, U. S. Dept. of Agriculture.

Crop reports.—Each month during the growing season reports are prepared by the Department of Agriculture which show the current condition of each of the important domestic crops. These reports are based upon statements received from reporters who are located throughout the farming dis-

[2] G. F. Warren, "Prices of Farm Products in New York," p. 24.

tricts. In the preparation of the cotton estimates, some fifty thousand separate opinions are tabulated.

The manner in which these reports are qualitatively and quantitatively interpreted into forecasts is decidedly interesting. Condition of the particular crop is reported on the basis "of a normal"; for example, the condition of the winter wheat crop on April 1, 1925, was reported as 68.7 per cent of normal. The term "normal," in this instance, is likely to be confusing unless properly understood.

"It is neither a maximum possible nor even a bumper crop, which occurs only at rare intervals when conditions are exceedingly favorable, nor a medium or small crop grown upon one or more adverse conditions. Neither is it an average crop, which rarely occurs because of the effect on the average of extremely low or extremely high yields in exceptional seasons. It is rather the typical crop represented by the average of a series of good crops, leaving out of consideration altogether the occasional bumper crop and the more or less frequent partial crop failure. The expected yield at planting time, the full crop that the farmer has in mind when he thinks of the yield he expects to harvest, or the typical crop represented by the average of good crops only, is the 'normal,' or standard adopted by this bureau for expressing condition during the growing season and yield at harvest time." [8]

The separate estimates are averaged together to get a general average condition for the entire country. This average is compared with a grand average of condition at the same date during preceding years. It is a matter of record that a certain average yield was harvested subsequent to a corresponding average condition. It is now assumed that if the current average condition is above the grand average of the preceding years, the subsequent yield at harvest time will be above the actual average yield of the preceding period; and that if the current condition is below the grand average, the subsequent yield will be below the actual record of the earlier period. In either case, the expected variation in yield should be in proportion to the variation in condition. A detailed explanation follows:

[8] From "Government Crop Reports," Circular 17, Revised, p. 20.

"The process in the interpretation may be explained by an example. The condition of corn on July 1, 1911, was 80.1 per cent of a normal condition; in the last five years the condition has averaged 85.0 per cent of a normal condition; thus the condition on July 1 is 5.8 per cent below the average condition (80.1 being 94.2 per cent of 85.0) and suggests a yield of 5.8 per cent below the average. In the last five years the yield averaged about 27.1 bushels per acre; 94.2 per cent of 27.1 bushels is nearly 25.5 bushels; therefore, conditions are said to indicate a yield of 25.5 bushels per acre." [4]

In connection with these reports, it should be borne in mind that they are estimates rather than forecasts, inasmuch as they assume that average climatic conditions will exist between the date of the estimate and harvest time. If weather conditions prove more favorable than the average, the crop will be larger; if less so, the yield will be smaller. As reliable weather forecasts cannot be made for more than a few days in advance, there is no practical way of adjusting these crop estimates for probable weather conditions. The estimate, instead of being an actual forecast of yield, is rather the point of equilibrium in expectations. The yield is just as likely to be higher as it is to be lower. It is the most probable quantity; but, like many other "most probable" events, it is not necessarily a very probable happening. There would seem to be too great a tendency on the part of trade to regard these estimates as definite forecasts. Their function is to serve as an indicator rather than as an infallible criterion.

A large share of the unfavorable criticism which has been directed against the crop reports during recent years is not warranted, either in the light of the fundamental difficulties involved, or in the degree of accuracy attained. In the case of cotton, about which the chief complaints center, predictions must always be hazardous, due to the influence of uncontrollable factors which may change the outlook over night. Yet greater care is exercised in preparing the cotton reports than is used in compiling the other estimates which are rarely questioned. It is obvious that the reports should gain in

[4] From *Monthly Crop Reporter*, U. S. Department of Agriculture.

accuracy as the harvest approaches, and that a reasonably wide margin of error should be allowed in considering the early estimates. It may be of interest to show what has been the average experience in reporting the condition of the three principal crops in this country over the past thirty years:

AVERAGE CONDITION "OF A NORMAL"*

Month	*Winter Wheat Per Cent*	*Spring Wheat Per Cent*	*Cotton Per Cent*	*Corn Per Cent*
December	90.8	—	—	—
April	84.4	—	—	—
May	85.1	—	—	—
June	81.0	93.1	82.5	—
July	80.5	86.5	82.7	86.5
August	—	80.2	80.8	82.0
September	—	77.3	73.6	78.8
October	—	—	68.0	78.3

* *Monthly Crop Reporter*, U. S. Dept. of Agriculture.

It would appear that the winter months are the critical months for winter wheat; that July is the critical month for spring wheat and corn; and that August is the critical month for cotton.

Intention to plant estimates.—A recent innovation in the activities of the Department of Agriculture has been the compilation and publication of "intention to plant" estimates. Prior to the time of planting, reports are gathered from various large farmers, which indicate the approximate acreage which the agriculturist expects to plant in each crop. These reports are summarized and the total acreage is compared to the acreage harvested during the preceding years. This information is published, with comments as to the probable effect upon production and prices if the expressed intentions are carried out. The farmer receives this report before he starts planting and is thus in a position to revise his plans if desirable.

"The statement of farmers' intentions to plant is not a forecast of the acreage that will actually be planted. It is simply an indication of what farmers had in mind to plant at the time they made their reports, compared with the acreage grown last year. The acreage actually planted may be larger

or smaller than these early intention reports indicate, due to weather conditions, price changes, labor supply, and the effect of the report itself upon producers' action." [5]

In an analysis of this report issued as of March 1, 1925, the department stated: "It seems doubtful if the general expansion of production contemplated by farmers would be to their best interests. . . . The present outlook for a market for Durum wheat does not justify the proposed increase of 12.5 per cent in acreage. . . . Farmers intending to plant corn should not expect to receive as high a price for their surplus as in 1924."

It seems reasonable to believe that, in 1925 and 1926, the publication of these reports played a constructive part in the regulation of acreage planted in corn. After the department suggested that the proposed increases of 2.3 per cent in 1925, and of 14.4 per cent in 1926, would be inadvisable, the plans were revised and the actual increases proved to be 1.5 per cent and 5.0 per cent for the respective years.

Forecasting agricultural purchasing power.—Considering its relative importance, it is fortunate that a serviceable method of gauging changes in farm prosperity has recently been provided. The Department of Agriculture computes monthly an index number of farm prices, using as a base average prices over the years 1909 to 1914. This index number is then compared with a similarly prepared index of the prices of non-agricultural products, and the resulting percentage is assumed to be an index of farm-purchasing power expressed in terms of the products bought by farmers. In December, 1924, for example, the index number of farm prices was 139, and of non-agricultural products, 163; the index of farm purchasing power, therefore, was estimated at 85 per cent of normal.[6]

This purchasing power index number has varied widely over recent years. In 1919, it was 105; in 1920, 85; in 1921, 69; in 1922, 74; in 1923, 79; in 1924, 83; and in 1925, 89. A decline in this index is indicative of smaller sales to farmers; and an increase in the index is significant of larger sales. The

[5] From *Crops and Markets*, Vol. 2, Supp. 3, p. 74.

[6] For a complete description of this index, reference is made to *Crops and Markets*, Vol. 1, Supp. 8, p. 285.

position of the index at 91 in the early months of 1925 was encouraging, despite the fact that it was below normal, because it was the highest point reached in over four years. This was evidence that business could expect greater stimulation from the farming districts than it had received for a prolonged period.

PURCHASING POWER OF FARM PRODUCTS *

Comparative Index Numbers of Farm Prices and Wholesale Prices of Non-Agricultural Commodities.

Year	*Index of Farm Prices* (*A*)	*Index of Non-agricultural Prices* (*B*)	*Index of Relative Purchasing Power* (*A/B*)
1910	103	102	101
1911	95	96	99
1912	99	100	99
1913	100	105	95
1914	102	97	105
1915	100	101	99
1916	117	138	85
1917	176	182	97
1918	200	188	107
1919	209	199	105
1920	205	241	85
1921	116	167	69
1922	124	168	74
1923	135	171	79
1924	134	162	83
1925	146	164	89
1926	136	161	84

* *Crops and Markets*, Vol. 4, No. 1, p. 30.

Holding or selling farm products.—Farmers are constantly confronted with the problem of determining the most profitable time to dispose of their crops. The evidence seems to be conflicting, since, in some years, holding brings a higher price, while, in others, holding results in a lower price. A suggested method for solving this problem is herein presented. The current price should be compared with an established average, and then compared with the current prices of other commodities. If the resulting index is at 100 per cent, the probabilities are in balance; if the index is above 100 per cent, it will probably be more profitable to sell immediately; if the current index is below 100 per cent, it will probably be more profitable to hold for the time being. If the index is

RELATION OF THE PRICE OF WHEAT TO PROFIT AND LOSSES FROM HOLDING

Prices for No. 1 Northern Wheat at New York in Cents.*

Crop Year	Price September	Purchasing Power September †	Price December	Price May Following Year	Price September Following Year	Amount by Which the Price Rose Above the September Price: December	May Following Year	September Following Year
1894.....	57.3	73	60.1	73.1	63.5	2.8	15.8	6.2
1895.....	63.5	80	69.3	73.3	70.7	5.8	9.8	7.2
1896.....	72.1	82	67.1	58.7	57.3	— 5.0	— 13.4	— 14.8
1906.....	83.6	82	91.0	107.7	118.6	7.4	24.1	35.0
1902.....	79.6	84	85.2	87.8	92.3	5.6	8.2	12.7
1901.....	76.7	85	85.8	83.1	79.6	9.1	6.4	2.9
1913.....	97.3	85	98.1	103.0	123.4	0.8	5.7	26.1
1887.....	81.0	88	91.0	96.9	99.6	10.0	15.9	18.6
1912.....	100.2	89	95.8	100.2	97.3	— 4.4	0.0	— 2.9
1884.....	88.6	90	82.9	102.9	93.0	— 5.7	14.3	4.4
1889.....	85.1	90	85.8	98.8	101.9	0.7	13.7	16.8
1892.....	78.8	92	76.5	77.4	72.1	— 2.3	— 1.4	— 6.7
1899.....	79.0	92	78.4	74.4	84.8	— 0.6	— 4.6	5.8
1900.....	84.8	92	82.6	84.3	76.7	— 2.2	— 0.5	— 8.1
1905.....	91.8	93	96.1	91.6	83.6	4.3	— 0.2	— 8.1
1896.....	70.7	94	103.5	82.0	102.7	32.8	11.3	32.0
1898.....	74.6	94	75.7	82.5	79.0	1.1	7.9	4.4
1903.....	92.3	94	94.1	101.1	125.4	1.8	8.8	33.1
1886.....	86.6	95	90.3	97.1	81.0	3.7	10.5	— 5.6
1909.....	108.9	99	122.1	116.6	122.0	13.2	7.7	13.1
1880.....	106.4	100	119.3	126.4	147.1	12.9	20.0	40.7
1882.....	108.5	100	109.8	123.2	114.6	1.3	14.7	6.1
1885.....	93.0	101	94.0	88.6	86.6	1.0	— 4.4	— 6.4
1888.....	99.6	106	104.9	83.2	85.1	5.3	— 16.4	— 14.5
1910.....	122.0	107	117.5	109.4	113.6	— 4.5	— 13.6	— 8.4
1911.....	113.6	107	114.1	126.9	100.2	0.5	13.3	— 13.4
1883.....	114.6	108	113.8	105.3	88.6	— 0.8	— 9.3	— 26.0
1908.....	111.8	109	117.9	134.3	108.9	6.1	22.5	— 2.9
1890.....	101.9	111	104.1	113.9	103.3	2.2	12.0	1.4
1907.....	118.6	111	119.3	115.9	111.8	0.7	— 2.7	— 6.8
1891.....	103.3	113	105.4	96.5	78.8	2.1	— 6.8	— 24.5
1904.....	125.4	128	123.2	106.8	91.8	— 2.2	— 18.6	— 33.6
1897.....	102.7	135	101.9	156.8	74.6	— 0.8	54.1	— 28.1
1881.....	147.1	140	141.7	146.8	108.5	— 5.4	— 0.3	— 38.6

* Statistical reports of the New York Produce Exchange.

† The five-year average price of wheat for September, 1910-1914, was 111.3. To find the purchasing power, the price in September is divided by this figure and the resulting index number is divided by the index number of prices of all commodities.

below 90 per cent, or over 110 per cent, the influence is much stronger.

An illustration is afforded in the case of No. 1 Northern Wheat. In September, 1913, the current price was 97.3 cents per bushel at New York. The established average being 111.3 cents for that date, the prevailing price was 87 per cent of the average. As the general commodity price average at the time was 102 per cent of the average, the indicated purchasing power of wheat was 85 per cent, which would suggest holding. By the following September, wheat had risen 26 cents per bushel. In September, 1911, the current price was 113.6 cents, or 102 per cent of the average. The commodity index was 95 per cent, thus indicating a purchasing power of 107 per cent for wheat, which would suggest selling. By the following September, wheat had fallen 13 cents per bushel.

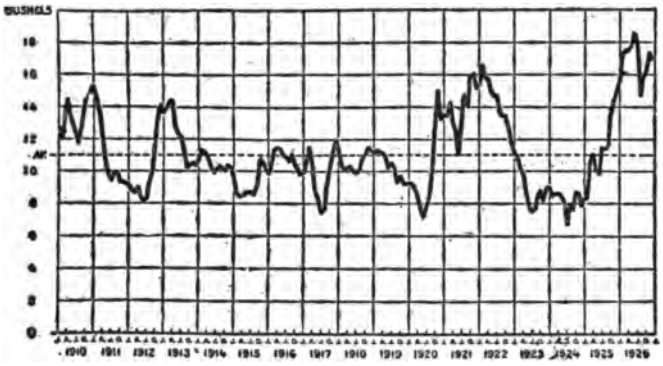
Although the results would not always have been favorable from the adoption of such a practice, it would seem that when wheat has a high purchasing power there is great chance of loss from holding, and when wheat has a low purchasing power there is a good chance of profit from holding.[7]

Corn-hog ratio.—The corn-hog ratio refers to the number of bushels of corn required to buy 100 pounds of live hogs, based on the averages of farm prices for both products. About eleven bushels of corn are necessary to produce 100 pounds of live pork. Under ordinary conditions, the market values of these two quantities should be about equal; corn at 80 cents a bushel should coincide with pork at 8.80 cents per pound. But corn cannot immediately be converted into pork, because of the time required, as well as a possible shortage of hogs. Changes in conditions of demand and supply in the case of both corn and hogs cannot, therefore, be adjusted at once to maintain a parity in the respective prices.

If relative market prices are such that it requires more than 11.0 bushels of corn to be equal to 100 pounds of pork, it may be said that corn is cheap and pork is dear. If less than 11.0 bushels are required, the inference is that corn is dear and pork is cheap. As is shown in the accompanying chart, the ratio

[7] For a detailed explanation of this method, reference is made to G. F. Warren and F. A. Pearson, "The Agricultural Situation," p. 103 *et seq.*

over recent years has been as low as 7.4 bushels and as high as 16.5 bushels.



The Corn-Hog Ratio Curve.

The curve shows the number of bushels of corn equal in value to 100 pounds of live hogs at average farm prices.

The forecasting utility of the corn-hog ratio lies in the fact that the relative price movements run in four-year cycles, although not necessarily every four years. The immediate effect of a large corn crop is to disturb the normal ratio of 11 bushels. This change is caused by the lower market price of corn, and, shortly thereafter, by a higher price for pork. Farmers prefer to utilize their corn surplus by feeding to the hogs, thus reducing the usual supply of hogs going to market. The hogs are kept from the market for breeding and later feeding. Consequently, it is not until the summer following the large corn crop that slaughter becomes heavy. Pork production then remains above the average during the following winter and summer, due partly to the accumulated shortage and partly to the effect of heavy breeding. By the third summer, the pork supply has substantially increased and the surplus corn has decreased, both of which cause the ratio to move upward. By the fourth summer, the ratio has regained its normal position of 11 bushels.

A small corn crop causes the ratio to move in the other direction. The limited supply tends to increase the market price of corn. The farmers prefer to sell their corn for cash at such a time. The fodder shortage results in increased slaughter of hogs with consequent depressing effect upon the price of pork. This condition of dear corn and cheap pork

CORN AND HOG RATIOS, 1910–1926 *

Number of Bushels of Corn Required to Buy 100 Pounds of Live Hogs, Based on Averages of Farm Prices of Corn and of Hogs for the Month.

Year	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*	*Average*
1910.....	12.2	12.0	13.6	14.4	13.3	12.9	12.2	11.7	13.0	14.2	15.1	14.9	13.3
1911.....	15.3	14.4	13.7	12.1	10.7	9.8	9.4	9.9	9.9	9.3	9.2	9.3	11.1
1912.....	9.1	8.8	8.6	9.0	8.4	8.1	8.3	9.1	10.1	12.0	13.2	14.1	9.9
1913.....	13.6	13.9	14.4	14.4	12.7	12.3	12.1	11.1	10.2	10.4	10.5	10.3	12.2
1914.....	10.8	11.3	11.2	10.9	10.3	9.9	10.1	10.3	10.2	10.0	10.4	10.2	10.5
1915.....	9.5	8.6	8.4	8.5	8.7	8.7	8.7	8.5	9.2	10.8	10.6	10.1	9.2
1916.....	9.8	10.5	11.4	11.5	11.4	11.0	10.9	10.6	11.1	10.4	10.1	9.8	10.7
1917.....	9.9	10.5	11.5	10.3	8.8	8.3	7.4	7.7	9.0	10.1	11.2	12.0	9.7
1918.....	11.2	10.3	10.1	10.2	10.3	10.0	9.9	10.1	10.8	11.0	11.5	11.3	10.6
1919.....	11.1	11.3	11.2	11.1	10.8	10.2	10.5	10.2	9.3	9.7	9.2	9.2	10.3
1920.....	9.3	9.2	8.9	8.4	7.6	7.1	7.8	8.5	10.1	13.0	15.0	13.2	9.8
1921.....	13.5	13.5	14.3	13.0	12.5	11.0	13.1	14.8	14.0	15.9	16.0	15.2	14.0
1922.....	15.4	16.5	15.8	15.7	15.0	14.7	14.7	13.7	13.4	13.4	12.8	11.7	14.4
1923.....	11.1	10.9	10.2	9.8	8.8	7.9	7.5	7.7	8.5	8.8	8.2	9.0	9.0
1924.....	9.0	8.5	8.6	8.6	8.5	8.1	6.7	8.0	7.7	8.7	8.7	7.9	8.2
1925.....	8.3	8.4	10.6	11.2	10.0	9.7	11.5	11.4	11.6	13.4	14.3	14.9	11.3
1926.....	15.8	17.2	17.5	17.5	17.8	18.7	17.7	14.7	15.8	16.2	17.3	17.0	16.9

* From *Crops and Markets*, Vol. 4, Supp. 1, p. 16.

continues over the ensuing year or two, until the prospect of a large corn crop or a hog shortage restores the ratio more closely to normal.[8]

If the experience of the period from 1910 through 1925 is a reliable guide, the observation may be made that when the ratio of 11 bushels of corn for 100 pounds of pork moves definitely into a higher or lower position, the probabilities are that a cycle has begun which will run from three to four years before the normal relation is restored. Careful study of this ratio will permit the determination of a fairly accurate forecast of hog prices from two to three years in advance.

It is undoubtedly appreciated that the cycle of hog prices just referred to is distinctly different from the general business cycle which has previously been discussed.

Summary.—The cases cited in the foregoing chapter illustrate various methods employed in agricultural forecasting. Crop estimates issued in advance of the actual harvests are forecasts based upon the relationship which the existing condition bears to the average condition of preceding years. Intention to plant estimates are prepared from an actual survey made of all sections which will be planted to the particular crop. Agricultural purchasing volume is forecasted by comparing the current average price received for farm products with that paid for non-agricultural products. The relative advantage of holding or selling crops at harvest time can be estimated by a comparison both with a long-term average and with the prevailing prices for other commodities. The prices of hogs over four-year cycles can be fairly accurately forecasted through the use of a basic ratio between bushels of corn and pounds of live pork. These examples do not exhaust the field, but are believed to be of sufficient general interest to warrant inclusion in this book. It is almost anomalous to say that in agriculture, where predictions are naturally hazardous, forecasting receives greater recognition than in industry, where the influencing factors are susceptible of more precise measurement.

[8] Cf. *Crops and Markets*, Vol. 2, Supp. 4, p. 141.

Chapter XII

INDUSTRIAL FORECASTING

Manufacturing problems.—The application of forecasting methods to industrial problems has acquired a decided impetus in recent years. Unlike agriculture, wherein production volume depends largely upon the influence of uncontrollable forces, manufacturing may be regulated quickly to meet changes in market conditions. This flexibility of control is both helpful and harmful. It is helpful in preventing overproduction; and it is harmful when, at times, it causes temporary conditions to be erroneously construed as permanent trends.

Production control is not the only field in which industry may profit from forecasting applications. Expansion plans require a careful survey of probable future sales to determine wisely the extent of new construction; a forecast of conditions in the building industry to ascertain if the current situation is favorable for building; and an analysis of trends, with relation to raw materials and markets, to establish the most suitable location for the new plant. The purchase of material necessitates a forecast, not alone of conditions of demand and supply in each commodity, but also of the probable trend of the general price level and relative convenience in securing shipments from vendors and deliveries by transportation companies. Sales commitments which cover long-term contracts at fixed prices should be eagerly sought at certain times and should be as earnestly avoided at other times.

The methodology employed in meeting these problems is discussed in other parts of this book. The purpose of the present chapter is to bring out a selected group of applications which pertain almost exclusively to the industrial field.

Budgetary applications.—In the preparation of industrial budgets, estimates must be made, usually twelve months in advance, covering anticipated revenues and expenditures. As expenditures are based upon revenues, and as revenues depend

upon sales volume, the success of the entire budgetary system is largely contingent upon the accuracy gained in forecasting orders to be received. An increase in orders will naturally require larger payments for materials and labor, just as a decline in sales volume lessens the financial requirement.

Although forecasting is thus essential in budget preparation, the functions of the two are not the same. The purpose of forecasting is to give a rather approximate view of future conditions, so that proper policy may be established. The purpose of budgeting is to insure financial control and thus keep expenditures within reasonable bounds. A forecast is commendable to the extent that it approaches a certain estimate; a budget is praiseworthy in the proportion it keeps to a definite limit.

The sales budget is a forecast of future business. It is usually prepared one year in advance, but many companies extend the estimate over five or ten years. It is subdivided by classes and is set up on a monthly or a quarterly basis. The basis used in preparing this budget may be termed "qualified experience." The three factors are: (1) the rate at which orders were received in the preceding year; (2) the current rate; and (3) developments which may occur during the next year. The first two are matters of statistical record. The third is a matter of careful analysis of existing conditions and trends.

An interesting method of establishing a one-year sales budget along unusual lines is used in the electrical manufacturing industry:

"In the fall of each year we make a budget. Each merchandising division does this. First, we estimate the sales. To do that scientifically, we start with the individual salesmen, call them in and go over the customers' cards, and ask them to estimate the purchasing power, and how much business they expect to get from them. This gives the total possibilities of the territory and the total amount of the business they expect to get." [1]

"Just prior to the beginning of the fiscal year every one of our 900 salesmen makes a survey of the field in which he

[1] From article by Gerard Swope, President of General Electric Company, in *System*, Vol. 43, No. 4, p. 443.

operates, talks with his customers, and then outlines the sales that he expects to make in each of the eight main lines of our product. This preliminary study having been made, it is reviewed, first, by the salesmen's division manager, second, by the district manager, and, third, by our headquarters supervisory staff. The figures submitted by the individual salesmen may be accepted or may be altered after this review. The final result is the quota of sales for the new fiscal year. A summary by each of the fourteen district offices is sent in to headquarters. From these district office sheets each headquarters sales manager totals the principal sales in each of the lines handled by him. The figures thus obtained are a guide to us in making our plans for sales campaigns, for general expenditures, for advertising, etc." [2]

The experience of the immediate past is seldom the best guide for estimating the immediate future. Indeed, in the preparation of one-year sales budgets, the record of the current year alone may prove a most unreliable guide. The cyclical movement of business tends to change the status of business over twelve successive months. An actual experience may be cited to bring out this point.

At the close of each year from 1913 through 1923, an estimate, based chiefly upon current sales volume, was prepared of expected orders for a certain industrial product during the succeeding year. In 1913, with current orders fairly large, an estimate of 1600 units was set for 1914; actual orders were but 1169. In 1914, an estimate of 1200 units for 1915, compared with the actual orders of 1105. An estimate of 850 for 1916, compared with actual of 1059. An estimate of 1200 for 1917, compared with an actual of 1521. An estimate of 1430 for 1918, compared with an actual of 1398. An estimate of 1530 for 1919, compared with an actual of 4165. As a result of this experience the 1920 estimate was set at 4000, but sales were only 2582. It was expected that the decline was temporary, so the 1921 estimate was set at 5000 to meet actual orders of but 1118. The 1922 estimate was thereupon radically reduced to 1080,

[2] From letter of H. D. Shute, Vice President of the Westinghouse Electric & Manufacturing Company, which appeared in leaflet, "The Sales Budget," issued by the Metropolitan Life Insurance Company.

whereas sales jumped to 2273. The 1923 estimate was then put at 2225, but sales jumped farther to 2945. The 1924 estimate of 2650 compared with actual sales of 2811. It is obvious that one-year forecasts of sales volume cannot be dependably made by merely considering the prevailing rate of incoming orders.

Adjustment of overhead for cyclical movement.—What has been described as a "novel and daring idea" in industrial accounting practice is the adjustment of overhead charges to the cyclical movement of business. Under ordinary procedure, a certain percentage is added to manufacturing cost to cover the general expense which cannot be directly allocated to each unit of output. As a substantial part of this overhead expense is irrespective of the volume of production, this burden charge must necessarily be greater in years of underproduction than in years of high activity. The consequence is that the profit margin is abnormally high in the active years and abnormally low in the slow years. While one would tend to offset the other in the long run, production costs, and, therefore, sales prices, are seriously burdened at an unfavorable time. An equalizing method is here suggested.

"Let us assume the normal output of a department is 100 pieces and the overhead $100, or an overhead charge of $1 per item. If the department produces 150 pieces at a normal overhead charge of $1 per item, not only will the $100 overhead be used up, but there will be an additional $50 as a reserve accruing to the management. When the output drops to 50 pieces, only $50 overhead will be applied to this reduced production, and the difference made up from the reserve established during unusual production." [8]

The adoption of this method of distribution of overhead expenses requires the addition of a "Reserve for Overhead" into the regular accounts. This reserve account is treated in the regular manner, being subject to additions during the active years and deductions during the inactive years. Overhead charges per unit of product are kept constant over a series of years, thus tending to stabilize earnings. A certain

[8] From "Overhead Expenses," prepared by Fabricated Production Department, Chamber of Commerce of the United States, 1921, p. 7.

market advantage, moreover, is gained in times of depression, since the stabilization of overhead at such a time permits lower selling costs than would be possible under the customary method of determining cost of production. The normal overhead charge is determined by establishing normal overhead expenses in comparison to normal production, with due allowance for expected changes, such as the growth of the business and unexpected changes, such as unanticipated increases in salaries or insurance rates.

Production authorizations.—Production managers in industrial plants are constantly facing the problem of determining the volume of production to be authorized over the ensuing weeks or months. In relatively few industries are the sales of the product so regular as to warrant the establishment of a constant rate of production. The problem is more acute in proportion to the time required for manufacture. In many plants these production orders, more popularly termed "bundles," must be placed over a six months' period. In January, the order is placed for production through July; in February, the order is carried through August; in March, through September; and similarly. The usual manner of determination is in accordance with the volume of sales over the past two or three months. Although in many cases, allowance is made for seasonal influences in these production orders, seldom is any attempt made to forecast the effect of cyclical movement. Adjustment for cyclical movement is made only after its effect is apparent in declining orders.

A representative method employed in this field is here described:

"We usually follow a system that permits of frequent review and at the same time allows the production departments ample time to adapt themselves to any change. Assume that in January there is not a positive indication of the trend of business. We would then for six months, beginning with February, give the production department an estimate of sales in a given class, continuing the rate of the two or three months just ended. Two months later, the sales rate having materially dropped and showing indications of going lower, we give a smaller estimate to October. If the factory during February and March has manufactured at a rate approxi-

mating the sales estimate, they now have four months to adapt themselves to the changed conditions.

"Again, by June 1, the rate having dropped again, but conditions giving evidence of more stability, no reduction is made in extending the order.

"The authorization for completed stock is a very important element in conjunction with the foregoing. While the primary object in accumulating stock is to promote sales through prompt service in shipments, it is important in other directions. It is a means for maintaining the "man power" facilities at times of low business; in a speculative sense to build up stocks at times of minimum costs; and it permits taking the peak of business without increasing plant facilities or incurring the extravagances of rush production.

"Our deliveries in the first half of 1923 were at a rate considerably in excess of facilities to manufacture, due to the large stock accumulated in 1922 when the signs indicated good business ahead." [4]

Seasonal adjustment.—Although most industries are compelled to arrange their production policies to conform to seasonal demand, the problem is especially acute in the automobile industry. In this field the wholesalers are dealers, often with limited resources, handling a product for which there is a highly fluctuating demand, both seasonal and cyclical. It is to the interest of the manufacturer to produce uniformly throughout the year. It is to the advantage of the dealer to accept shipments only at times when customers desire deliveries. The two opposing interests must be harmonized in so far as possible.

The customer demand for automobiles is highly seasonal. One of the largest manufacturers has published the following analysis, by months, of retail deliveries in the United States. April, being the peak month, requires twice as many cars for delivery as October, and three times as many as January.

The General Motors Corporation has endeavored to meet this estimated fluctuation in consumer demand by operating at a fairly level line of production adequate to meet the total demand for the year. A certain surplus capacity, within

[4] From article by J. T. Stockdale, in *The G. E. Monogram*, Vol. I, No. 9, p. 13.

reasonable limits, is provided to permit an increase or decrease in the rate of production as the year progresses. This flexibility would not be possible where the yearly capacity just equals the customer demand.

Month	*Percentage of Total*	*Seasonal Index*
January	4.86%	59
February	5.15	62
March	11.75	141
April	14.70	177
May	13.50	163
June	11.68	140
July	7.11	85
August	4.25	51
September	6.96	84
October	7.60	91
November	6.94	83
December	5.50	66

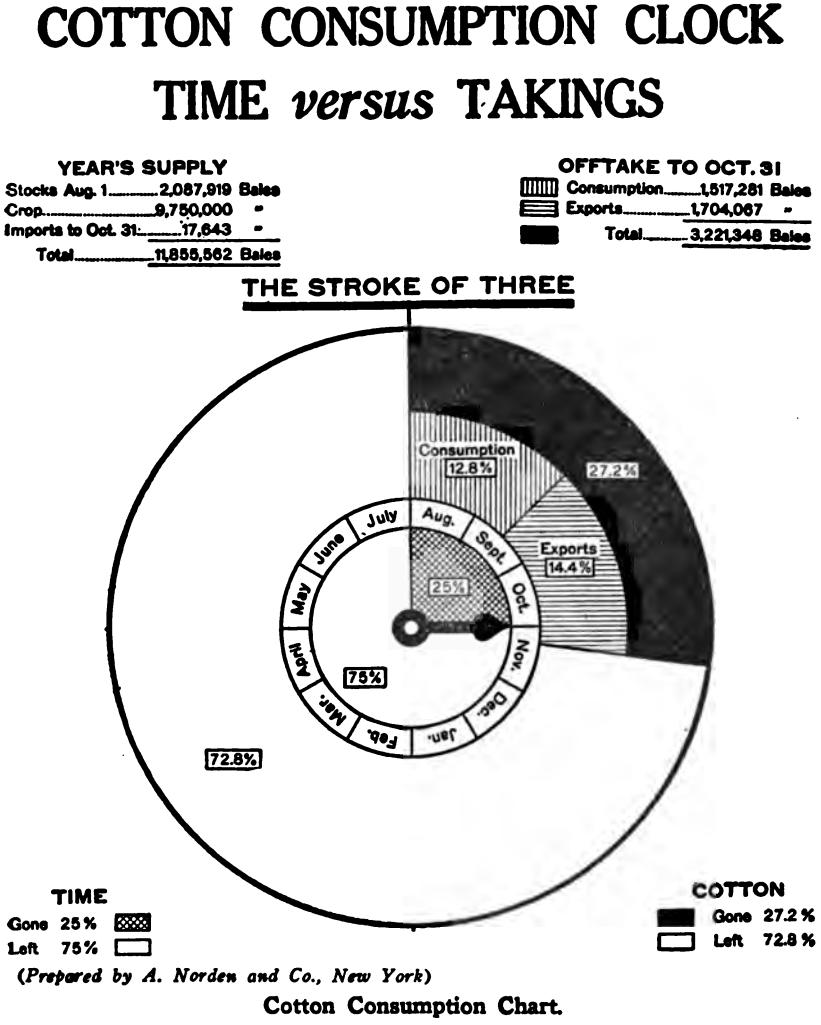
The basic level line of production is determined from the sales budget. Each month during the year the actual deliveries are compared with the estimates, and necessary adjustments are made in the production schedules. The dealers, although expected at certain times to accept shipments in excess of current deliveries, are thus protected against any large accumulation of unused cars.[5]

Commodity forecasting.—The determination of conditions of demand and supply in the great commodity markets of the world is one of the fields in which forecasting methods are constantly employed. Conditions are changing with every minute of the day and revisions of previous estimates must be made quickly. An excellent illustration of the method in which existing conditions are carefully studied is shown in the accompanying chart, which visualizes the position of cotton on November 1, 1923. As might be inferred, most elaborate statistics are compiled and maintained, which endeavor to give as complete a picture as possible of both production and consumption, in the past, the present, and the future. Such data is the basis for the determination of market policy.[6]

[5] From statement by Alfred P. Sloan, President, General Motors Corporation, in *The Wall Street Journal*, Aug. 29, 1925.

[6] An excellent exhibit of the various statistics and charts employed for this purpose appeared in the Annual Report of the American Sugar Refining Company for 1924.

An example of the methods employed may be of interest. In January of 1925, the price of copper was about 15 cents per pound. Users of copper had to determine whether it



Cotton Consumption Chart.

would be advisable to add to stocks at that time. If the price were to advance, the policy would be to buy freely; if the price were to remain at about the same level, the policy would be to buy in normal quantities; if the price were to decline, purchases should be postponed. Three months after

the following analysis was prepared, the market price was below 13½ cents:

"For the thirteen-year period beginning in 1912 and ending in 1924, the total production of copper by mines in the United States averaged 1,366,000,000 pounds annually. During the same period, imports averaged 486,000,000 pounds and exports averaged 787,000,000 pounds. This would indicate that the domestic consumption has averaged 1,065,000,000 pounds.

"Under the most favorable operating and marketing conditions, it is estimated that the total capacity of the copper mines in the world is about 3,000,000,000 pounds annually, of which mines in the United States supply about 60 per cent. Under present conditions, it is estimated that current production for the world is at the rate of about 2,500,000,000 pounds and in the United States at the rate of about 1,500,000,000 pounds.

"Consumption of copper is about equaling current production, since producers' stocks apparently are not increasing. Consumers' stocks are doubtless large, however, due to many having taken advantage of relatively low prices in 1924.

"Domestic and foreign consumption for the past year or more has been well in excess of pre-war quantities. Apparent domestic consumption in 1923 and 1924 averaged 1,250,000,000 pounds compared with 800,000,000 pounds average in 1912 and 1913. Foreign consumption has regained its pre-war status, as is evidenced by 1,071,000,000 pounds exported from the United States in 1924, compared with 926,000,000 pounds exported in 1913.

"Due to the large stocks in the hands of consumers and the heavy consumption of copper in 1924, there is unlikely to be any further large increase in the demand in the near future. Should such a demand develop, however, a potential increase of about 500,000,000 pounds annually in the supply would tend to check a material advance in the market price which is now slightly over 15 cents.

"Conditions, therefore, do not seem to justify any large addition to stocks at present prices. Whatever price advantage might be gained would probably be offset by carrying charges."

COPPER STATISTICS

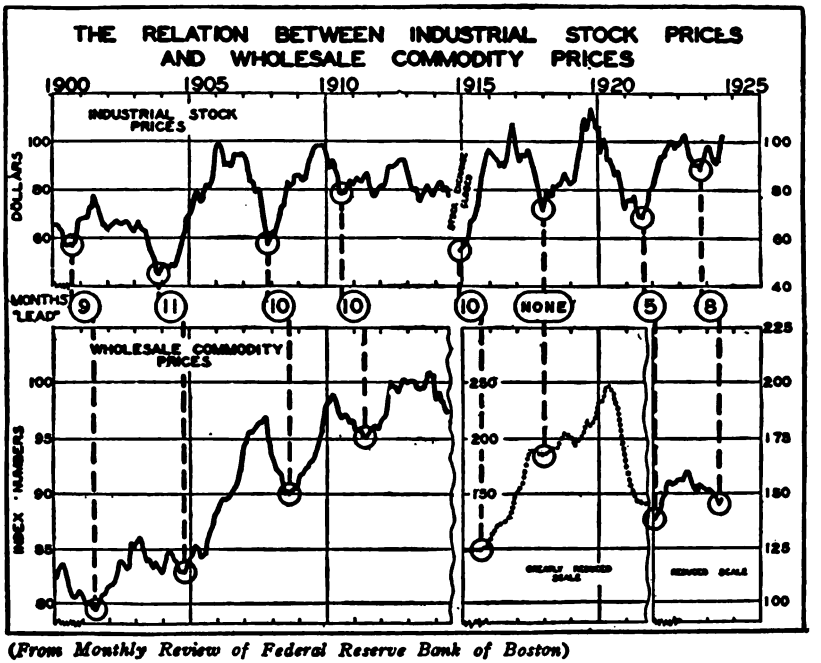
(Millions of pounds.)

Year	Domestic Production	Imports	Exports	Apparent Domestic Consumption
1912	1,241	410	775	877
1913	1,228	408	926	711
1914	1,158	306	840	605
1915	1,424	315	681	1,058
1916	1,942	516	789	1,669
1917	1,922	556	1,132	1,346
1918	1,937	575	747	1,766
1919	1,209	429	516	1,122
1920	1,270	485	624	1,132
1921	476	350	628	198
1922	1,023	541	728	837
1923	1,343	668	768	1,243
1924	1,587	751	1,071	1,267
Thirteen-year Average	1,366	486	787	1,065

Trends in commodity prices.—The policy adopted in purchasing commodities should conform as closely as possible with the current trend in general price levels. If the trend is upward, a liberal attitude is warranted, and if the trend is downward, a cautious policy is necessary. It should be appreciated, of course, that individual commodities often move contrary to the general swing. A prospective short crop will advance the price of cotton at a time when other prices are declining. But a liberal, a cautious, or a normal policy should be adopted with respect to the general run of commodities in accordance with the probable trend of prices.

While there is no certain way in which the trend of prices may be predicted, experience has shown that a serviceable barometer may be found in security price movements. A comparison of the movement of the Dow-Jones average price of twenty industrial stocks with the index of wholesale prices prepared by the Bureau of Labor Statistics at Washington shows an ordinary "lead" in the stock market of about nine months. During the past twenty-five years, commodity prices have not definitely begun an upward trend before security prices, and only once—in 1917—have the turning points coincided. During the same period in only two cases has a downward trend in industrial stock prices failed to forecast accurately a similar movement in commodity prices.

It would appear, therefore, that purchasers of commodities have a fairly dependable price barometer in the movement of industrial stock quotations. A liberal policy would be justified after stock prices start rising, following a sustained decline. A cautious policy would be warranted after stock prices start declining, following a sustained rise.



(From Monthly Review of Federal Reserve Bank of Boston)

Comparison of Stock and Commodity Prices.

In an endeavor to take full advantage of favorable purchasing opportunities, buyers have recently innovated a method which has been termed the "release authorization," in placing orders. Under ordinary conditions, shipment on the entire order is made reasonably soon after the contract is placed. The loss of capital invested, the cost of storage, and the danger of deterioration make a serious burden on the buyer and may completely offset the advantage in price. With the release authorization, however, the longest possible price protection is obtained with shipments to be made only as authorized, and never exceeding one month's supply.

Buying policies at abnormal times.—The determination of a general policy with respect to the purchase of materials and supplies should be made with proper consideration of the current position of average prices. Allowance must be made for the fact that the average index at times reflects a condition which is not true of each specific commodity. Broadly speaking, however, an abnormally high level of prices calls for caution equally as much as an abnormally low level warrants courage. And it so happens, fortunately, that a rather fine line of demarcation can be drawn between the normal and the abnormal in the average price level.

The Bureau of Labor Statistics at Washington publishes a monthly index of wholesale prices in the United States, which has been referred to in detail in an earlier chapter. The basis of this index makes 100 represent average prices in 1913. Since 1922, following the great war inflation and subsequent deflation of prices, the index has reached a point of stability at about 150 per cent of the 1913 base. As experience has shown that the normal fluctuation of average prices is rarely more than 6 per cent over or under an established level, one can infer that this price index will normally vary in the future between 141 and 159. At 150, the purchasing policy would be normal. It would become liberal as the index decreased and careful as the index advanced. It would become very liberal if the index broke under 141 and highly cautious if the index went beyond 159.

This reasoning is based on the assumption that 150 will remain the point of stability indefinitely. No assurance exists that this will prove to be true, and there are many who hold that average prices over the next decade will gradually decline. However, until a definite trend appears to the contrary, one may reasonably assume that the stability demonstrated over the five years, 1922 through 1926, will continue.

Basic inventory valuation method.—An interesting application of economic principles to inventory valuation is to be found in the "basic inventory" valuation method, also known as the "normal stock" system. Under this plan, that part of the inventory which represents the normal supply is carried always at the same fixed price irrespective of the current market. In this way the income reports do not include any

adjustment for fluctuations in the value of the regular inventory during the period.

This method is employed especially during times when market prices are abnormally inflated, such as in the years from 1916 to 1921. Conservatively managed companies foresaw the inevitable decline in prices which was to follow the high levels of the war years, and consequently refused to inflate their accounts by carrying inventories at prices which could not be sustained. If they had followed the usual accounting practice of valuing inventories at the lower of the two alternative prices—cost or market—they would have reported profits far in excess of those arising out of regular operations during those years. In fact, most companies did follow such a policy. As a consequence, when price deflation came with unprecedented rapidity in 1920, the companies which followed the usual practice were compelled to report large deficits arising out of inventory losses during the year. The companies which followed the more conservative plan were able to report satisfactory operating profits during 1920 without deduction for inventory adjustments.

To illustrate the use of this method of inventory valuation, extracts follow which have been taken from the annual reports of two representative industrial corporations.

"In the early years of the War, the officers and directors realized that the advance in prices of raw materials would affect this industry in a peculiar way. It was evident that if the inventory were valued according to high war-time prices, the profits would be materially increased; and when, after the War, the inevitable decline in prices occurred, the company would be confronted with large losses due to such declines. The company is compelled to have on hand constantly an inventory of raw materials, work in process, and finished machines of at least 50 per cent of the gross sales of a normal year. The turnover in this business, that is, the period between the purchase of raw materials and the sale of the manufactured product, averages about twelve months; whereas in some lines of production the turnover is made in a much shorter time. This longer period of turnover is due to the fact that the company's manufacturing program is not based upon definite orders for goods but is necessarily made

upon estimates of future crops and the probable need of machines, which must be manufactured and distributed throughout the agricultural districts of the world in sufficient time to be available when needed upon short notice.

"A normal inventory of materials and parts sufficient to protect ordinary manufacturing operations is as much a fixed investment with this company as real estate, factory buildings, or machinery.

"In view of these facts it was decided that so much of the inventory as represented the portion constantly on hand (termed the basic inventory) should be valued at pre-war (1916) prices and carried on the balance sheet at those prices; and that fluctuations in values should be reflected only in the amount of the inventory carried in excess of the basic inventory. This policy was adhered to even though the United States Government for taxation purposes valued the entire inventory at cost or market prices, thus resulting in the payment of taxes on profits never realized.

"The inventory at the close of 1921 was valued at the then cost or market, whichever was lower, and is so valued in this balance sheet. The company shows a net profit for the year 1921, notwithstanding the decline in value of the inventory. Had not the company adopted conservative methods in valuing inventories during the past few years the balance sheet for 1921 would have shown a net loss in excess of $20,000,000." [7]

"A more important difference (that in some years has resulted in differences in NET EARNINGS or LOSSES of as much as $6,000,000) is the system of valuing inventories. The Bureau of Internal Revenue requires inventories to be valued at market value or cost. If at cost, it is the price paid for the last raw material purchased, equal in quantity to the amount of the inventory. Every change in the value of pig lead of one cent a pound above or below the value used in the previous inventory results in an increase or decrease in the showing of NET EARNINGS of almost $2,000,000, although we have on hand in metal in transit, process of manufacture, and finished stock approximately the same number of tons at both dates, and cannot realize the profit or actually suffer

[7] International Harvester Company, "Annual Report," 1921, p. 13.

the loss except as a book entry, unless the company is liquidated. We therefore assume that every carload of raw material received is dumped directly into the melting-pot from the car, and used in manufacturing the product sold that day (or period under review); with the result that the inventory on hand at any given date is the same inventory that was on hand in 1913, when we established the Normal Stock system of valuing inventories, at which time inventories were valued on the basis of pig lead at $3.40 per hundred pounds.

"The normal stocks only are valued at this price. Any excess above normal is valued on the system required by the Bureau of Internal Revenue. In case of deficiency below the Normal Stock, a reserve is automatically created in the inventory, sufficient to bring the stocks up to normal at the then market price. In this way we eliminate book profits and losses. The profits shown become the correct measure of the company's success and efficiency of its employees. No one is deceived." [8]

Forecasting industrial pension costs.—One of the most difficult problems in industrial forecasting is the preparation of estimates to show future costs of pension plans. These plans vary with respect to retirement age, years of service, and amount of annuity, and thus make difficult any direct comparison of plans in operation. For the purpose of illustration, a typical plan may be assumed wherein employees are retired at the age of sixty-five after a minimum service of twenty years, at an annual pension equal to 1 per cent of the average salary earned during the final ten years multiplied by the number of years of service. An employee at sixty-five, after thirty years of service, in the last ten of which the average wage was $2000, would thus be entitled to an annuity of $600. The manner in which estimates are prepared to forecast the future cost of such a plan has been thus described:

"The distinguishing characteristics of this fourth type of financing pension plans—the actuarial type—have already been suggested. It consists primarily in a systematic valuation of liabilities, both past and future, and the setting up of reserves to meet them as they mature. The valuation of these liabilities is the more difficult, the more diverse the factors

[8] National Lead Company, "Annual Report," 1925, p. 4.

determining cost and the more uncertain their operation. The actuary in making the calculation takes account of the age and sex composition of the working force, with a view to ascertaining the number of employees now on the force who have attained or expect to attain during each succeeding year the stated retirement age. He then ascertains the extent of accrued liabilities by computing the amount of back service credit for each employee at the time of launching the plan. From this he proceeds to determine the number of employees who would during each year fulfill the prescribed service requirement for a pension, provided they remained alive and active on the force. Further, on the basis of past experience in the given plant and in similar plants, he estimates the probable rate of labor turnover in the years to come, and likewise the probable rate of growth of the working force from the indications of its previous growth. Prognostication of either of these variable quantities, particularly of the latter, is hazardous, owing to market changes and other factors lying outside the business as well as within, that are not measurable with accuracy, even if they could be foreseen.

"Far less difficult is the determination, first, of the probable number of employees who will be eliminated each year by death before reaching the age of retirement, and, secondly, of the chances of life, at their respective retirement ages, of the men and women covered by the pension program. The basis for computing these quantities is found in the general mortality tables, corrected for the peculiar hazards and other special conditions of the industry in question.

"The result of all these calculations, together with the valuation of the various benefits under the plan, is a more or less valid estimate of the cost of the plan. The forecast is merely approximate, however, and has to be checked against actual experience at frequent intervals, so as to guard against the unperceived accumulation of discrepancies or error in the original calculation. But with these reservations, it supplies the essential information upon which a sound financing program extending over a considerable period of years can be based." [9]

[9] "Industrial Pensions of the United States," p. 115 *et seq.*, National Industrial Conference Board.

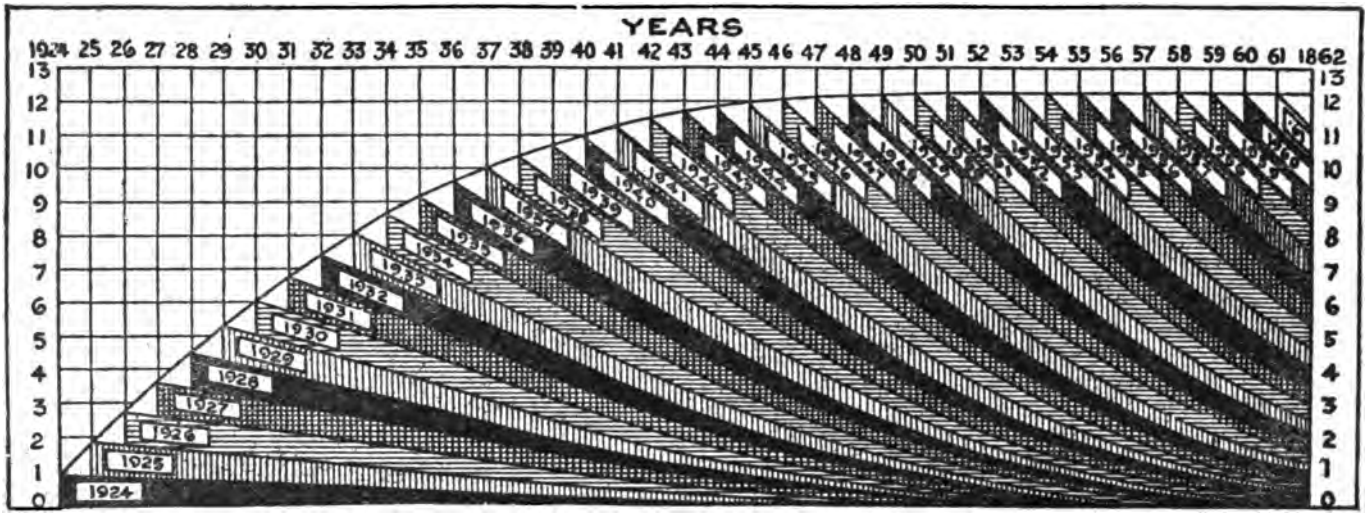
The accompanying chart indicates the extent to which pension costs grow during the early years of operation. It should be noted that the chart is based upon the assumption that there has been no change in the number of employees or in the average wage paid during the thirty years preceding the adoption of the plan. It is obvious that even the large increase shown would prove a decided underestimate for the average company which has had increases both in the number of employees and the scale of wages.

The actual experiences of two representative American companies over recent years will serve to point out several interesting aspects of the problem. The first illustration will be that of the Baltimore and Ohio Railroad Company which has had a plan in operation since 1884. The actual payments to pensioners have been as follows:

1885	$ 7,354	1905	$ 73,322
1886	18,125	1906	82,972
1887	20,669	1907	95,310
1888	23,438	1908	112,356
1889	24,160	1909	129,247
1890	25,100	1910	157,273
1891	27,894	1911	174,746
1892	22,381	1912	193,908
1893	31,954	1913	212,645
1894	34,457	1914	234,292
1895	34,800	1915	266,538
1896	34,726	1916	295,652
1897	46,346	1917	312,623
1898	50,242	1918	321,247
1899	52,117	1919	331,443
1900	49,026	1920	352,390
1901	55,830	1921	380,013
1902	63,143	1922	407,786
1903	64,730	1923	435,502
1904	67,199	1924	456,885

After forty years of operation, there was no evidence that the peak had been reached. In fact, it was almost certain that the annual increase would continue for many years. The number of eligible employees in 1884, at the time the plan began, was 16,848, and the corresponding number of eligibles in 1924 was 54,706. The number of pensioners in 1915 was 1,036, or 4.7 per cent of the 21,722 who were on the eligible list twenty-five years previous in 1890. At the same ratio (4.7 per cent of 54,706 eligible employees in 1924), the

HOW PENSIONS GROW WITH NO PAYROLL GROWTH



(From "The Annalist," Nov. 30, 1925, article by G. Edwards)

Estimating Pension Costs.

number of pensioners in 1949 (twenty-five years after 1924) will be 2,571, which compares with 1,290 on the pension list in 1924.

The second illustration is that of the United States Steel Corporation. This plan has been in operation since 1911 only and is somewhat affected by a change made in 1915 whereby the age limit was increased from sixty to sixty-five, and the service period from twenty to twenty-five years.

			New Pensioners Added	
Year	*Pensioners*	*Annual Payments*	*Years of Service*	*Monthly Pension*
1911	1,606	$ 281,457	30.55	$20.90
1912	1,843	358,780	29.51	20.40
1913	2,092	422,815	29.84	21.30
1914	2,521	511,967	29.89	21.00
1915	3,002	659,389	29.09	20.85
1916	3,013	711,130	33.23	25.00
1917	2,933	712,506	32.24	22.65
1918	2,861	709,059	34.77	27.35
1919	2,940	733,707	32.31	26.75
1920	2,969	779,766	34.37	34.35
1921	3,437	947,879	34.90	38.60
1922	3,886	1,266,661	35.40	40.65
1923	4,054	1,448,112	34.50	43.25
1924	4,478	1,683,920	35.20	43.80
1925	5,084	2,068,652	35.10	45.10

Again it is clearly evident that constantly increasing pension appropriations will be necessary for a great many years into the future. As in the preceding case, it is significant to observe that the payroll of the Steel Corporation had grown from 196,000 in 1911 to 249,000 in 1925.

In view of the general lack of appreciation among industrial executives of the ultimate cost of pension plans, it may be of interest to offer some tentative observations, based partly upon the limited American experience and partly upon the longer European record:

1. The total pension cost for any one year will not reach a maximum until the youngest employee at the time of the beginning of the plan reaches an extreme old age. In other words, the annual cost, apart from any increase in the number of employees, will show a continued increase for some sixty or more years after the origin of the plan. This is due partly to the longer service records of the younger men who eventu-

ally reach the retirement age, and partly to the effect of higher wage scales as the business grows.

2. At its maximum, the pension cost will be about 10 per cent of the annual payroll, assuming that present tendencies in the rate of labor turnover will continue. Some municipal pension funds which have been in operation a long time require an annual appropriation in excess of 20 per cent of the current salary list. The present experience of American pension plans, whereby a yearly appropriation of about 1 per cent of the annual payroll is adequate to meet current requirements, will prove an unreliable criterion in the future.

3. An annual appropriation of 1 per cent of the payroll will probably prove sufficient to pay all current pensions and provide an adequate fund for the future, including allowance for growth in number of employees and wage increases, *if it is made effective when the business begins.* But as most pension plans are started after the concern has been in existence a certain period, the 1 per cent appropriation takes care of the present and future only. The "accrued liabilities" of the past must also be taken into consideration if the reserve fund is to start on a solvent basis. An initial reserve appropriation of about 50 per cent of the current annual payroll will be necessary for this purpose.

4. An annual appropriation of about 2¾ per cent of the payroll is a fair estimate of what is necessary to meet current pension requirements and build up a fund for future needs in the case of companies which have been established for many years.

Summary.—The cases cited in this chapter are special applications of forecasting methods used in industrial and mercantile houses, in addition to those mentioned in preceding chapters. Budgets of expected sales over periods in advance are prepared by setting up the experience of former periods and qualifying the estimate up or down in accordance with new factors of influence. Overhead charges are stabilized over long periods by averaging active and inactive years. Factory schedules of output for stock are controlled under a flexible system which is based upon the volume of new orders. Greater stability of operation is gained in industries which have seasonal sales peaks by providing a definite surplus capacity to take care of temporary demands. Changes in individual commodity

prices are forecasted by studying all known factors of influence upon demand and supply, in that particular commodity. Changes in the general trend of all commodity prices can be forecasted with a fair degree of accuracy from the course of stock exchange prices. Purchasing policy can be wisely determined during abnormal times through comparison of the prevailing level with that established under normal conditions. Stability of earnings during years of price deflation is protected by equalized inventory valuations. Pension plans are put on a sound solvent basis through careful estimating of future costs. In varying degrees, these problems require the application of forecasting methods.

Chapter XIII

FINANCIAL FORECASTING

Financial forecasts.—Estimates which pertain chiefly to the money market may be grouped into a single class and termed financial forecasts. The money market includes the commercial banks, the investment bankers, the stock exchanges, and the foreign exchange market. Although these various interests act primarily as facilitating agencies for commerce, they have their own problems apart from the purely industrial life of the nation. Commercial banks are obliged to predetermine the probable demand of their customers for the return of deposits and the proper degree of liquidity in the invested assets. Investment bankers must foresee as closely as possible the trend of interest rates to avoid substantial losses on bond inventories. Buyers of securities, both bonds and stocks, endeavor to judge the future movement of these markets before making their commitments. Corporations, as users of credit and borrowers of money, must constantly survey the trend of financial conditions as a basis for fiscal policy. For reasons almost obvious, financial forecasts are subject to a wider range of error than are those which are based upon more stable conditions of supply and demand and which deal in physical rather than monetary units.

Bond maturities.—Considerably more attention is now being given by corporations to the maturity date on new bond issues than was formerly the case. In general, the purpose for which the funds are being borrowed and the current market rate of interest are the primary factors influencing the determination of maturity date. If the purpose is temporary financing, or, if interest rates are high, the maturity will be relatively short. If the object is permanent financing, or if the money rates are low, the choice probably will be long term. Some recent experiences, however, indicate the advisability of more careful attention than is usually given to this phase of borrowing.

The financial difficulties of the Chicago, St. Paul & Milwaukee Railroad in 1925 were due largely to a most unfortunate selection of a bond maturity date. In 1915, at a time when its credit was unquestioned, the company issued 4 per cent bonds at a small discount from par value, but unluckily selected a ten-year maturity, although a more distant date might readily have been chosen. When the bonds fell due in 1925, the company was obliged to default in payment of principal, despite earnings in excess of interest charges, because the impaired credit standing of the company prevented a refunding operation. This default was the major cause of the receivership in 1925, a most deplorable development which might have been avoided had more care been exercised in the selection of maturity when the bonds were issued.

Of course it is not inferred that borrowers ever have the ability to select favorable maturity years in advance. It is a matter of common experience, however, that some years are favorable for refunding and that others are not. The danger in this regard is lessened when the maturity date is put into the future as far as possible rather than recurring at short intervals. It is also reduced when the company utilizes what might be termed a "spread-maturity" date. While redeemable bonds offer to the corporation the choice of different years for extinguishment of the debt, this option feature usually requires the payment of a premium for the privilege. Under the "spread-maturity" plan, redemption is at par during any one of the last few years of the life of the bond. For example, the American Telephone & Telegraph Company 5 per cent debentures are payable between July 1, 1956, and January 1, 1960; and the United Light and Power Company 5½ per cent First Lien and Consolidated Mortgage bonds are payable between September 30, 1956, and April 1, 1959. In this way the company is able to select a time for payment in which current position in the cycle is favorable.

It is interesting, also, to note that corporations usually avoid presidential election years in selecting bond maturity dates. A tabulation covering aggregate annual corporate bond maturities in the United States over the next thirty years would show a marked decline every fourth year. Presidential years are not particularly abnormal in a commercial sense, yet

the corporations seem to avoid even the potential economic stress which may develop during a bitterly fought political campaign.

Refunding redeemable bonds.—Financial forecasting problems arise in cases involving the refunding of redeemable bonds bearing a high interest rate with a new issue of bonds carrying a lower interest cost. Under customary corporate practice, the interest rate which a new bond bears is determined by current conditions in the money market. Because bonds which sell at a discount are more popular than those which command a premium over the par value, the offering price is usually slightly below par. When interest rates are high, new bond issues necessarily bear high coupon rates and generally carry a redemption option whereby the company can call the bonds for payment before final maturity. To recompense the bond owner for such inconvenience, a slight premium is often added to the par value for the accelerated maturity. At a later date, when market interest rates have receded, the question comes up of retiring the high rate issue with the proceeds of a new issue. Ostensibly, it should be profitable to retire a 7 per cent loan if a new loan can be floated on a 6 per cent basis. From a practical viewpoint, however, it may prove more economical to allow the old bonds to remain outstanding.

It may be assumed that a certain company in 1920 put out an issue of $1,000,000 in bonds bearing 7½ per cent interest, due in 1935, redeemable at 105 at the option of the company at any interest date, the net price received by the company being 90 after allowance for discount and selling expenses. In 1926, the company proposed to retire these bonds with the proceeds of a new issue carrying 5½ per cent interest, due in 1946, at an expected net price of 95. The problem is to forecast the costs of the two plans and determine the more economical.

The carrying cost of the old issue is $75,000 yearly in interest, with a principal maturity of $1,000,000 in 1935.

As the old bonds must be retired at 105, the cash requirement for redemption is $1,050,000. As the new bonds are to be sold at a net price of 95, a total par value of $1,105,000 must be issued to provide $1,050,000 in cash. The interest annually on $1,105,000 at 5½ per cent would be $60,770.

The cost of the new issue would be $60,770 yearly in interest, with a principal maturity of $1,105,000 in 1945.

A comparison of the two plans shows a saving of $14,230 annually in interest but a loss of $105,000 in principal. The value of an annual accumulation of $14,230 on an annuity basis at 6 per cent, over the period of nine years, the remaining lifetime of the old issue, is $166,590, which more than offsets the loss of $105,000 in principal. The net saving will amount to $61,590 by 1935 with the assurance of money at 5½ per cent during the remaining lifetime of the new issue, or until 1946.

It will be noted that the price received for the old bond issue was not considered in the solution of the problem. The discount on the old bonds is so much loss actually sustained, irrespective of a possible refunding issue. Whether the price received was 85, 90, or 95, the fact remains that the monetary cost of carrying the bonds during their remaining lifetime is $75,000 annually and $1,000,000 at maturity.

A practical accounting objection arises in this latter connection which, however, in no way invalidates the solution on an economic basis. It is the practice, when bonds are sold at a discount, to set up a fictitious asset account termed "bond discount" and to write off the amount over the life of the bonds. In the preceding case, the solution would seem complicated by the disposition of the portion of the "bond discount" account on the old bonds remaining to be charged off. The most advisable course would be to combine the old "bond discount" account with a new one to cover the discount on the new issue and also to include therein the premium required for the redemption. Otherwise, earnings for the current year will be burdened with the entire premium cost and unexpired bond discount on the old issue.

If the figures in the preceding case are changed slightly, the result is materially altered. If the old bonds were 7 per cent coupon instead of 7½ per cent, the annual interest saving would have been $9,230, the accumulated savings would have been $108,055, and the aggregate net saving of but $3,055 would be too small to warrant the refunding operation.

Bank reserve policy.—Banking institutions are compelled to keep their assets in fairly liquid condition at all times in

order to meet the demands of their depositors. Although the nature of the deposit, whether demand or time, has definite influence upon the reserve policy of the bank, in either event provision must be made for meeting both normal and abnormal demands. Moreover, the type of bank, whether commercial or savings, and its relation to the Federal Reserve system, further affects the policy. A savings bank is not subject to wide variations in the demand for the return of deposits. Member banks of the Federal Reserve system have available an emergency source of funds in the rediscount privilege. To illustrate the problem, however, a bank has been selected which is representative of hundreds of similar institutions in this country. It is a State bank, not a member of the Federal Reserve system, having both commercial and savings accounts. It may be further assumed that the bank is located in Wisconsin where the reserve requirement is 12 per cent in cash against all deposits.

The bank has total deposits of $22,100,000 made up as follows:

Deposits Subject to Check	$ 5,300,000
Deposits of Other Banks	11,600,000
Certificates of Deposit	2,000,000
Savings Deposits	3,200,000

The problem arises in forecasting as to what will be the probable demand on the part of the depositors for the return of their funds, and in arranging the assets in varying degrees of liquidity to conform with the estimate. At least 12 per cent of the total must be retained either in the vaults or on deposit at another bank to meet the legal requirement. The remainder may be invested in call loans, acceptances, time loans, securities, and real estate mortgages. As the rate of income return on these investments, as a general rule, varies inversely with the degree of liquidity, the bank officers have to study their situation carefully, if they are to derive a satisfactory profit and at the same time keep their assets sufficiently liquid.

The bank in question has met the problem in admirable fashion by dividing its asset accounts into four classes. The first class is termed "Primary Reserve" and represents that share which is in the form of cash or its practical equivalent

Obligations:		
Payable on Demand:		
Checking Deposits	$ 5,300,000	
Deposits of Other Banks	11,600,000	$16,900,000
Time Deposits:		
Certificates of Deposit	$ 2,000,000	
Savings Deposits	3,200,000	5,200,000
Total Obligations		$22,100,000

Resources:			*Per Cent*
Primary Reserve:			*of Total*
Current Items:		*Amount*	*Obligations*
Cash on Hand	$ 631,000		
Due from Banks	6,109,000	$ 6,740,000	30.5
Quick Items:			
Call Loans	———		
Bank Acceptances	———		
Commercial Paper	$ 2,350,000		
U. S. Govt. Bonds	1,514,000		
Other Bonds Due this Year	1,600,000	5,464,000	24.7
Total Primary Reserve		$12,204,000	55.2
Loans and Discounts		9,874,000	44.7
Secondary Reserve:			
Revolving Fund:			
Municipal and Corporate Bonds Due within Three Years	$ 817,000		
Investment Fund:			
Municipal and Corporate Bonds Due after Three Years	1,635,000		
Total Secondary Reserve		2,452,000	11.1
Special Commitments:			
Real Estate Mortgages		———	
Total Resources		$24,530,000	111.0

in highly marketable securities. This part of the total assets is available to meet the ordinary variations in the demands of depositors. The second class represents the ordinary loans and discounts which are normally being repaid from day to day. The third class is termed "Secondary Reserve" and represents that part of the assets which has been invested in securities of lower marketability but of higher yield than in the Primary Reserve. The Secondary Reserve is to provide a definite source of funds to meet an emergency which might arise at a time when loans and discounts could not be quickly collected and when the Primary Reserve is inadequate. The fourth class comprises special commitments, such as real estate mortgages, which give a satisfactory income return but which cannot be quickly converted into cash.

The Primary Reserve has been divided into two parts: "current," to include cash on hand or on deposit at other banks; and "quick," to include commitments such as call loans, bank acceptances, commercial paper, United States Government securities, and bonds maturing during the same year. As is shown in the accompanying statement, the Primary Reserve amounts to $12,204,000, or 55.2 per cent of the total obligations. This percentage is considerably larger than would be the case in another bank where time deposits were heavier. Moreover, no less than $11,600,000 represents the deposits of other banks, the great bulk of which is subject to recall at any tightening of the money market.

The second class—loans and discounts—amounts to $9,874,000, or 44.7 per cent of the total obligations. These loans are fairly well distributed with about one-sixth falling due each month over the ensuing six months.

The Secondary Reserve, all of which has been invested in municipal and corporate bonds, has also been divided into two parts, somewhat arbitrarily termed "revolving fund" and "investment fund," in the ratio of one-third to two-thirds. The revolving fund comprises short-term bonds, due within three years, the proceeds at maturity being reinvested in similar issues or carried into the more active accounts. The investment fund comprises long-term bonds which ordinarily will be carried indefinitely, but which have a fair degree of marketability to permit conversion into cash at any emergency.

In this instance, the bank has deemed it inadvisable to carry

any real estate mortgages, due to the large volume of demand deposits. Generally speaking, however, a bank finds it advantageous to invest in local mortgages to the extent of from 5 to 25 per cent of its obligations, depending on their nature. The bank will thereby secure a higher income and incidentally contribute to the development of the community.

The excellent condition of this bank is due to the care which has been exercised in estimating its maximum and minimum obligations with respect to the future. It is difficult to imagine an economic development sufficiently drastic in its influence to affect the solvency of this institution.

Contingency reserves.—Although the practice is quite common for industrial companies to set up reserves out of earnings to meet unexpected contingencies, seldom is this procedure followed in the case of banks. While it is appreciated that the profit and loss surplus is itself in the nature of a contingency reserve, it is often wiser to segregate the portion which may be required for contingencies.

In adapting such a policy to commercial banking, the difficulty is in establishing a fair measure of the risk involved. The method employed by the largest bank in the United States is here explained:

"In our institution we have an assumption, which is subject to change, for experience may show it to be very wrong, that conditions are normal when the member banks of the country are borrowing from or discounting at the Federal Reserve banks to the amount of $500,000,000 and that discounting above or below that figure reflects a condition of inflation or deflation. On the theory, then, that the risk of banking varies as these borrowings increase or decrease, we are establishing a reserve for losses or contingencies, set aside monthly against current earnings, and based upon the bank's average commercial loans and discounts, increasing our percentage so applied for each unit of $100,000,000 increase or decrease above or below the normal figure of member bank borrowings." [1]

Safeguarding financial emergencies.—It is generally regarded as far-sighted policy for a corporation to maintain a

[1] Speech of Charles E. Mitchell, President of National City Bank of New York, as reported in *The Wall Street Journal*, Sept. 28, 1923.

financial reserve account. If the problem were simply a question of immediate profit, as unfortunately many companies regard it, such reserves would be rare. In most cases, industrial executives feel that whatever surplus is available can be more economically employed in expanding the business itself than in bank balances or security holdings. This objection would seem to be well founded in view of the fact that the ordinary successful industrial enterprise shows a return of at least 10 per cent annually upon the money which it directly employs in its operations in comparison with an ordinary return of 5 per cent from securities and 2 per cent on bank balances. Yet there are times when, for one reason or another, it becomes inexpedient for the enterprise to expand, although the required funds may be at hand. One reason for such a condition may exist in the fact that the growth in sales volume is relatively slow and will not warrant an immediate increase in production facilities. Then, again, overcapacity may already exist in the industry, or building costs may be prohibitively high.

The chief reason, however, why a corporation should set up such a reserve is for a contingency fund to take care of unusual developments. The existence of such a fund would operate to benefit the company in three different ways: (1) to prevent loss; (2) to create profit; and (3) to insure stability. Each of these will be considered separately.

Loss is prevented in various ways. In the first place, the corporation avoids the necessity of paying a high interest rate for bank loans in a stringent money market. It is a matter of record that companies of unquestioned credit were compelled to pay 8 per cent and more for credit accommodation during the latter part of 1920. In the second place, it prevents the necessity of selling inventory stocks at sacrifice prices to provide the cash needed for meeting current obligations during periods of depression. During the difficult money market of 1921, many companies were compelled to liquidate their inventories at prices below cost to protect their financial solvency. In the third place, the company is in a position to protect its cash discount privilege on purchases. If the terms of sale are 2 per cent, 10 days, net 60 days, the company which cannot take advantage of the discount is in reality paying interest at the rate of 14 per

cent per annum for the use of the money between the discount expiration date and the net date. In the fourth place, the company is able to meet its fixed charges, such as taxes and bond interest, without difficulty at a time when the enterprise may be operating at a financial loss.

Not only does the existence of such a reserve fund prevent possible loss as indicated in the preceding paragraph but it also tends to increase profits. In the first place, it permits the company to finance a desired expansion of plant facilities at a time when construction costs are favorable. Such a condition usually exists during the period of industrial depression at a time when the psychological attitude of the management would probably be unfavorable unless the funds were readily available. In the second place, it may permit the management to increase output capacity at a relatively low cost by providing funds which will allow the purchase of a competing plant which currently may be in financial difficulty. In the third place, it puts the company in a position to take advantage of an opportunity to increase its inventory stocks beyond the normal requirements at a time when the market price is abnormally low. The companies whose financial position is protected in this way are generally able to show costs of materials at an average lower than the prevailing market, and thus enjoy a fundamental operating advantage over their competitors. In the fourth place, it permits the company to extend more liberal credit terms to its customers at times when credit conditions are stringent. In the fifth place, it allows the company to provide financial assistance to customers in emergencies, thus tending to build up the strongest kind of sales goodwill. In the sixth place, the reserve, if temporarily invested in marketable securities, will provide a source of corporate income irrespective of the earnings of the company itself or of external business conditions.

The existence of a financial reserve fund will insure stability to the enterprise. In the first place, it will permit the continuation of the payment of dividends during years when earnings are inadequate and when otherwise the cash position would not be strong. In the second place, it assures liquidity of working capital at all times, since the securities can readily be converted into cash. In the third place, it protects the solvency of the enterprise. Many cases have oc-

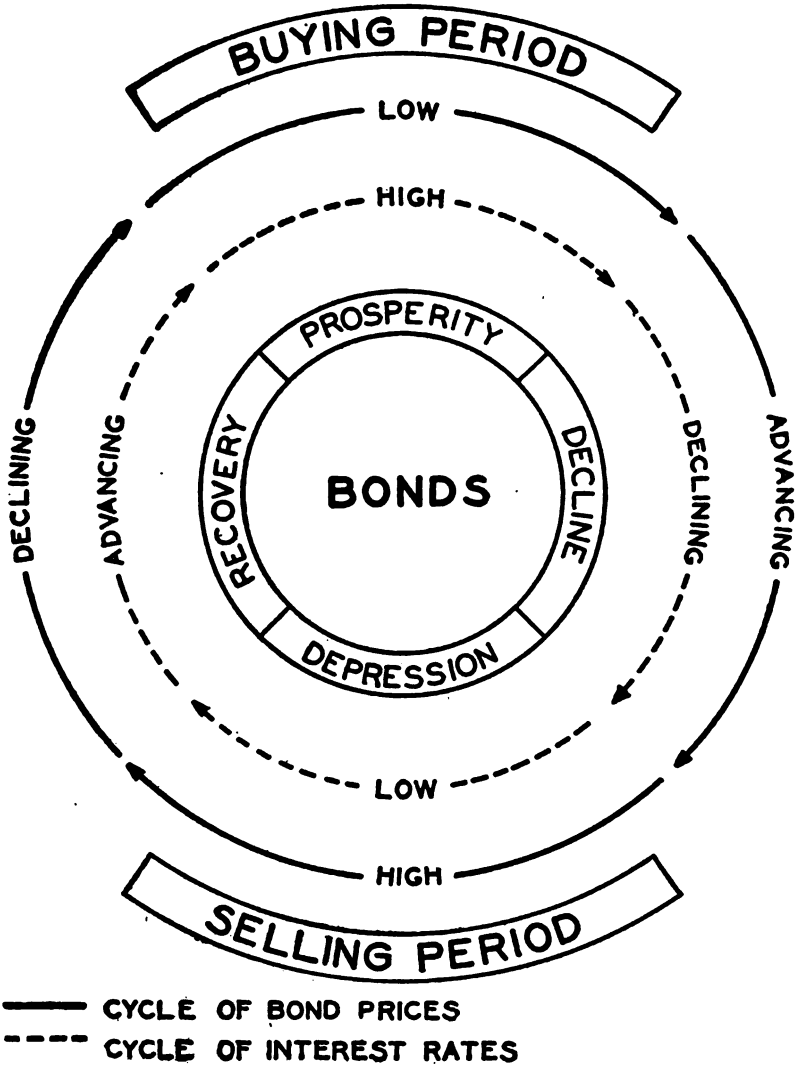
curred in recent years where companies have been forced into solvency through insufficiency of working capital, despite the fact that their total assets showed a comfortable surplus over their liabilities.

In order to indicate the extent to which this policy is followed by representative industrial corporations of the United States, a compilation is appended to show the extent to which certain well-known corporations have set up financial reserves. It should be appreciated that in no instance do these reserves include investments in subsidiary companies. In most cases, they exist for the purpose of meeting a contingency which may develop along the lines previously suggested, although there are a few cases where the reserve is specifically for one or more of these causes. For example, the American Telephone & Telegraph Company reserve is for this explicit purpose: "Funds temporarily invested in municipal, state, and U. S. Government short-term obligations in anticipation of financial requirements of Associated Companies for the extension of their properties."

Company	*Security Reserves*
United States Steel Corporation	$110,937,000
General Electric Company	74,528,000
Standard Oil Co. of N. J.	68,562,000
American Telephone & Telegraph Co.	45,618,000
General Motors Corporation	36,851,000
Eastman Kodak Company	31,086,000
American Sugar Refining Co.	25,393,000
American Smelting & Refining Co.	20,442,000
American Locomotive Company	19,862,000
Bethlehem Steel Corporation	17,162,000
National Lead Company	12,271,000
Standard Oil Co. of Indiana	12,066,000

Investment policy.—Security prices, as a whole, change with variations in general business conditions. At one stage of the business cycle bond prices are strong and at another they are weak. In similar fashion, stock prices are high and low at different times. Investors who have observed these correlated movements of security prices and business conditions have found it advantageous to adopt a policy to conform to these changes.

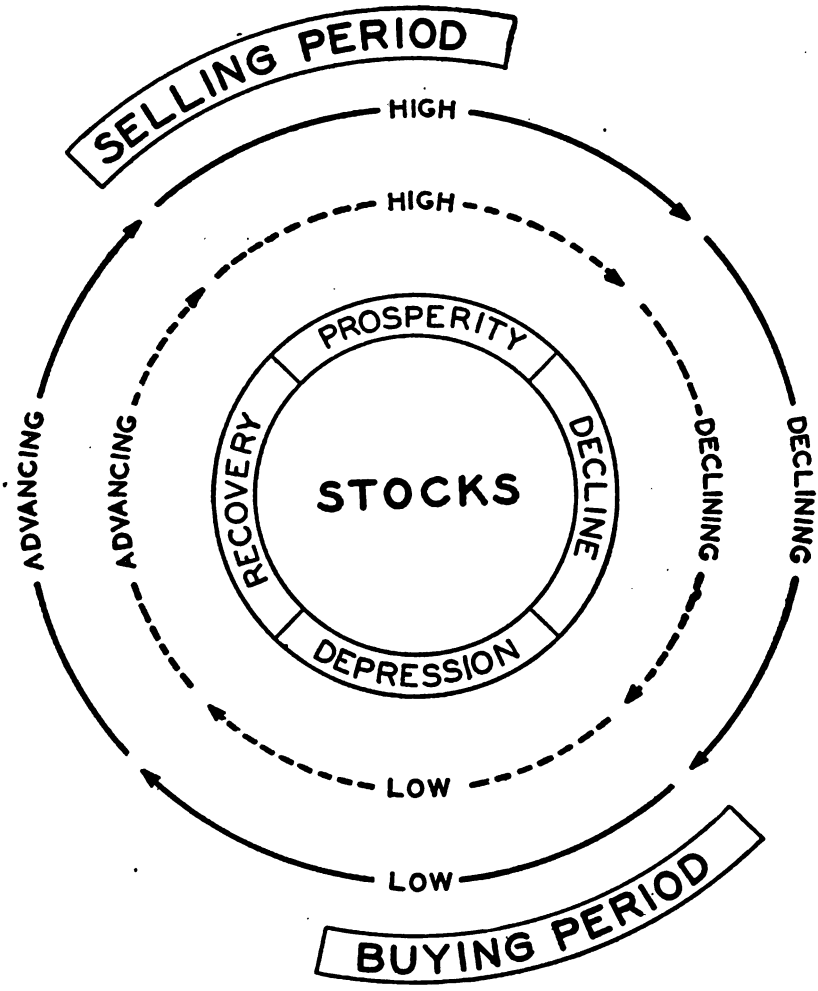
Over extended periods, prices of stock and prices of bonds do not move uniformly. Indeed, the fundamental conditions



The Cycle of Bond Prices.

The broken line shows the trend of interest rates. The outer line shows the trend of bond prices.

which make for higher stock prices almost preclude the concurrent probability of higher bond prices. The factors which cause bond prices to advance usually signify lower stock prices.



The Cycle of Stock Prices.

The broken line shows the trend of corporate earnings. The outer line shows the trend of stock prices.

It is not logical, therefore, to follow the same policy in buying both classes of securities.

The price of a share of stock depends chiefly upon the

earning power of the company. Increased earnings accrue for the benefit of the stockholders, thereby enhancing the value of the stock. When current earnings are low, stock prices are low, and when earnings are high, prices are high. Moreover, the prospect of increased earnings causes prices to rise just as an unfavorable outlook causes prices to decline. As corporate earnings are generally low in periods of depression, increasing during recovery, high in prosperity, and falling in decline, stock prices tend to follow the same movement. Although somewhat affected by the "discounting" operations of investors, stock prices generally reflect current earnings. The advantageous time to buy stocks is during periods of depression and recovery. The best time to sell is during the phase of prosperity.

Bond prices fluctuate with changes in interest rates. In fact, the price of a bond is a certain rate of income return converted into terms of dollars. In practice, bonds are as often quoted on the basis of interest yield as in percentage of par value. The relation of the coupon rate on the bond to the current market rate of interest largely governs the ratio of market value to par value. Irrespective of the reputation of the borrower, a 4 per cent bond will sell below par in a 5 per cent market. Not even the strong financial position of the General Electric Company has been sufficient to prevent its 3½ per cent bonds selling at a substantial discount for many years.

The rate of interest, which is the cost of borrowing money, depends upon conditions of demand and supply in loanable funds. In times of business depression, the demand for money is small and the supply is rather large, thus creating relatively low interest rates. Conversely, when business is active, the demand is large, the supply is limited, and interest rates are higher. When interest rates are low, bond prices are high, and vice versa. As a bond bears a fixed rate of interest, say, 5 per cent, its price is a reflection of the relation of this nominal rate to the current market rate. If the latter rate is 4 per cent, the bond naturally will sell at a premium over its par value; and if the market rate is 6 per cent, the 5 per cent bond will sell below par. Advancing interest rates make for lower bond prices and declining interest rates signify higher bond prices.

As interest rates follow a uniform movement through the business cycles, bond prices are reciprocally affected. In periods of depression, interest rates are low and bond prices are high; in periods of recovery, interest rates rise and bond prices decline; in periods of activity, rates are high and bond prices are low; and, in periods of business decline, rates are falling and prices are rising. The advantageous time to buy bonds is in times of prosperity; the advantageous time to sell bonds is in periods of depression.

Certain qualifications to such general statements are necessary. In theory, stock and bond prices should always move conversely, but in practice they often move together over short periods of time. Easy money conditions stimulate the demand for both classes of securities. An unusual day in the stock market will sympathetically affect the bond market. Moreover, the lagging tendency of interest rates will cause bond prices to continue to rise even after stock prices have started advancing toward the end of periods of depression. These sympathetic and overlapping movements are of temporary duration and do not alter the fundamental principle of opposite tendencies in security prices.

The statements are true of securities collectively rather than individually. Any single security may move out of line with the general trend due to special circumstances affecting that security only. An investment policy based upon the business cycle is more likely to prove profitable when applied to a group of securities than to an individual issue.

The Dow theory.—The Dow theory is a hypothesis that stock price movements follow a certain uniformity over given periods of time. It assumes that there are three concurrent movements in the stock market, namely, an underlying basic trend, an occasional interruption in the basic trend, and a daily fluctuation. The underlying basic trend is known as the Primary Movement and the interruption is known as the Secondary Movement. The daily fluctuation, being without especial significance, is practically ignored in the theory.

In the application of the Dow theory, it is customary to use the averages of selected industrial and railroad stock prices published daily in *The Wall Street Journal,* known as the Dow-Jones averages. The closing prices daily of twenty identical industrial stocks are combined to give the industrial

average, and of twenty railroad stocks to give the railroad average. Any similar compilation of representative stocks should serve the purpose as effectively as do the Dow-Jones averages.

The Primary Movement is the general swing of prices upward or downward over an extended period of time. These movements are not uniform in duration or degree, but usually last at least one year and generally are much longer. A complete record of these movements since 1900 is here given:

1. Upward .....June, 1900, to September, 1902.
2. Downward.....September, 1902, to September, 1903.
3. Upward .....September, 1903, to January, 1907.
4. Downward.....January, 1907, to December, 1907.
5. Upward .....December, 1907, to August, 1909.
6. Downward.....August, 1909, to July, 1910.
7. Upward .....July, 1910, to October, 1912.
8. Downward.....October, 1912, to December, 1914.
9. Upward .....December, 1914, to October, 1916.
10. Downward.....October, 1916, to December, 1917.
11. Upward .....December, 1917, to November, 1919.
12. Downward.....November, 1919, to August, 1921.
13. Upward .....August, 1921, to March, 1923.
14. Downward.....March, 1923, to October, 1923.
15. Upward .....October, 1923, to — — — — —.

A survey of this record indicates that the advances are usually longer than the declines. The periods while prices were moving upward averaged twenty-five months, with a maximum of forty months. The periods when prices were moving downward averaged seventeen months, with a maximum of twenty-seven months.

The Secondary Movement is a temporary interruption counter to the basic trend. Technically speaking, these counter movements are known as "reactions in a bull market" and "rallies in a bear market." The change is usually abrupt and is followed slowly by a resumption of the basic trend. It has been observed further that, when a sharp decline develops in an advancing market, it is usually followed by a rally covering about 40 per cent of the decline and a subsequent sagging to the previous low point.

The interpretation of the theory comes under two classifications—economic and technical. From an economic viewpoint, the assumption is that stock market prices depend primarily upon business conditions. Anticipated improvement in

business causes the trend of prices to move upward; prospective business depression causes prices to turn down. It is upon this assumption that the utility of the stock market as a business barometer is predicated.

The Dow theory is less concerned with the economic significance of changes in stock prices than with what might be termed their technical significance to buyers of securities. The purpose of the theory is to provide a method of determining current position of the stock market with respect to probable future tendencies. Upon the assumption that a period of relative stability has been reached in the market after a definitely upward trend, the questions arise, Has the movement reached its peak? or Will the advance be resumed? Under the Dow theory, it is held that prices during this period of stability fluctuate between narrow limits; for example, from 105 to 110 in the industrial averages, and from 100 to 105 in the railroad averages, marking what is technically known as a period of "accumulation" or "distribution," depending upon whether the market supporters are acquiring stocks for a further advance, or selling stocks in anticipation of a subsequent decline. During this period of relative stability, the averages are said to be "making a line," in the sense that they are moving almost horizontally. Eventually the "line" is broken by a movement of the averages above or below the established high and low points of the period of stability. If the averages break above, the theory holds that the upward basic trend is about to be resumed. If the averages break below, the indication is that the top of the movement has been reached and that a turn downward in the basic trend may be expected. In other words, prices will continue upward so long as one high point in the averages exceeds that of previous high points; and prices will move downward when the low point becomes lower than the previous low points.

It is an essential part of the Dow theory that the two averages must corroborate each other. The movement of the industrial averages must be confirmed by a similar movement of the railroad averages at about the same time, although not necessarily to the same degree, to provide a definite basis for interpretation. A new high for the industrial group with-

out a corresponding new high for the rails is not conclusive evidence.[2]

The 1¼ per cent interest theory.—The Harvard University Committee on Economic Research suggests that a certain change in interest rates is significant of a subsequent change in security prices. The extent of this change is 1¼ per cent either upward or downward. A decline of 1¼ per cent in interest rates on prime commercial paper, with allowance for seasonal variation, from the high point of the money cycle, is the signal for the inauguration of a major forward movement in security prices. An increase of 1¼ per cent in interest rates on prime commercial paper, with allowance for seasonal variation, from the low point of the money cycle, is indicative of the end of a major advance in security prices. For example, if the previous high point in the cycle of interest rates was 5¼ per cent, a bull market in securities would be forecast when the rate fell below 4 per cent. And if the previous low point in the cycle was 3¾ per cent, a bear market would be indicated when the rate exceeded 5 per cent.[3]

Manufacturing activity theory.—A second theory suggested by the Harvard Committee pertains to the degree of manufacturing activity. Upon the assumption that normal activity runs from 70 to 85 per cent of plant capacity, the percentage of normal in actual operation becomes a serviceable criterion for investment policy. The end of a decline in security prices is evidenced when manufacturing activity falls below 85 per cent of normal. The end of an advance in security prices is evidenced when manufacturing activity exceeds 112 per cent of normal.[4]

The blast furnace theory.—An interesting theory on security price movements has been suggested by Col. Leonard P. Ayres, of the Cleveland Trust Company. The basis of this theory is the percentage of blast furnaces in the United States in actual operation to the total available. On January 1, 1926, the available furnaces totaled 385, which made the basic

[2] This discussion of the Dow theory has been adapted almost entirely from "The Stock Market Barometer," by W. P. Hamilton, Editor of *The Wall Street Journal*.

[3] "The Economic Cycle" (booklet), Committee on Economic Research, Harvard University. An interesting study of the efficacy of this barometer appeared in *The Wall Street Journal* on Oct. 7, 1926, page 5. See also *Letters* of Harvard Economic Service, Apr. 4, 1925, Mar. 6, 1926, and Oct. 16, 1926.

[4] *Ibid.*

number 231. The theory is that security prices generally make a bottom when the country's blast furnaces pass 60 per cent in operation on the decline; and that they usually make a top when the curve of furnace operations passes 60 per cent on the way up.[5]

The pig-iron barometer.—Another theory on security price movements based on pig-iron production is offered by Colonel Ayres. From an analysis of various periods of recovery following depression eras, he suggests that the high point in bond prices is reached about eighteen months after the low point in pig-iron production. He further suggests that the high point in stock prices is reached about twenty-four months after the low point in pig-iron production. In this theory, no corollary premise as to corresponding low points in security prices and high points in pig-iron production is offered.[6]

The scrap-iron barometer.—Changes in the market price of steel scrap are regarded as a serviceable barometer of security prices, and particularly of United States Steel Corporation common stock, long regarded as the market leader. An upward or downward movement in the price of scrap usually forecasts a similar movement in the price of the stock. During the past twenty-five years, the price of steel scrap has ranged (excluding the war years) between $10 and $25 a ton.[7]

Summary.—Although there is a financial aspect in every economic prediction, the cases just cited pertain primarily to the money market. In corporate bond issues, the selection of maturity date is of sufficient importance to warrant greater care than is usually exercised. In changing money markets, the prior redemption of callable bonds presents a problem in forecasting relative costs. Banking institutions must estimate in advance the withdrawals of depositors in order to preserve adequate liquidity in their investments. Corporations must anticipate the various financial emergencies which arise to disturb the normal course of events. Investors in securities should follow a policy which would enable them to buy and sell at the more favorable times.

[5] *Bulletin of the Cleveland Trust Company,* July 15, 1924. See *The Wall Street Journal,* Oct. 15, 1926, page 4, for an appraisal of the validity of this theory.

[6] "Business Recovery Following Depression" (booklet), Cleveland Trust Co.

[7] *The Wall Street Journal,* April 30, 1925, also, Jan. 29, 1924.

PART II

THE FORCES OF THE BUSINESS CYCLE

Chapter XIV

THE BUSINESS CYCLE

The integral aspect of business.—The variations in the degree of activity of business from time to time afford one of the most interesting subjects for economic research. It is not suggested that these variations follow invariably with clocklike regularity. In fact, no cycle ever duplicates a preceding one with exactness. A fundamental similarity, however, does exist with respect to the sequence of the phases of the cycle, although its existence may often be obscured by the more obvious differences in degrees of intensity. The purpose of the present chapter, therefore, is to show the general characteristics of each phase of the cycle rather than to afford an exact picture of every cycle. A complementary object is to present an integral aspect of the forces which govern business conditions.

The economic forces which receive attention are arbitrarily divided into five groups: (1) conditions relating to production; (2) conditions relating to marketing; (3) conditions relating to labor; (4) conditions relating to corporate prosperity; and (5) conditions relating to finance. The first group includes agriculture, industry, and new construction. The second comprises prices, transportation, foreign trade, and retail sales. The third includes employment, wages, and controversies. The fourth comprises earnings, failures, new security issues, and exchange transactions. The fifth includes bank clearings, bank statements, interest rates, and gold movements.

The fluctuations of business.—Business conditions are never static. Constantly the trend of commercial activity is undergoing change. At one time, the industrial enterprises of the country are rushed to meet what appears to be an almost insatiable demand; at another, industry marks time because the demand for its products seems completely to have disappeared.

Alternate periods of prosperity and depression—of commercial activity and dullness—are not of recent origin. Their

reoccurrence has been noted for centuries [1] and the underlying causes have engaged the attention of leading economists—from Smith and Mill to Rodbertus, Sombart, Lescure, Aftalion, and others of even more recent fame—throughout the nineteenth and into the twentieth century.

Wide variance of opinion exists as to the cause of the fluctuations despite the attention which has been directed to it. Certain of the theories which have gained the most popularity will be referred to in the development of the subject, but first consideration must be given to the manner in which business conditions change.

The stages of business.—Commerce is continually in one of two stages—a period of prosperity which connotes activity, or an era of depression which implies dullness—or in a period of transition between the two. A crisis usually marks the transition from the period of prosperity to that of depression, and in this manner enables the respective periods to be readily differentiated. Seldom can the line be drawn so sharply when a period of depression ends and one of prosperity begins, although the inception of the World War in 1914 definitely began the period of prosperity in the United States which continued until 1920.

The periods of transition between alternate stages of prosperity and depression are regarded apart from the conditions into which they lead, and the complete movement under which business conditions tend to return to a previous status is thus regarded as a cycle with four component divisions. These divisions are: (1) a period of depression, with commercial activity at its lowest ebb; (2) a period of recovery, with activity increasing; (3) a period of prosperity, with activity stimulated to a maximum; and (4) a period of decline, with activity declining. Panics and crises are not regarded as separate periods, first, because the transition from the third to the fourth stage often transpires without their occurrence, and, secondly, because they may be more accurately considered as the final stage of the prosperity period.[2]

[1] Sir William Petty, in 1662, estimated the length of the business cycle to be seven years.

[2] A line of differentiation may readily be drawn in the cases of panic, crisis, and depression. A panic is that state of business conditions when fear and apprehension that preceding conditions of activity and prosperity are about to be radically transformed, suddenly inculcate a spirit of extreme pessimism into

Characteristics of a period of depression.—To show the manner in which business conditions change during a complete cycle, the characteristics of the depression period may first be reviewed. It is the negative phase of the cycle, a period when activity is below normal, in part to atone for the excesses of the preceding period, and in part to lay the foundation for subsequent recovery. At such a time, the average decline in activity is not great, seldom exceeding 10 per cent below normal, although, in individual industries, the effect is often more severe.

Production during a period of depression.—Total productivity materially declines during the depression stage, although rarely falling below 80 per cent of normal.

Agricultural production is not seriously affected, due chiefly to difficulty in regulation. Farmers cannot curtail operations so readily as other producers, as they must constantly commit themselves from six to twelve months in advance. Moreover, there is a greater economic waste involved in the restriction of farm production, owing to the inability of the producers to apply their equipment to other use. Agriculture, therefore, continues with a regularity that is quite independent of conditions of depression and prosperity.[3]

Industrial production, as distinguished from agricultural, is substantially restricted. The demand has declined because buyers are either unwilling or unable to purchase. Moreover, apprehension concerning the course of prices in the immediate

the business world and cause transactions to be consummated without proper regard for reasonable values. A crisis is that state of business conditions when it becomes apparent that for one or more reasons commerce cannot further be conducted in the same manner as obtained in the immediate past and that readjustment is imperative. The reason is usually the maladjustment of production or the exhaustion of credit availability. A depression is that state of business conditions when commercial activity is abnormally low. A panic is invariably of brief duration; a crisis is more protracted as it includes the final stages of the period of activity as well as the early stages of the period of depression; and a depression is ordinarily prolonged over several years. Cf. T. E. Burton, "Crises and Depressions," p. 6.

[3] Fluctuations in agricultural production are due chiefly to non-economic reasons, and are believed, in some circles, to be the cause of business cycles. Sombart's theory follows along this line, as does also Moore's. "The fundamental, persistent cause of the cycles in the yield of the crops is the cyclical movement in the weather conditions represented by the rhythmically changing amount of rainfall; the cyclical movement in the yield of the crops is the fundamental, persistent cause of economic cycles."—Henry L. Moore, "Economic Cycles, Their Law and Cause," p. 149.

future has a natural effect in causing producers to lessen the risk of loss from a further decline.

New construction tends to increase during a period of depression—in truth, it is one of the factors which mitigates the situation and assists in bringing about the period of recovery sooner than would otherwise be the case. The reason is fairly obvious. In the preceding stages of the business cycle, prices rose, and each succeeding increase served to discourage building until costs lowered. With lower costs existing during the stage of depression, construction is encouraged with the additional stimulus gained from the postponement of previous needs.

Marketing during a period of depression.—Commodity prices usually reach their lowest level when depression is at its deepest stage. As prices are determined by conditions of supply and demand, this would indicate a considerable lack of balance between the determining factors. The fact that the supply exceeds the demand does not necessarily mean that an abnormal supply has been produced. Quite often—as was the case in 1921—the cause of the maladjustment is to be found in decreased demand. And demand has fallen off chiefly because purchasing power, as represented by wages, has declined.

Merchandise movements, as represented in the shipment of commodities over the various transportation routes, likewise reach their lowest level. The curtailment of industrial activity is accurately reflected in the volume of traffic which covers the movement of raw material to the factory as well as finished products from the factory to the consumer.

Foreign trade constitutes a rather anomalous situation. If the depression is world-wide, both exports and imports will be abnormally small. Should the depression be confined to this country, the tendency would be for exports to increase and imports to decline. The low prices obtaining would encourage purchases from abroad, and would discourage shipments into the country.

Retail sales are dull when times are poor. Industrial inactivity has resulted in reduced purchasing power which expresses itself in the volume of sales at the retail stores.

Labor conditions during a period of depression.—With industrial activity considerably below normal, employment conditions, from the standpoint of the workers, are distinctly

unfavorable during an era of depression. The curtailment of operations has caused a material reduction in the number of workers employed. A distinct labor surplus arises, with the number unemployed constantly increasing as part-time operations and even complete suspensions develop. Unemployment is at its maximum at the final stage of the depression period.

Wages are low when industrial inactivity prevails. Although there is a notable tendency at certain stages of the business cycle for the movement to lag behind the current trend, wages generally increase slightly before evidences of recovery are to be noted. As has previously been stated, the low level of wages during adverse times has its reflection in diminished purchasing power with resultant effect upon price levels.

Industrial controversies are uncommon at this stage. Employees are not in a position to maintain effectual resistance against the policies of employers which may be contrary to the interest of the workers. It is a serious indictment of our industrial society that in alternate periods of commercial and industrial activity and dullness, capital and labor each continually seek to take advantage of the opportunities afforded to gain at the expense of the other.

Conditions of corporate prosperity during a period of depression.—Corporate earnings are decidedly affected by a period of depression. The nature of the respective enterprises plays an important part in this regard, but, in general, business profits materially decline. Earnings of public utility companies are less adversely affected than those of the pure industrials, because of the relative stability of revenue.[4] Many industrial enterprises not only are obliged to suspend the payment of dividends upon outstanding stock, but they experience difficulty in meeting the fixed charges upon bond obligations.

Commercial failures naturally increase with a decline in corporate earnings. The trend is not uniform, however, as the maximum, in liabilities at least, is reached in the period of relapse when prices are falling rapidly rather than in the

[4] Indeed, the World War taught that a period of prosperity and rising prices is less desirable for a public utility than a period of dullness, since, during a period of rising prices, gross revenues do not increase proportionately with the rise in costs.

ensuing period of depression when prices tend to stabilize at the lower levels.

New security issues decrease in the depression period due both to the lessened demand for capital for new enterprises and to the decreased new capital available. Current low interest rates encourage corporate borrowers to issue long-term bonds at this stage. Thus, long-term financing is the rule during periods of depression, just as short-term issues are used in periods of prosperity.

Stock exchange transactions decrease in periods of depression. As the stock market constantly endeavors to discount the future, a recovery in the market usually precedes a recovery in general conditions. For this reason, activity on the exchanges, especially in industrial common stocks, is often noticeable toward the end of periods of depression. In this manner, stock market activity serves as an actual barometer and lends color to the belief that the end of the period is not far distant.

Conditions of finance during a period of depression.—A decrease in bank clearings signifies lessened business activity. Consequently the volume of clearings reaches its lowest level in a period of depression. This is due to the low level of prices as well as to the smaller number of transactions.

Bank statements occupy the anomalous position of being most satisfactory, from a banking standpoint, when conditions are poorest. The falling off in business has served to decrease the loans of the banks and to increase the reserves. Both of these factors improve the financial strength of the banks.

Interest rates lag somewhat behind the trend of conditions and are lowest in the depression stage, for at this time the banks are obliged to lower rates to keep their loanable funds employed. As has been previously noted, the low interest rates which prevail during periods of depression encourage corporate borrowing for long terms, both to refund existing loans that were issued at higher rates and to expand productive facilities in anticipation of the ensuing period of recovery.

Gold imports usually increase in periods of depression, since decreased merchandise imports and augmented exports cause a favorable trade balance to exist which normally is paid in gold imports. Gold production is stimulated in a régime of

low prices, just as it is discouraged when prices are high. An increase in the supply of gold may serve either of two functions: it may be used to strengthen banking reserves, or to form the basis for an expansion of the volume of credit in employment. The stimulus given to the money market from the gold importations tends to shorten the period of depression, just as the exportation of gold during a period of prosperity operates to check the advancing movement.

The recovery of business activity.—The transition from a period of depression to one of recovery is of gradual development. Just as production is overdone in a period of prosperity, it is underdone when depression rules, and conditions which obtain when business is dull tend to work out their own salvation. Consumption continues with definite regularity regardless of current conditions, and the surplus stocks gained in the period of activity are substantially reduced during times of depression.

Low production costs, accomplished through greater efficiency of labor even more than through lower wage scales, low interest rates, and abnormally low cost of materials encourage a revival of industry. This factor, together with an increased demand for commodities, which eventually results after the effect of underproduction becomes apparent, causes producers to increase their output. The reaction does not occur in all lines simultaneously, but an improvement in one or more of the important industries has a stimulating effect upon the others. Although it is difficult to determine exactly when recovery begins, after the improvement has once started, it gains momentum and "each effect reacts to strengthen the cause which preceded it." [5]

[5] "An increase in the physical volume of business, indeed, seems to be an invariable concomitant of revivals; but this increase usually sets in months, even a year or more, before depression has relaxed. . . . The course of wholesale prices is an even less reliable guide. For, contrary to widely accepted opinion, prices do not always rise in the early stages of revival, and they do sometimes turn upward during depression. As for the money market, its changes during periods of business revival are irregular in part, and in part indistinguishable continuations of changes already under way before the revival began. For example, discount rates sometimes rise and sometimes fall when the change for the better occurs; bank loans expand, but the expansion antedates the revival; the ratio of reserves to deposits may move in either direction; the ratio of loans to deposits usually, but not invariably, rises; applications for investment loans may increase before the revival or not until it has come; the purchases of bonds and stocks are similarly erratic in their behavior, etc. The

Production in a period of recovery.—An increase in productivity is the chief feature of the period of recovery. Agriculture is less affected than industrial operations and construction work, due, as has been previously stated, to its inherent inflexibility. Industry throws off the lethargy which was manifest while dullness prevailed and there is an appreciable revival of activity to meet an increased demand which is just asserting itself. The betterment comes slowly at first, owing to the caution of producers who are unable to determine the degree of permanency in the improvement of conditions.

New construction, which includes highways, railroad mileage and rolling stock, and structures of all kinds, reaches its maximum during the period of recovery. Costs are comparatively low at this stage. Moreover, the improvement in business conditions creates a feeling of optimism which encourages new building generally. As expenditures for industrial maintenance were radically reduced during dull times, the recovery in business induces manufacturers to restore their plants to full efficiency by increasing the outlay for maintenance, improvements, and betterments at this period.

Marketing during a period of recovery.—Prices advance during a period of recovery. In fact, the rise in prices—which is in itself the effect of a maladjustment of supply and demand—is the most important single factor which causes the trend of conditions to move upward. At no stage of the business cycle, however, do prices change uniformly. Wholesale prices invariably move first. But wholesale prices do not advance evenly. Those commodities which serve as a basis for speculative transactions on the exchanges—raw materials such as cotton and copper—increase in price before others in which there is less interest. Of the raw materials, agricultural products advance more quickly than mineral, due to the greater facility in adjusting the latter to changing conditions. Wholesale prices of semifinished products advance after the increase in raw materials, as a natural consequence thereof. Wholesale prices of finished products similarly follow the advance in raw materials and semifinished goods.

statistics of unemployment, monetary circulation, savings, profits, and bankruptcies are no safer guides than those which have been mentioned. Thus there is no certain way of predicting when business will begin to recover from a prevailing depression."—W. C. Mitchell, "Business Cycles," p. 457.

The increase in productivity entails a larger volume of merchandise shipments, in raw material and partly finished form from the sources of derivation to the producers, and in finished form from producers to consumers. Car loadings are better and the number of idle freight cars, which reached its maximum during the depression period, diminishes gradually.

Foreign trade follows no uniform trend during periods of recovery. The normal influence will be for exports to decline somewhat, due as much to revived interest in the domestic market as to advancing prices. Imports increase, encouraged by higher prices which represent an increased demand for goods and larger purchasing power. Yet comparative conditions are of most significance. A change in conditions of demand and supply abroad may be one of the chief determinants —as was the case in 1915—in bringing about the period of recovery.

Retail sales increase, but slowly at first. The purchasing power of the public determines the total retail sales, and, as will be seen, increases in wages lag behind in a period of recovery. The tendency of the general public is to spend as it earns, and naturally expenditures cannot be increased until income advances. Incidentally this is the main reason why retail prices do not advance so quickly as wholesale.[6]

Labor conditions during a period of recovery.—The number of unemployed workers decreases in a period of recovery. Machine operation and efficiency of management increase profits through the reduction of costs, but substantial increases in productivity can be accomplished only through an increase in the number of workers. A progressive world constantly creates new demands more than sufficient to occupy the time of workers supplanted by improved methods of production.

Wages increase gradually, a continuation of the trend which began even before the period of depression ended. Total wages increase more rapidly than the rate of wages, which is

[6] Dr. E. Engel, Chief of the Prussian Statistical Bureau, over thirty-five years ago, formulated four propositions with regard to family budgets, which are probably as true to-day as then: (1) the greater the income, the smaller the relative percentage of outlay for subsistence; (2) the percentage of outlay for clothing is approximately the same, whatever the income; (3) the percentage of outlay for lodging, or rent, and for fuel and light, is invariably the same, whatever the income; and (4) as the income increases in amount, the percentage of outlay for sundries becomes greater.—E. D. Jones, "Economic Crises," p. 38.

taken as the usual criterion. A period of recovery brings full-time employment to the workers which, in itself, is equivalent to a substantial increase in wages. The rate of wages increases only after the recovery is well under way when increased living costs lead the workers to seek larger wages. Unlike commodity prices, there is popularly considered to be an equilibrium of wages—a point at which the income of labor is sufficient to grant a decent living. As wages have been below this point, a restoration to the equilibrium is sufficient to cause labor to refrain from asking more for the time being.

Controversies are rare. Increased profits to employers cause them to desire to increase production and they are content to increase the wages of labor, as the advance is always more than offset by the increase in profit. The demands of labor at this stage are usually conservative—the privations of dull times are too recent not to have an effect. Coöperation between capital and labor is most easily obtainable at this time.

Conditions of corporate prosperity during a period of recovery.—Corporate earnings increase rapidly in a period of recovery. Prices advance more quickly than production costs and thus the margin of profit becomes larger. Not only is the profit on each transaction increased, but the number of transactions also multiplies, both of which factors serve further to increase the total gain. Even after production costs advance, the volume of transactions tends to keep earnings high. As profit is the predominant factor in business, the increase in earnings, incidental to a period of recovery, stimulates industrial activity and strengthens the cause which preceded it.

Commercial failures show a marked falling-off. In an era of rising prices, business profits are secured without the corollary of even ordinary acumen. It is simply necessary to buy, to hold for a time, and then to sell. The upward trend of prices will bring a profit to even the least sagacious. Consequently, bankruptcies and insolvencies become less and less frequent.

New security issues gain in volume, principally because of the desire on the part of producers to expand their output capacity to meet the increased demand for their products.

The advance in the charges for capital—interest rates—has not been sufficient thus far to discourage long-term borrowing.

A recovery in business conditions causes a boom in the stock market. More likely than not the boom will precede the recovery rather than follow—a phenomenon puzzling to one who does not appreciate that the market discounts all news, good and bad alike, before the happening of the event. The market value of stock depends upon the capitalized earning power—past, present, and prospective—of the issuing corporation.[7] As the period of recovery means prospective increased earning power to the company, stocks ordinarily advance before the earnings become actual. This accounts for declines later when profits, although greatly in excess of those for preceding periods, are less than have been anticipated. The stocks which declined the most during the depression stage—especially those which were obliged to suspend dividend payments—rise more rapidly than the others, in anticipation of an early restoration of dividends. Common stocks rise more rapidly than preferred, both because they had declined more in the preceding period and because the potential dividends on the common stock are in proportion to the total earnings of the company, whereas the preferred is in most instances limited to a comparatively small fixed return, regardless of abundant earnings.

Conditions of finance during a period of recovery.—Bank clearings gain in amount due to increased prices as well as to a greater volume of transactions. Bank statements show an increase in loans and in money in circulation with a corresponding decline in the ratio of reserves to liabilities. Interest rates —except the rate on call loans which is fixed daily and therefore fluctuates constantly—strengthen with an increase in the demand for credit accommodation and tend to advance, although well after the recovery has set in.[8] Yet it has been

[7] An enterprise which earns $100,000 annually is estimated to have a value of about $1,000,000 although the physical property may have cost considerably less. This process of valuation is termed "capitalizing the earning power" on a 10 per cent basis. The value of each share fluctuates in accordance with changes in the capitalized earning power of the company rather than with changes in the value of the physical assets.

[8] Prof. Irving Fisher has suggested that the lagging adjustment of the rate of interest to changing conditions may account for the phenomena of business cycles. Borrowers take advantage of low interest rates to increase loans—deposit currency—which increase, according to Professor Fisher's theory, causes

noted that interest rates lower even after the period of recovery has begun.[9]

International movements of gold, exports and imports, are smallest at this stage. The influx created during the era of depression by the influence of low domestic prices is checked by the advance in the price level. Moreover, the export of gold which eventually follows high prices has not commenced.

The development of the period of prosperity.—The recovery in business is really a transition stage between periods of depression and prosperity. Although slow at first, the betterment intensifies as it continues. Just as the pendulum swings below a theoretical normal during the depression stage, in a period of recovery the upward swing carries it above the line of normalcy. Psychology plays an important part. A spirit of optimism now pervades commerce and stimulates production generally. Enthusiasm is epidemic. Increasing prices are bringing larger profits and the volume of business grows continually. Business has recovered from its slump and enters the stage of prosperity.

Production during a period of prosperity.—The high prices which are obtainable in a period of prosperity might reasonably be expected to cause agriculturists to increase their acreage. Weather conditions during the growing season, however, exert a more powerful influence than fluctuating acreage. Experience has taught the farmers to act conservatively in this respect. The record high prices secured for the 1919 crops encouraged large harvests in 1920. Prices declined to such an extent in the meantime, however, that, although the volume of agricultural production in 1920 substantially exceeded that of 1919, its value was 40 per cent less.[10]

prices to rise. The rate of interest should always be high enough to prevent inflation, that is, the granting of credit beyond actual requirements, or overborrowing. The belated rise in interest rates checks these operations and makes for the decline which eventually follows.

[9] "Nevertheless, discount rates usually average less in the first year of business revival than in the last year of business depression."—W. C. Mitchell, "Business Cycles," p. 466.

[10] Some specific illustrations follow:

Corn:	1920—3,232,367,000 bushels	$2,189,721,000
	1919—2,917,450,000 bushels	3,934,234,000
Cotton:	1920— 12,987,000 bales	914,590,000
	1919— 11,030,000 bales	1,967,143,000
Tobacco:	1920—1,508,064,000 pounds	298,001,000
	1919—1,389,458,000 pounds	542,547,000

Industrial production has now reached its maximum. The demand for goods seems insatiable. Market price becomes of secondary importance to the major problem of securing deliveries. The lure of abnormally high profits causes producers to become overenthusiastic regarding future requirements and the manufacturing plants of the country operate almost to the limit of their capacity. Only a shortage in labor prevents even greater production.

Construction work declines at this stage. The increase in costs—labor as well as materials—causes new building to be curtailed. Difficulty in obtaining labor and materials is a factor as troublesome as advancing prices. Projects accordingly are postponed until such time as conditions are more favorable. Practically all construction entered upon at this stage is for industrial purposes.

Marketing during a period of prosperity.—Prices continue to advance throughout the period; in fact, a decline in the level of prices indicates the end of the period. So long as the demand for commodities and services exceeds the supply, prices will advance. It is only after supply—which has been constantly increasing—approximates the demand that any retrogression is probable. The increasing level of prices brings increased profits but not in the same proportion as formerly, since production costs are mounting even more rapidly as the prosperity stage develops. Labor is demanding an increasing share in the distribution, and is less efficient even at higher wages. Raw material costs are constantly advancing, as are also supplementary costs, such as the charge for borrowed capital. Prices do not stop advancing suddenly. An increasing resistance develops as they go higher and further advances become more gradual. Toward the close of a period of prosperity prices appear to be stabilizing at the high level.

Commodity shipments reach a maximum at this time. So great is the traffic that actual congestion at points along the principal arteries compel the placing of embargoes on shipments. Idle cars decline in number and the height of the period often finds the usual surplus of cars converted into a deficit. So important do adequate transportation facilities become that consumers, in their eagerness to secure goods, are often willing to pay a substantial premium for prompt delivery.

Foreign trade figures are likely to be misleading at this

stage. Because of high price levels, the value of both exports and imports has been materially enhanced; in volume, however, the gain is not so great. Exports tend to decline due to the high domestic prices and to the inability of producers to meet the home demand. Imports increase for the same reason that exports diminish.

Retail sales greatly increase. The inherent inclination of the average American to spend as much as he earns finds constant expression in the sales of the retail stores. The increase is notably in articles of luxury rather than uniform in all lines.

Labor conditions during a period of prosperity.—Unemployment ceases to be a problem in periods of prosperity, as the difficulty is in securing workers for jobs rather than jobs for workers. The labor problem, instead of being entirely solved, assumes a different aspect, even more troublesome than before. As increased production is the chief desideratum, labor has the upper hand and is in a position to compel employers to make conditions of employment more satisfactory to the workers. Just as employers, in times of depression, force labor to accept the terms of the former, in times of activity, labor goes to the opposite extreme and prescribes the conditions under which it will work.

Wages increase most rapidly at this stage. An incessant demand for greater output, a shortage in the number of workers, competition between rival industries, increased living costs, and other factors induce the workers to seek higher wages. The ease with which increases are secured early in the period encourages further demands at short intervals and causes production costs to mount more quickly than selling prices. Incidentally labor becomes less efficient as the period continues, because the necessity for doing good work is no longer imperative. Wages tend upward throughout the period but do not reach their highest point until business has begun the retrograde movement.

This period is marked by many industrial controversies. As the workers continue to demand higher wages—both in the form of increased rates and shorter hours—the resistance of the employers becomes stronger. In the early stages, increases are freely granted, as enhanced earnings more than counterbalance the effect. But as production costs increase more pro-

portionately than selling prices, the profit margin lessens and employers find themselves less inclined to grant further increases. The controversies frequently develop into strikes, which tend to be longer continued as the period progresses, due to the increasing resistance of the employers as well as to the better economic position of the workers.

Conditions of corporate prosperity during a period of prosperity.—Business profits enormously increase. In addition to the ordinary margin of profit which would be gained if prices remained stable, the continual advance in prices acts to magnify the earnings. Even after the margin of profit diminishes, for a time the increase in the volume of transactions makes the total net profit as great as ever. The increase in profits is the impelling force which causes business endeavor to reach such a high degree of activity at this stage. The psychology of getting the most "while the going is good" stimulates the entire commercial field.

Commercial failures continue to decline in number as the prosperity period lengthens. This is a natural corollary to the increase in business earnings. The continued decrease in the number of failures is a criterion of the degree of prosperity which exists and is also a good barometer of the approach of the end of the period when the inevitable reaction must come. An extremely low percentage in commercial failures is a warning of financial storms in the not distant future.

New security issues reach their highest point at this time. The nature of the securities offered changes with each period of the cycle. In the depression stage, new capital was secured through the sale of long-term bonds on low interest rates. In the prosperity stage, high interest rates confine corporate borrowing to short terms, and cause most of the new capital to be raised through the sale of stock which bears a high dividend rate, the payment of which, however, is contingent upon earnings and is not fixed and definite as in the case of bonds. This era is notable for the marketing of vast quantities of securities of doubtful value. The promise of unreasonably high profits upon such stocks appeals to credulous investors who find themselves in the unusual position of having a surplus income.

Stock exchange transactions are large. The increased incomes of many individuals encourage them to enter the specu-

lative markets. Trading decreases in volume, however, as the period continues, and often the height of the prosperity era finds comparative dullness on the exchanges. The stock market is looking ahead, and the close of the period usually finds that prices, especially of those stocks which advanced most at the beginning, have already begun to decline.

Conditions of finance during a period of prosperity.—Bank clearings reach a maximum at the close of the period. At that time prices are highest and the volume of transactions is greatest. Clearings do not decrease until well after the retrograde movement has begun.

Bank statements reflect large increases in loans and deposits, and money in circulation, as well as a substantial decrease in the ratio of cash reserve to obligations. The gain in business activity has been facilitated to a marked degree by the granting of bank credits. Eventually the credit available at the banks approaches the point of exhaustion, and then the end of the prosperity era is in sight.

Interest rates follow, rather than keep pace with the trend of conditions. The increase in loans and decrease in the ratio of reserves compel bankers to increase the charge for borrowing to protect their position as well as to check inflation. At first, advancing interest rates are ineffectual, due to the large profit margins, but as earnings decrease and interest charges increase, the increased cost of credit effectually checks borrowing.

A period of prosperity affects the gold situation mainly by causing a decrease in production. Increased cost of production coupled with a stationary market price—for gold cannot change in price as under modern monetary systems gold *is* price—results in a distinct curtailment in the output.[11] As a result of increased imports and diminished exports, there is a normal tendency for gold to be exported at this stage.

The beginning of decline.—A period of prosperity tends to work out its own undoing. The main factor is the decrease in earnings which is the combined result of various developments during the period. Production costs in the form of expenditures for material and wages, decreased efficiency of workers, and interest charges encroach upon sales prices

[11] Prior to the World War, the average annual gold production of the world was about $500,000,000. In 1919, it had declined to about $350,000,000.

which cannot interminably be raised. The increase in the supply is eventually sufficient to meet the demand and the restoration of this balance alone places an economic check upon further advances. The cost of production did not determine the price while there was a shortage and will not determine the current price when a surplus exists. Moreover, greater resistance develops as prices increase, and demand actually declines, due to unwillingness rather than to inability to purchase.[12]

A financial crisis often marks the end of a period of prosperity and the beginning of retrogression. The crisis is attributable chiefly to the use of credit. As is shown later, periods of prosperity and depression would probably exist even were credit not used. But credit permits the expansion of business to go far beyond what would otherwise be the case. Credit is based upon confidence, and, in business, confidence is predicated upon profits. While prices are advancing, profits are easily obtained and there is general confidence in the situation. As profits decrease, apprehension develops and credit becomes increasingly difficult to obtain. Furthermore, the credit which one firm extends to another is largely dependent upon the credit the first firm can obtain from its bank and that, in turn, is limited by the credit position of the bank. Bank loans are easily obtainable at the beginning of the period of recovery, as the position of the banks is strong; but as loans expand with the increase in business activity,

[12] "The world of business is a system comprising numberless independent enterprises, bound together by industrial, commercial, and financial ties. For the continuance of prosperity it is indispensable that a certain balance be maintained between the fundamental processes which constitute the activity of this system. The demand for goods of every kind must keep pace with the increasing supply, despite the steadily rising prices; the cost of raw materials must not increase too much in comparison with the selling prices of manufactured goods; mercantile collections must grow with mercantile credits; bank reserves must expand with demand liabilities; the cost of living must not rise much faster than money incomes; banks and investors must continue able to provide the ever-increasing loan funds required by business enterprises; and the like. If there occurs a serious maladjustment in the rate at which any of these factors is growing in relations to the others, some business enterprises will suffer loss of profits. Then the bonds which unite different enterprises will become channels through which the injury will spread to other enterprises, just as they were recently channels for the spread of prosperity. Unless the original injury is promptly healed, there is grave danger that the cumulation of prosperity will be converted into a cumulation of depression."—W. C. Mitchell, "Business Cycles," p. 473.

eventually the banks are obliged to curtail their loans and the credit necessary to finance a continuation of the expansion of business becomes obtainable only on restrictive terms.

Retrogression starts, therefore, when prices begin to fall. Prices decline because of a restoration of an approximate balance between conditions of demand and supply. Curtailment of credit not only serves to check advancing prices—since inability to borrow is tantamount to inability to buy—but often precipitates a financial crisis in the transition from the period of prosperity.

Panics and crises.—Panics are caused by a sudden loss of confidence on the part of the business world.[18] The belief that prices are about to decline prompts holders of commodities and securities to liquidate at the earliest possible moment. Naturally this is coincident with a disinclination on the part of buyers to purchase. Others are obliged to sell to meet credit obligations which they are required to reduce. Supply far exceeds demand for the time being, and a drastic fall in prices results. Sellers are unable to understand why there is such a lack of purchasing demand and are seized with fear. In their fright, they offer their holdings at sacrifice prices. In a market of this kind, with many sellers and few buyers, prices drop precipitously. The decline in prices brings severe losses to those who were carrying large stocks or who had committed themselves on future contracts at high unit prices.

The transition between periods of prosperity often occurs without the concurrence of a panic or even a crisis. The efficiency of the Federal Reserve System in meeting a financial emergency was well demonstrated in 1920, and there is reason to believe that panics, at least in the former sense of the word, will rarely occur in the United States.

Panics and crises, when they do occur, are of limited dura-

[18] "A more complete and philosophical solution of the problem is found, it seems to me, in the constitution of human nature itself, which bears with impatience the dullness of a monotonous level, and rapidly passes from one extreme to another. Enthusiasm and despondency are equally epidemic. When prices are rising and when profits, even when only on paper, roll up rapidly, everybody is eager to buy. But when, after this eagerness has evaporated and suspicion succeeds to confidence, the current turns the other way, everybody desires to sell, prices fall, and until the remembrance of the losses thus incurred is obliterated by time, nobody is willing to make fresh ventures."—Matthew Marshall in *Engineering Magazine*, vol. 5, p. 415, quoted by T. E. Burton in "Panics and Depressions."

tion. At such a time, even the worst is discounted and a more reasonable attitude is quickly assumed by the business world. The demand for the immediate liquidation of loans—a policy both fatuous and ruinous, as an intelligent creditor does not collect his debts by forcing debtors into bankruptcy—ceases and with it terminates the critical stage. But business does not resume its former status. A panic marks but the beginning of the retrogressive movement.

Production during a period of decline.—Agriculture is not largely affected by the retrogression of business. The farmers have a more inherent belief in the fundamental soundness of the country, regardless of the sequence of good times and bad times, induced to no small extent by the inability to regulate production, as in the case of the industrial plants. Workers who left agriculture to gain the larger wages obtainable in the factories return to the farm with the advent of an industrial depression.

Industrial production falls off. Stocks on hand are more than adequate to meet the existing demand, which is but a fraction of its former volume. Moreover, the decline in prices impels producers to curtail operations only to the orders on hand. Incidentally the cancellation of unfilled orders placed during the period of prosperity is usually greater in volume than new orders being received. As in a rising market, each new advance gives an additional gain to manufacturers, so in a falling market each further decline means added loss to producers in proportion to the quantity of merchandise they are carrying. As prices continue to fall, the curtailment of industrial activity becomes more general, and leads into the period of depression where it reaches its lowest phase.

Construction operations are decidedly limited at this stage. The spirit of pessimism in the market is more than sufficient to offset the encouragement offered through lower construction costs. There is also a tendency, now that prices are falling, to wait for the bottom rather than to begin while the downward trend continues.

Marketing during a period of decline.—Prices decline at this stage, rapidly at first, but more gradually as the period continues. The lack of uniformity in the fluctuations is again apparent. Wholesale prices decline earlier than retail. Articles of production fall before articles of consump-

tion. Raw material prices, especially of mineral products, drop in advance of those of manufactured goods. The lack of support to the market which accounts for the continued decline in price levels is a reflection of the reduced purchasing power of the public coincident with current wage reductions. As prices decline, profits are adversely affected, and inactivity spreads throughout commerce.

Merchandise shipments fall off. The deficit in idle cars is eliminated, and successive reports soon indicate an increasing surplus. Traffic congestion ends and deliveries are effected with promptness.

Foreign trade receives greater attention. The decrease in the domestic demand causes producers to seek markets abroad. The decline in prices is of material assistance, and there is a certain tendency for exports to increase. Imports lower both in volume and in value.

Retail sales do not decline immediately. Wages—which determine purchasing power—are not reduced at first, and, consequently, retail sales do not feel the effect of the change in condition until the reductions actually become effective.

Labor conditions during a period of decline.—The curtailment of industrial activity brings a corresponding reduction in the number of workers. In some instances, the same result occurs through part-time operations. Unemployment which becomes manifest at this stage does not become critical until retrogression has developed into actual depression.

The trend of wages is downward. Reductions are not put into effect at the beginning of the period, however. In many cases wage agreements guaranteeing existing scales for a definite period prevent immediate reductions. Moreover, workers strenuously resist reductions, and in preference to strikes and complete suspension of operations, employers continue the existing rate temporarily. As the period continues, producers are obliged to reduce wages to continue operations, since wages comprise on the average about two-thirds of the entire production cost. The resistance on the part of the workers becomes less effective in view of lower living costs and the growth in the number of unemployed. Production costs are lowered, not alone through diminished wage scales,

but also through the increased productivity of the individual worker.

Frequent controversies occur at the beginning of the period when wage reductions are initiated. Controversies which developed into strikes in the period of activity now develop into lockouts since, in many instances, employers can more economically suspend operations than continue. As industrial activity lessens, the workers are more disposed to accept the reductions as inevitable, and controversies become comparatively less numerous.

Conditions of corporate prosperity during a period of decline.—The decline in prices is accompanied by a corresponding decline in business profits. The principal loss is incurred in the shrinkage in the value of inventories held over from the preceding period. The income statements of the leading American industrial companies for 1920 bear eloquent testimony in this respect. But even before the loss on inventories has been written off, the profits of the enterprises during succeeding periods are substantially less than during the prosperous years. Dividends, especially extra disbursements which are common in a period of prosperity, are materially reduced, and in many cases are omitted to conserve the assets of the company to meet the uncertain days which are ahead.

Business failures increase. The failure of one or two large enterprises is often a feature of the critical stage which usually marks the end of the period of prosperity. Failures at the beginning of the period are comparatively few in number but the total liabilities are large. As prices continue to fall, business men find it increasingly difficult to conduct profitable operations, especially new enterprisers who began during the fair weather of rising prices and who find the procurement of profits under the new order a task requiring a considerable degree of business sagacity.

New security issues decrease abruptly with the beginning of the downward movement and offerings during this period are limited to refunding operations, extending the maturity of loans previously made.

Just as improvement in business conditions causes a boom in the stock markets, so retrogression brings a slump. The bull movement is succeeded by bear operations even before the reaction in business has developed. The market falls and

trends downward until definite promise of recovery is in sight.

Conditions of finance during a period of decline.—Bank clearings decline slowly, due more to a decrease in the volume of business than to the price decline, although both are important factors. The volume of transactions reaches a minimum during this period rather than during the succeeding stage of depression.

Bank statements reflect the liquidation through which the market is proceeding. Loans do not decline at first to any substantial extent, because of the inability of borrowers to market their holdings—a condition which has recently gained the appellation of "frozen credit." But loans gradually are paid off and deposits decline in accordance. The cash position of the banks is strengthened with the decrease in liabilities, and credit becomes more easily obtainable.

Interest rates do not immediately decline but follow their usual habit of lagging behind. The credit position of the banks does not improve at once, since outstanding loans are liquidated only with extreme difficulty. Eventually, however, the decline in business activity brings betterment to the position of the banks and interest rates are lower in consequence.

Gold exports are checked at this stage by an increase in merchandise exports and a decline in imports, which restores a state of balance to total international shipments and receipts. This trend continues as depression develops and eventually brings gold imports in settlement of the excess of exports.

The complete cycle.—The business cycle has now swung back to the period of depression which was the point of origin in the present discussion. The manner in which business conditions follow an unending cyclical movement having been discussed, some attention will now be given to the cause of the fluctuations.

Chapter XV

WHY BUSINESS CONDITIONS CHANGE

Price and profit.—An approach to the task of determining the causes of the undulations of business must have its origin in an appreciation of the institution of money economy which dominates commercial endeavor. Production and distribution should be the two most significant terms in business, but the commercial world subordinates them to the twin deities of price and profit.

Price is the amount of money for which commodities exchange. Profit is the difference between sales price and cost of sales, and is universally comprehended in terms of money. Men engage in commerce for the profit to be derived, and habitually conceive this reward in terms of money. True, in the ultimate sense, men do not strive for money but for the command over the world's goods which money gives. Subjectively, men work that they may be in a position to satisfy their desires; but, objectively, they work for money.[1]

Business is conducted for the sake of profits, and since profit in commerce is measured in terms of money, the existing commercial organization is considered to be a money economy. It is not altogether propitious that this should be the case. As a medium of exchange, money facilitates the conduct of business immeasurably. But men have come to regard money as much more than a simple medium of exchange. It serves as a standard of value in comparing the worth of commodities, as a store of value in enabling persons to transfer present goods and services into future commodities, and as a standard of deferred payment in the performance of credit transactions. The universal satisfaction with which money serves as a medium of exchange has led men to believe that it serves the

[1] "Commodities, those economic goods which are the real objects of human desire, apparently occupy a secondary place in the business world, for in the conscious purposes and desires of men money is the real thing."—Jos. F. Johnson, "Money and Currency," p. 10.

other functions with equal adequacy. Unfortunately, this condition does not obtain, and this brings about one of the factors contributing to the sequence of business prosperity and depression.

Subordination of production.—But the most important effect of the money economy upon commerce is the fact that it dominates productivity. Production, as the underlying motive of business, should be the controlling factor in commercial endeavor, and money should be one of the agencies by which productivity is facilitated. It is indeed an ironical development in commerce, that money, one of the means to an end, should, to the average individual, become the conscious end. In the true sense, the prosperity of any country depends upon its productivity, or, in other words, upon an adequacy of goods. But the money economy requires that the prosperity of any individual in that country be measured in the adequacy of money. As the country is comprised of the individuals, the adequacy of money unfortunately proves a more potent factor than the adequacy of goods.[2]

An analysis of price.—As an inquiry into the causes of periods of business prosperity and depression resolves itself into the question of money-making, and as that is directly dependent upon the relationship of prices, an analysis of the method by which prices are determined becomes of major significance. The task is not easy. The simple statement that the price of any commodity depends upon the relationship between the demand and the supply of the commodity merely scratches the surface of the problem. Consideration must be given to the

[2] "To the nation the making of money is important in a fashion quite different. Comfort and misery do not depend upon the aggregate of money incomes received by its citizens; they do depend upon the abundance of useful goods. Efficiency in producing useful goods is important to an individual chiefly because it enhances his ability to make money; money-making is important to a nation chiefly because it enhances the efficiency of production. Natural resources, mechanical equipment, and industrial skill are factors of fundamental importance under any form of economic organization. But where money economy dominates, natural resources are not developed, mechanical equipment is not provided, industrial skill is not exercised, unless conditions are such as to promise a money profit to those who direct production. The elaborate coöperative process by which a nation's myriad workers provide for the meeting of each other's needs is thus brought into precarious dependence upon factors which have but a remote connection with the material conditions of well-being —factors which determine the prospects of making money."—W. C. Mitchell, "Business Cycles," p. 21.

manner in which demand is created before it can be measured, and also to the manner in which the current supply came into existence.

Price comprehends two elements: cost plus profit, or cost minus loss. Business men always regard price with relation to cost, as herein lies the element of profit, which, as has been previously stated, is the apparent reason causing them to follow commercial pursuits. Surprising it would be, therefore, to find any single factor exerting a greater influence upon the price of any commodity than its cost of production.[8]

Effect of cost of production.—Under conditions of free competition, the main factor in the establishment of price is cost of production. Goods which cost nothing to produce have no price; they are free. But cost of production is not the only factor affecting prices. In fact, changing conditions of demand and supply are continually causing prices to be established seemingly independent of the cost of production. During the first three months of 1920 raw cotton was selling at over forty cents a pound, and during the last three months of the same year, it was quoted below twenty cents; changes in production cost could not and did not account for the change in the market price. Other factors, to which consideration is about to be given, often have greater influence than the cost of production; but in the long run production cost is the basis of the equilibrium to which price movements tend to return after the other forces have spent themselves.

Factors in price determination.—Prices are popularly assumed to be determined by conditions of demand and supply; but, while this is true, it would be more precise to add "and by prospective profits." Demand measures *value,* but supply determines *price.* Producers, therefore, always endeavor to regulate the supply of any commodity in adjustment with the demand at a price which will permit a reasonable margin of profit over the cost of production.

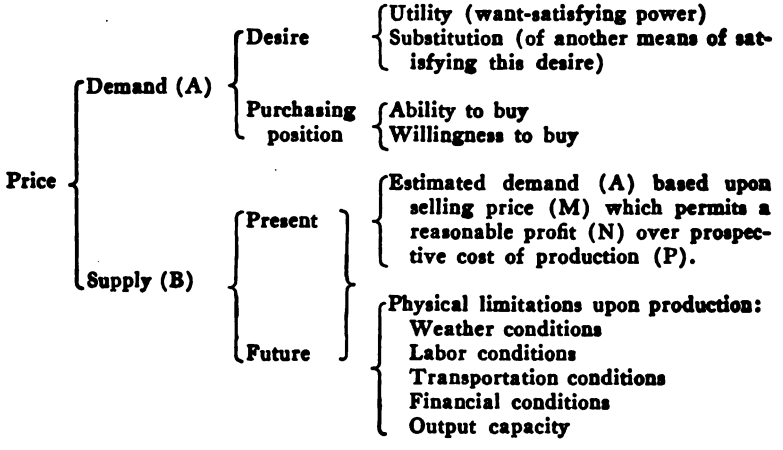
The regulation of the supply to meet the demand is a problem of large proportions. It is more than the biggest problem in business—it is business itself. The ability of men successfully to contend with this problem measures their business capacity and, by the same token, their monetary reward.

[8] Cost of production is used here in its broadest sense. It includes distribution cost as well as production.

Every individual in commerce has this problem, in direct or indirect form, constantly before him. In its essence, the task is one of predetermination, and those individuals are most successful who have the best foresight.

The problem is divided into three parts, as is shown in the accompanying analysis. The first task is to estimate what the demand will be at a future time, that is, when the new supply reaches the market, upon the basis of a given price which is estimated in accordance with production cost. The second is to produce the new supply in the desired quantity despite physical restrictions which constantly arise in production. The third is to predetermine the prospective cost of production.

DIAGRAM ANALYSIS OF PRICE



In each case, the possibility of error, and consequently of loss, since the business man must back his judgment with his money, is extremely large.

Estimating the demand.—The first part of the major problem—and deserving the title of major problem—is the task of estimating what the demand will be when the new supply reaches the market. Over a reasonably long period, demand varies with price. At a given price, there is a certain demand, represented by those willing to pay that price, which is known as the effective demand. The demand at a lower price would normally be greater, and this is considered the potential demand. The effective demand naturally receives the greater attention.

Demand is desire qualified by purchasing position. Most individuals have unlimited desires but limited purchasing ability. Hence, demand is not merely the total desires. Desire is predicated upon utility, which is the power of the commodity to satisfy wants. A community desires wheat because its product—bread—satisfies hunger. But utility alone does not determine desire, as the substitution of another commodity—corn, for example—can satisfy the same desire.

Effect of purchasing position.—Purchasing position, as well as desire, determines the effective demand. The purchasing position of an individual depends upon his ability and willingness to purchase. The ability of prospective customers to purchase may be gauged usually from conditions of employment and corporate prosperity, which are taken up in detail in a later chapter. One of the contributing causes in the rise in price levels between 1914 and 1920 was the increased purchasing power of the public. Willingness to purchase is not always synonymous with ability. The "buyer's strike" during the latter part of 1920 was quite irrespective of the ability of purchasers to make payment. Because relative willingness to purchase is of psychological creation, its predetermination is difficult. Yet an unwillingness to purchase is always evident in a declining market; the unusual phase of the 1920 situation was that it was one of the causes of the decline.

The first problem of the producer, therefore, is to estimate the prospective demand at a certain price. He appreciates that any error he commits at this point, or, for that matter, at any other step in his problem, will tend to make the basic price different from what he anticipates, and he acts with greater caution by reason thereof. The experience of previous operations is his chief, often his only, criterion, and invaluable as this assistance is, the producer is apt to overemphasize its importance. A more scientific attempt on the part of the producers to meet the demand on the basis of the new rather than the old conditions would prove decidedly efficacious in reducing the range of price fluctuations.

Regulating the supply.—The second part of the problem—after the prospective demand has been estimated—is that of regulating the supply in accordance therewith. The existing supply—which, incidentally, came into existence as a result of

calculations similar to those now being considered—is a factor of importance only if the quantity is abnormally large. The close of the World War in 1918 found enormous stocks on hand of many commodities, such as copper and wool, which naturally tended to curtail further production in those lines. Usually, however, the current supply suffices chiefly to meet the consumptive requirements until the new supply is available and to provide a reserve—termed carry-over—to meet a possible deficit in the forthcoming supply.[4]

Limitations upon supply.—The achievement of a desired production is conditioned upon the successful forecast of the effect of forces both economic and non-economic, which impose physical limitations upon productivity. The restricting elements are the conditions of weather, labor, transportation, finance, and output capacity. In agricultural production, the acreage planted does not determine the total yield; the weather conditions between the planting and the harvest exert a powerful influence. Since weather conditions may not be determined more than a few days in advance, the problem of regulating the agricultural supply to meet the demand is highly difficult. Labor conditions, also, create physical restrictions. The years 1918 and 1919 were marked by decreased production caused by labor shortage and aggravated by numerous controversies and decreased efficiency. Conditions of transportation at times are detrimental to productivity as, for example, in 1920, when the railroad congestion made traffic most uncertain. The condition of the money market is another factor which often tends to handicap production. The credit needed to finance the operations of the producers may be obtainable only on unsatisfactory terms; during the years 1920 and 1921 industrial borrowers were obliged to pay as high as 9 and 10 per cent, and even higher, to secure funds. The output capacity may be insufficient, at certain times, especially during periods of business revival following periods of curtailed production, to meet the estimated demand.

Producers are obliged to make allowance for each of these contingencies. If proper allowance is not made, and the error may as readily create an oversupply as a shortage, the effect

[4] Out of an average annual production of about 800,000,000 bushels of wheat in the United States, over 100,000,000 bushels are usually carried over into the next harvest.

will be to cause an inequality to exist between conditions of demand and supply with consequent fluctuations in price.

Prospective cost of production.—The third part of the problem is to estimate the prospective cost of production. Although it has been previously stated that cost of production was the main factor in the establishment of price, a line of demarcation must be drawn between actual cost and prospective cost. The actual cost of production determines profit—an all-important factor—but, strange to say, has comparatively little influence upon current price.[5]

The prospective cost of production is the point at which the predetermination of supply begins. After the prospective cost has been estimated, a profit margin is added—which competitive conditions require to be a reasonable amount—and the total is the price which producers expect to realize.[6] This is the price which is used as a basis in estimating the prospective demand as has previously been shown. Estimates of prospective productive costs are based almost entirely upon experience. Actual costs do not always verify prospective costs, due to changes in economic conditions between successive periods of production. Seldom do conditions remain stable for an appreciable time. The undulations of business cause the trend of commercial activity and prosperity constantly to swing upward or downward. As production requires time, the

[5] "Note that even when the computation of cost of production appears to be a backward-looking computation, it is only as a basis for a further and forward-looking computation. Costs that have been, have no direct bearing upon present price. The supply is as it is, no matter what the costs are now seen to have been. The cost of production that is really and ultimately significant in modifying price is the prospective cost as over against the prospective price. And in most occupations, the computation is for a fairly long term—a season, or a succession of years, or even a lifetime. The bearing of cost, such as it is—and however tardy is its working on the volume of supply—is significant only for such persons as undertake the cost, and for the supply which it affects, and for the period upon which it bears. Prices are influenced by it by virtue of the fact that there are always enough marginal men in any competitive production to bring about a reduction of the supply, if the relative advantages of the industry appear likely to suffer. And there are always men in other industries, near to their respective margins, who will be attracted to any particular industry if its relative advantages appreciably increase."—H. J. Davenport, "The Economics of Enterprise," p. 69.

[6] "Generally speaking, prices may be considered competitively fixed and in their normal relation to costs when the industry as a whole has earned an average gross profit of anywhere from 9 to 12 per cent on investment."—Kemper Simpson, "A Statistical Analysis of the Relation between Cost and Price," in *The Quarterly Journal of Economics*, Vol. 35, No. 2, p. 271.

prospective cost will approximate the actual only if proper allowance has been made for current trend of conditions.

The prospective cost of production affects price to the extent that it governs supply. But an error in estimating the prospective cost does not affect price, as, by the time the error is ascertained, the price will have been determined by existing conditions of demand and supply. But errors in estimating prospective costs affect profit, which is the difference between price and actual cost, and in this manner affect future prices, as will be seen.

Effect upon price.—If the estimated demand has been correctly forecast, and the supply has been accurately regulated in accordance, the price of the commodity will be M. If, likewise, the prospective cost of production coincides with the actual cost, the profit margin will be N, which affords a reasonable rate of return. A reasonable rate of return will neither encourage nor discourage production and will tend toward stability. Desirable though this result would be, it seldom happens, due to the great difficulty in correctly forecasting all three contingencies.

If inaccurate appraisal has been made of either the demand or the supply, or both, the price will not be M. If the actual demand exceeds the supply, the price will be M+ and the profit will be N+, or an abnormal rate of return. This will stimulate production and likely cause overexpansion later. If the actual demand is less than the supply, the price will be M— and the profit will be N—, or a subnormal rate of return. This will discourage production and tend to non-employment and industrial depression until the balance is restored. In both of these cases, the actual profit, N+ or N—, as the case may be, would be subject to revision in proportion to the extent to which the actual cost agrees with the prospective cost.

Why prices rise.—A period of marked business activity has its origin in a rise of prices.[7] This is fundamental. Later the increased business activity will contribute to a further rise, but this will be after the upward swing is well under way. Now prices do not rise automatically, but because of changes in the relationship of supply and demand.

[7] "In such a period the potent fact which serves as incentive to the acceleration of business is a rise of prices."—T. B. Veblen, "Theory of Business Enterprise," p. 194.

At a certain time it becomes apparent that the current supply of a given commodity is insufficient to meet the demand. This is because producers have erred in estimating the demand or in regulating the supply. Either they have underestimated the demand or have not made proper allowance for the physical restrictions upon production.[8] While demand exceeds supply, the price of the commodity rises and the profit to producers increases. Since the cost of production is not, at the outset, affected, a marked tendency arises to expand productivity to gain the increased profit. This brings a stimulus to allied industries, especially those supplying producer's goods [9] to the industry concerned, which will tend to increase prices and profits in those lines as in the original. Sooner or later, the increased production catches up with the existing demand and, as this fact becomes apparent, a tendency will develop for prices to return to the previous level which gave reasonable, but not large, profits. Resistance to the decline will be met in increased production costs—material as well as labor—which have developed in the meanwhile and which presently would operate to lower the profit formerly obtainable at the original cost. This resistance cannot be effectual, however, as buyers will pay only a price justified by existing conditions of demand and supply. While demand exceeds supply, high prices are obtainable; but when the supply equals or exceeds the demand, the premium cannot continue. Prices are due to swing back. Artificial measures, such as the withholding of commodities from the market—a policy which in itself is a confession of defeat and simply evidences the weak-

[8] An unfortunate aspect of the present organization of industrial society wherein men seek primarily to "make money" rather than to promote the general welfare by contributing toward maximum productivity is illustrated at this point. Producers aim to undersupply rather than exactly meet the demand—an application of Gregory King's law, evolved centuries ago, that a short crop yields a larger return than a large crop. The total wheat production in the United States in 1915 was 1,025,801,000 bushels valued at $942,303,000; in 1916—the following year—the crop was only 639,886,000 bushels but was valued at $1,025,765,000. The production declined 38 per cent but the value of the crop increased 11 per cent.

[9] Producer's goods are those used in the creation of commodities, for example, machinery; whereas consumer's goods, such as clothing and foodstuffs, are those immediately and completely utilized.

ness of the market to buyers and thereby drives prices further down—cannot stay the swing.[10]

Relationship of credit.—Credit, that is, commercial borrowing, never causes alternate periods of prosperity and depression. It merely magnifies their effects. An expansion of credit permits profits to increase more rapidly by reason of facilitating the increase in production, but thereby shortens the period of increased activity. A curtailment of credit precipitates the downward price movement, and incidentally the ensuing period of depression, which would be just as certain to occur when the supply met the demand, although less abruptly, if there were no such an institution as credit. Panics are credit phenomena; periods of prosperity and depression are not.

Effect of changes in the demand.—Demand is never stable; apart from other reasons, it fluctuates with changes in the supply, a condition which renders even more difficult the problem of regulating the supply. Because of this factor, the success met in the endeavor to make supply approach demand in a period of prosperity does not depend entirely upon increased production. At the outset the appreciation of a shortage further accentuates the demand; but toward the latter part of the period, when supply is rapidly increasing, demand is actually declining. Producers are operating at top speed and do not appreciate this fact at the proper time. The close of a period of prosperity, therefore, usually finds the rate of production still increasing with the demand rapidly falling off. These countermovements have a tendency to make the readjustment more drastic.

Why depression ensues.—The forces which cause prices to rise must eventually act in reverse manner to accomplish a decline as soon as equality between conditions of demand and supply is approached. The decline of prices should not, of itself, bring about a period of depression, as a restoration of the former price should still allow a reasonable margin of profit. But, as has previously been stated, production costs have advanced in the interim. The inability of producers

[10] The attempt on the part of the agriculturists during the latter part of 1920 to withhold the current crops, especially cotton and wheat, from the market because of dissatisfaction with current prices, not only failed to strengthen prices, but actually caused prices to decline further.

promptly to adjust production costs, primarily wages,[11] to sales prices while prices are moving downward—perhaps they might accomplish this more readily if they were consistent when prices are rising—impels a radical curtailment of production. Another important reason for the adoption of this curtailment policy is to be found in a continuance of the decline in the demand already evidenced toward the close of the period of prosperity but gaining in intensity as prices lower.

The curtailment of industrial activity is synonymous with a period of business depression. Decreased productivity means unemployment and lower wages, in short, decreased purchasing power, which tends further to weaken the situation and to prolong the period of depression. As in a period of rising prices, an incorrect estimate of demand causes overproduction, just so in a period of falling prices an incorrect estimate of demand causes underproduction. Production may be postponed, but consumption, particularly of the necessities of life, continues constantly. Underproduction eventually causes a shortage to exist, and, as this shortage becomes apparent, the instinct of wanting what cannot be had takes hold, demand quickens, more so because certain wants have been postponed, and the upward swing begins.

Overproduction and surplus capacities.—A causal factor of cyclical movements is frequently suggested in the overproduction of commodities which arises out of surplus capacities in American industrial plants. The assumption seems reasonable that owners desire maximum use of installed capacity, and, consequently, stimulate output beyond conservative warrant. That surplus capacity exists is freely admitted, but the preceding deduction does not necessarily follow.[12]

Surplus capacity is more an element of economic strength than weakness. It is actually essential in many cases. Few enterprises expect to run at capacity throughout the year. In the automobile industry, the seasonal demand for cars neces-

[11] An industrial survey conducted by *The New York Herald* in 1921 showed that labor received 85 cents out of every dollar of cost in steel making; 75 cents out of each dollar of cost in bituminous coal mining; 85 cents in building construction; 38 cents in ship building; 60 cents in railroading; 33 cents in furniture; 35 cents in shoe manufacturing; and 50 cents in textiles.—Cf. *The New York Herald,* May 8, 1921.

[12] In this discussion allowance should be made for the fact that normal capacity of an industrial plant is usually assumed to be about 75 per cent of theoretical maximum.

sitates more active operations during certain months of the year. Electric light and power companies usually keep a reserve of at least 25 per cent in available equipment over the peak load to meet emergency demand. Elsewhere reference is made to an analysis prepared in 1923 which indicated an average surplus capacity of 30 per cent in American industry. While this margin was possibly higher than precise economy would approve, it was not unreasonably or dangerously so, save in those separate industries well over the average.

Two factors are always working with time to reduce whatever danger exists in surplus capacities. One is deterioration, through depreciation or obsolescence of the installed equipment. The second is the growth of the consumptive demand through population increase, higher standards of living, and greater purchasing power. The combined effect of these two forces is to eliminate, at times with startling quickness, the unhealthy margin of capacity.

Surplus capacity is an element of strength in that it permits adaptation to seasonal peaks of demand and to the variable volume of orders from occasional customers, especially in foreign markets. Surplus capacity is an element of weakness, in that it tends to create costly competition by oversupplying the market. Yet this condition has developed more in theory than in practice. Industrial managers are usually quick to curtail output when demand falls off. The business cycle may not fairly be ascribed, as has been done, to "industrial assininity." Moreover, with comprehensive current data on conditions of supply in most industries, there is much less danger than ever before from this source.

Control of the cycle.—Various methods of controlling the fluctuations of business activity have been suggested from time to time. The Federal Committee on Unemployment, appointed during the depression of 1921, recommended certain practices which would be helpful in accomplishing greater stabilization of trade. It was urged that improvement should be constantly sought in the compilation, dissemination, and interpretation of fundamental statistical data of current activity in trade, upon the assumption that business men may thus be in a position more intelligently to plan ahead. It was

further recommended that the following practices might be advantageously adopted:

1. Credit expansion should be controlled within reasonable limits by the banks of the country. In the inactive phase of the cycle, a liberal policy is helpful, and in the active phase a cautious policy is beneficial.

2. Inflation should be controlled so far as possible by the Federal Reserve banks. Federal Reserve policy with regard to discounts and interest rates should be determined with particular respect to the current activity in trade.

3. Industrial expansion should be privately controlled to conform to the trend of general activity. Policies as to production, expansion, inventories, and reserves should take into consideration the current position of the business cycle.

4. Construction activity, both private and public, should be postponed during periods of great business activity. The volume of such pending building would thereby provide a serviceable backlog to stimulate business during a later period of quiet trade.[18]

Of these recommendations, at least one has been put into effect with measurable success. The Federal Reserve banks, through careful scrutiny of commercial loans offered for rediscount, judicious adjustment of the discount rates, and a flexible policy of open-market bill-purchasing, are exercising a control over business activity which is proving none the less efficacious, because of its apparent indirectness. The Reserve banks, through public statements of their officials or advisory notices to the member banks, have not been reluctant to issue words of encouragement or caution to the business world as occasion has required. That the effect has thus far been wholesome may not fairly be denied. Business men have displayed a decided inclination to accept this counsel in good faith and the stabilization of conditions has been greatly promoted.

Too many factors, partly physical and partly psychological, exist to justify the statement that the business cycle has been finally controlled. But recent progress in this direction has been notable, and one may confidently predict that future fluctuations will be within narrowing limits.

[18] "Business Cycles and Unemployment" (Pamphlet), p. 10 *et seq.*, U. S. Department of Commerce.

Summary.—A discussion of cyclical movement should begin with a general appreciation of the usual course of business activity. Commerce is that function of human endeavor by which commodities and services are produced and distributed to the consumers. The first stage is the procurement of raw materials; the second, the refinement of these materials into finished products; the third, the distribution of the products; and the fourth, the consumption of the goods.

Of the three classes of raw materials, namely, animal, vegetable, and mineral, only in the last may the supply be readily adjusted to meet changing conditions of demand. Live-stock production cannot be so easily regulated. Agricultural output depends chiefly upon uncontrollable climatic conditions.

The raw materials are refined, or directly put into service, in one of the three great classes of industrial enterprise. These classes are the manufacturing industry, the construction industry, and the public utility industry. All three regulate production in keeping with consumer demand for the product or service.

The finished product moves to the consumer through the stores or offices of the middlemen, known variously as wholesalers, jobbers, sales agents, retailers, and so forth. The distributing agencies function as clearing houses for consumer demands.

The consumers may arbitrarily be placed in three classes. The Government (through Federal, State, and local authorities represented by the army, the navy, and various public works) may be termed the first, or public, class. The so-called public enterprises privately owned, such as hotels, hospitals, theaters, garages, schools, and the like, may be styled the second, or semipublic, class. The individual citizen buying for his personal requirements may be called the third, or private, class. It is to meet the consumptive requirements of these three classes that the preceding agencies of production and distribution endeavor to regulate their activities.

Complementary with the primary classes in the flow of business activity are the facilitating agencies of transportation, communication, and finance. The transportation companies operating on land, water, and, more recently, in the air, must necessarily wait upon business for their traffic. The communication companies, likewise, operating on land, water,

and in the air, have not the power of originating traffic. The financial institutions, in theory, at least, merely supply the funds that transactions may be expedited.

It would appear that considerable interdependence exists in business activity, but that the major motivating force is the extent of the consumptive demand. It is easy to say that, in a country of 120,000,000 persons, increasing 1,500,000 each year, with high standards of living and almost unlimited natural resources, small apprehension should be felt at any time as to the strength of this consumptive demand. People must continuously eat, be clothed, sheltered, and provided with the conveniences of life, such as water, light, heat, power, education, entertainment, transportation, and communication. Moreover, they will seek a fair share of the luxuries warranted by their station in life.

In theory, consumption is a constant factor; in practice, it is quite the opposite. The amount of consumption at any given time depends entirely upon the ability and inclination of the consumer to purchase. One seems as important as the other. During the years of the great agricultural depression from 1920 to 1923, farmers were unable to buy in normal volume. But the deliberate policy of the steam railroad companies in "bunching" their purchases of new equipment is plain unwillingness to help in the stabilization of business. Although the railroad companies of the United States should order at least 200 new locomotives and 12,000 new freight cars each month, only one locomotive and but 387 freight cars were actually ordered in June of 1924. Residential building was inactive from 1916 to 1918, due to inability to place contracts, and from 1919 to 1921, due to high costs of construction. Financial difficulties caused all public utility companies to postpone expansion plans from 1919 to 1922.

It may safely be said that, in its natural course, business runs smoothly. Business cycles are unnatural in theory, but obstacles arise to prevent a sustained equilibrium. Uncontrollable climatic conditions affect agricultural prosperity. Industrial output is regulated to give maximum profit rather than fairly balanced output. Even in the purchase of necessities, consumers do not spend consistently. The sum total of business activity, consequently, is ever changing, tracing a fluctuating line, which, because of a tendency to move upward

during one period and downward during another, has been called the business cycle. The causal factor of this movement is the inability of producers to regulate their output to meet the capricious demands of the consumers.[14]

[14] If we trust to history, then, the answer seems to be that the cyclical movement is part and parcel of the *normal* system of industry. If we ask economic theory for an explanation of why this should be so, the answer seems clear. The outstanding feature of modern industry is the division of labor. This division of labor has three consequences. The first is that, as the value of all products depends on a demand outside and independent of the maker—no man "makes" value, but only things to which value is attached by the desires and purchasing power of others—the individuals of the community are daily periling their resources on the chance of finding a paying demand from other people for their goods, while, all the time, there is any number of causes acting on this demand, increasing, diminishing, or, it may be, totally extinguishing it. What is more, every advance in wealth and culture tends to make this demand more capricious, and, with every change in demand, some industry or other goes on short time. For, while the simple wants of a poor community may be fairly counted on to produce a steady demand, the desires and activities of a wealthy community are infinitely varied and constantly changing, and every such change affects a long chain of industries in which huge capitals are specialized and literally "sunk," and thousands of laborers are employed.

The second is that every industry depends for its smooth working on other industries. The production of any and every good which man consumes being divided up into many successive and complementary industries, every individual industry depends, first, on getting the supply of things necessary for its operations from a preceding industry; and, second, on its products being taken up by the succeeding industries which carry them one stage nearer to the final good which people demand for a living. The drop of a single link in the long chain causes dislocation in every trade which connects the first raw material obtained from the earth with the finished article sold across the counter. And this danger of dislocation is the greater, the more highly "manufactured" the article is.

The third is that every industry depends on purchasing power obtained from other industries. If any trade, either because of dislocation of supply or change of demand, goes on short time, the loss of purchasing power on the part of its members at once affects the shops, and to that extent puts the shops, and through them the factories, the farms, and the carrying trade which fill the shops, on short time, and the diminished purchasing power of such shops, factories, farms, and carrying trades in turn affects other industries, and so on *ad infinitum*.

The third, and to some extent the second, of these explains the phenomena of industrial contagion, and contagion explains the cyclical movement. That depression breeds depression has often been noticed, and is easily understood once it is realized that "contagion" is more than a mere metaphor—the *virus* is diminished purchasing power transmitted from pocket to pocket. It has not been so much noticed that in industry there is a contagion of health as well as a contagion of disease. When the depression has run its course, and the cycle begins the upward movement, the healthy current of added purchasing power acts in precisely the same way, spreading activity through the shops to the farms, the factories, and the carrying trades. The only thing that still remains obscure is how the reaction from depression begins. As a rule, it

comes so gradually that the beginnings are already beyond record when it is ascertained that "trade is on the turn." As a matter of theory, an abundant harvest—particularly if it be international—would make the new start, for such a harvest is a spontaneous gift of heaven, and fills the farmers' pockets with new purchasing power.—William Smart, "Economic Annals of the Nineteenth Century," 1801–1820, p. 607.

PART III

BUSINESS CRISES IN THE UNITED STATES

Chapter XVI

THE PRINCIPAL AMERICAN CRISES

Frequency of American business crises.—The annals of American business from 1800 to 1926 include seven major crises which developed in the following years, namely, (1) 1837, (2) 1857, (3) 1873, (4) 1884, (5) 1893, (6) 1907, and (7) 1920. Minor disturbances occurred in 1814, 1818, 1825, 1829, 1848, 1866, 1903, and 1913. The elapsed time between the major crises was respectively 20, 16, 11, 9, 14, and 13 years. If the minor crises are included the elapsed time was 4, 7, 4, 8, 11, 9, 9, 7, 11, 9, 10, 4, 6, and 7 years. While a greater degree of periodicity is found in the recurrence of the major crises than in the elapsed time between all crises, in neither case have the intervening intervals been sufficiently regular to substantiate a theory of true periodicity. "Seven years of plenty followed by seven years of want" has not been the accurate story of American business.

Alternate periods of prosperity and depression are the results of cumulated change, as has been shown in the earlier description of the business cycle, but an analysis of the various factors which contribute to the change does not warrant the belief that a fixed regularity exists in their operation. Upon two occasions—the outbreak of the Civil War in 1861 and the World War in 1914—developments which ordinarily are not considered in the establishment of a theory of periodicity in business cycles have thrown commerce entirely out of its accustomed channels, have necessitated radical changes in business methods, and have completely altered the results which would have obtained had the old order remained.

Changes in the nature of crises.—In the brief summary of the major crises of the United States which appears in the following pages, a material change in the nature of succeeding crises is noteworthy. Economic conditions were vastly different in the early nineteenth century from those in the early twentieth. Agriculture was then the chief occupation and

engaged the attention of more than 75 per cent of the people. The population was relatively small, being but 17,000,000 in 1840. Facilities of transportation and communication were decidedly poor, as the railroad development did not come until nearly the middle of the century. From a political aspect, the nation was none too strong. The twenty years estimated by Washington as necessary to weld the country together proved a conservative prediction. Federal finances were in deplorable condition until well after 1820. A shortage of monetary metal compelled the issuance of a superabundance of paper currency.[1]

The last half of the nineteenth and the first twenty years of the twentieth century witnessed a striking change. The invention of the steam engine and its application to transportation and to industry and the development of the use of electrical power proved momentous factors in the rising importance of industrial production. Improved facilities in transportation and communication, large scale manufacturing made possible through new machinery and the corporate form of business organization, and a tremendous increase in the use of credit in business, all tended to put the conduct of business on a plane vastly different from that occupied in the early nineteenth century.[2]

With the entire institution of business in the process of material change, the commercial disturbances which meantime arose differed from those which preceded and followed. The earlier crises are attributable to causes such as specie shortage, overexpansion of railroads, and the building of public works; whereas recent disturbances are due more to reasons such as industrial overproduction and credit inflation.

The earlier crises.—The economic disturbances which developed in the United States in 1814 and 1818 were chiefly due to the unsatisfactory banking policies in practice. After Congress refused to extend the charter of the First Bank of the United States in 1811—a most unfortunate act as later developments proved—hundreds of state banks entered the field. A vast increase in the volume of outstanding credit resulted through loans and note issues by these new banks, enormously out of proportion to the specie reserves held at the

[1] D. R. Dewey, "Financial History of the United States," p. 76.
[2] W. H. Lough, Jr., "Syllabus of Lectures on Panics and Depressions," p. 3.

time. In the meanwhile the War of 1812 had begun and was going none too favorably for the United States, with corresponding adverse effect upon banking confidence. The capture

CONDITION OF BANKS IN THE UNITED STATES, 1811–1816*

Year	Number of Banks	Capital	Circulation	Specie
1811.....	88	$52,000,000	$28,000,000	$15,000,000
1815.....	208	82,000,000	45,000,000	17,000,000
1816.....	246	89,000,000	68,000,000	19,000,000

* "A Brief History of Panics in the United States," C. Juglar, p. 36.

of the city of Washington by the British on August 24, 1814, was followed by a suspension of the Philadelphia and New York banks. The banks remained closed until 1817.

The period of depression which began in 1814 lasted until 1820. Business conditions in 1819 were particularly poor.[3] Even the rectification of the error of 1811—when the charter of the First Bank of the United States was permitted to expire—through the chartering of a Second Bank of the United States in 1816 failed to prove of assistance until well after 1820.

The crisis of 1837.—Business conditions during the period from 1820 to 1837 were in marked contrast to those which existed during the six years immediately preceding. The completion of the Erie Canal in 1825 was the first great step in the opening of the West, and served as a stimulus for similar projects throughout the North and the East. Steam railroads were proved practicable by 1830 and extensive construction was in progress within a few years thereafter. The financial position of the Government had improved to such an extent that the entire national debt was redeemed by 1835 and a surplus of $26,749,803 was on hand on January 1, 1836.[4] With the exception of a small reserve, this surplus was divided among the state governments. Public projects—banking, canals, and railroad construction—were undertaken in the

[3] "Distress was severe throughout the country; many laborers were thrown out of employment; prices of exportable articles fell; and, in general, a readjustment of values was forced upon the country. Contraction of credits by the banks in their endeavor to obtain a specie basis in 1817 also contributed to diminish the credit facilities which the banks could afford to importers; the State banks reduced their note issues from $100,000,000 in 1817 to $45,000,000 in 1819."—D. R. Dewey, "Financial History of the United States," p. 166.

[4] C. A. Conant, "History of Modern Banks of Issue," p. 626.

enthusiasm of the moment without conservative regard for productive power in the immediate future. Speculation, especially in land, became rampant.

Factors other than speculation and unproductive projects also contributed to the reaction of 1837. Congress refused to extend the charter of the Second Bank of the United States which expired in 1836. The Coinage Act of 1834 changed the ratio of the relative value of gold and silver under the bimetallic system which then prevailed from the old ratio of 15 to 1—which undervalued gold and hence kept it from circulation, thereby protecting reserves—to a new ratio

BANK EXPANSION IN THE UNITED STATES, 1829–1845*

(Amounts in millions of dollars.)

Year	*Number of Banks*	*Capital*	*Circulation*	*Loans*
1829.....	329	110.2	48.2	137.0
1834.....	506	200.0	94.8	324.1
1835.....	704	231.2	103.7	365.2
1836.....	713	251.9	140.3	457.5
1837.....	788	290.8	149.2	525.1
1838.....	829	317.6	116.1	485.6
1839.....	840	327.1	135.2	492.3
1840.....	901	358.4	107.0	462.9
1841.....	784	313.6	107.3	386.5
1842.....	692	260.2	83.7	324.0
1843.....	691	228.9	58.6	254.5
1844.....	696	210.9	75.2	294.9
1845.....	707	206.0	89.6	288.6

* "Financial History of the United States," D. R. Dewey, p. 225.

of 16 to 1—which overvalued gold and hence forced it into circulation and out of the country.[5] In 1836, the Treasury Department refused to accept other than specie in payment for public lands, and thus put a decided check upon speculation in this field. The failure of the agricultural crops in 1835 and 1837 was an additional unfavorable factor.

Public meetings held in New York protesting against high commodity prices early in 1837 indicated that the end of the period of prosperity was close at hand. The crisis came on

[5] In 1834 the ratio on the basis of the relative market value of gold and silver was 15½ to 1. At 15 to 1, gold was undervalued; at 16 to 1, silver was undervalued.

April 1, 1837, and during the following ten days 128 commercial failures were reported in New York City. Specie payments were suspended by the banks on May 10 and were not resumed until the following year. The depression in business continued until 1840.

The crisis of 1857.—Liquidation was so thorough during the three years of depression immediately preceding 1840 that

BANKING CONDITIONS IN THE UNITED STATES, 1846–1860*

(In millions of dollars.)

Years	*Number of Banks*	*Loans*	*Deposits*	*Circulation*	*Specie Reserve*
1846.....	707	312.1	96.9	105.6	42.0
1847.....	715	310.3	91.8	105.5	35.1
1848.....	751	344.5	103.2	128.5	46.4
1849.....	782	332.3	91.2	114.7	43.6
1850.....	824	364.2	109.6	131.4	45.4
1851.....	879	413.7	129.0	155.2	48.7
1852.....	992	527.0	189.0	156.3	53.0
1853.....	1,098	408.9	145.6	146.1	47.1
1854.....	1,208	557.4	188.2	204.7	59.4
1855.....	1,307	576.1	190.4	187.0	53.9
1856.....	1,398	634.2	212.7	195.7	59.3
1857.....	1,416	684.5	230.4	214.8	58.3
1858.....	1,422	583.2	185.9	155.2	74.4
1859.....	1,476	657.2	259.6	193.3	104.5
1860.....	1,562	691.9	253.8	207.1	83.6

* Compiled from D. R. Dewey's "Financial History of the United States," p. 260, with slight amplifications.

the ensuing period of recovery was long sustained. A failure of the principal European crops in 1845, 1846, and 1847 was but a single factor contributing to the general prosperity in this country. The Mexican War in 1847 stimulated commerce through abnormal Federal expenditures in the same manner although to a lesser degree as did the recent World War. The discovery of gold in California in 1849 greatly increased the monetary reserves of the country.[6] Political and economic difficulties in Europe caused an enormous increase in

[6] The gold discoveries in California were almost simultaneous with those in Australia. The average annual production of gold in the world from 1492 to 1850 was about $9,000,000; in the period from 1851 to 1860 the annual average increased to $133,000,000.—C. A. Conant, "History of Modern Banks of Issue," p. 637.

immigration to the United States.[7] Railroad expansion was more rapid than the growth of the country. In the nine years preceding 1857, over 20,000 miles of new railroads were constructed; in the year 1856 alone, 3,642 miles were completed.[8]

As the era of prosperity continued, business activity increased, and prices advanced. A fever of speculation ensued and the demand for bank loans was insatiable. A tightening

NEW RAILROAD MILEAGE CONSTRUCTED IN THE UNITED STATES, 1840–1900 *

Year	Mileage Increase	Year	Mileage Increase	Year	Mileage Increase
1840	516	1860	1,837	1880	6,711
1841	717	1861	660	1881	9,846
1842	491	1862	834	1882	11,569
1843	159	1863	1,050	1883	6,745
1844	192	1864	738	1884	3,923
1845	256	1865	1,177	1885	2,975
1846	297	1866	1,716	1886	8,018
1847	668	1867	2,249	1887	12,876
1848	398	1868	2,979	1888	6,900
1849	1,369	1869	4,615	1889	5,162
1850	1,656	1870	6,078	1890	——
1851	1,961	1871	7,379	1891	4,844
1852	1,926	1872	5,870	1892	3,656
1853	2,452	1873	4,097	1893	4,143
1854	1,360	1874	2,117	1894	2,899
1855	1,654	1875	1,711	1895	1,895
1856	3,642	1876	2,712	1896	2,053
1857	2,487	1877	2,274	1897	2,163
1858	2,465	1878	2,665	1898	2,026
1859	1,821	1879	4,809	1899	3,466

* "Statistical Abstract of the United States," 1919, p. 328.

of the credit market as early as 1854 gave warning of the necessity of the curtailment of credit. The warning passed unheeded, however, and the inevitable crash came in 1857. The failure of the Ohio Life Insurance and Trust Company on August 24, 1857, precipitated a panic. Prices dropped

[7] "In 1845, the number of immigrants to this country was 114,000; in 1847, 225,000; and in each of the five years after 1849 it was more than 350,000. More immigrants, in fact, came between 1845 and 1855 than in the preceding twenty-five years."—D. R. Dewey, "Financial History of the United States," p. 257.

[8] C. A. Conant, "History of Modern Banks of Issue," p. 637.

demoralizingly on the New York Stock Exchange, interest rates mounted enormously, specie payments were suspended by the Philadelphia and New York banks, and several large railroad companies went into receivership. As is usually the case when economic crises develop out of financial difficulties, the crisis of 1857 was not long continued. By the end of the year, conditions had regained a large degree of stability.

The crisis of 1873.—American commerce passed through tumultuous days between 1857 and 1873. The Civil War which lasted from 1861 to 1865 left many perplexing problems in the form of a tremendous increase in the national debt, and the monetary system of the country on a paper basis. The public energies turned from war to industry with such vigor that even a serious panic in England in 1866 failed to affect adversely American conditions.[9]

Railroad construction in the years following the Civil War was greatly increased. The average new mileage completed during the war was slightly over 1,000; in 1869, it increased to 4,953; in 1870, to 5,690; in 1871, to 7,670; and in 1872, to 6,167; or a total of 24,480 miles in four years. The increase in railroad construction naturally brought a corresponding gain in iron production, and in industry generally. Production was overstimulated from the viewpoint of both the actual requirements and the financial capacity of the country.

A marked stringency developed in the money market late in 1872 and continued with increasing emphasis into 1873. A few small bank failures early in September were followed by the failure of Jay Cooke and Company—a private banking house intimately connected with the Treasury Department—on September 18, 1873, and panic ensued. Bank runs compelled many financial institutions to close. Industry was profoundly affected; new railroad construction decreased to 2,117 miles in 1874 and 1,711 in 1875; foundries and mills practically ceased operations. Business prostration continued for six years—one of the darkest periods in the commercial history of the United States.

The crisis of 1884.—The economic disturbance of 1884 was of short duration. It is attributable almost entirely to speculative causes. European crop failures resulted in a heavy de-

[9] May 11, 1866—the day following the Overend, Gurney & Co. failure—has long been memorable in British financial history as "Black Friday."

mand upon American agricultural production with the result that the value of merchandise exports in 1881 was nearly $1,000,000,000. The large favorable trade balance brought a corresponding increase in gold imports which served as a basis for augmented bank loans. Stringency developed rapidly during 1884. The suspension of the Marine Bank in New York on May 5, 1884, was followed by several smaller failures. To meet the currency shortage, local banks and clearing houses formed associations which issued "clearing house certificates" which were acceptable in lieu of cash. The crisis, which was chiefly felt by the stock exchanges, passed rapidly and by the end of the year equilibrium had been reestablished.[10]

THE RATIO OF GOLD TO SILVER ACCORDING TO RELATIVE MARKET VALUES, 1840–1895*

Year	Ratio of Gold to Silver	Year	Ratio of Gold to Silver
1840	15.61	1875	16.58
1850	15.70	1876	17.87
1860	15.29	1877	17.22
1870	15.57	1878	17.94
1871	15.57	1879	18.39
1872	15.63	1880	18.04
1873	15.92	1885	19.39
1874	16.17	1890	19.77
		1895	31.57

* D. R. Dewey, "Financial History of the United States," p. 406.

The crisis of 1893.—The severe business depression which developed in the United States in 1893 was caused by two outstanding factors. The failure of Baring Brothers & Company in London caused British nationals to regard their foreign investments with large misgivings. Although the investments marketed through the house of Baring had been principally in Argentine, British investors were led to restrict their commitments in other countries, including the United States. Up to this time, English capitalists were content to leave their investments in this country undisturbed and even reinvested the interest payments. As a result of the Baring collapse, however, the English investors began to withdraw their commitments which required that large gold shipments be made

[10] C. Juglar, "A Brief History of Panics in the United States," p. 102.

from this country. Another reason which prompted this action was the bimetallic policy which was being followed by the United States Government.

Under legislation passed in 1873, the United States went on a gold monetary basis. The Bland-Allison Act which was passed in 1878 attempted to restore silver on a bimetallic basis with gold at the ratio of 16 to 1 but with limited success. The silver advocates, disappointed with the results of the Bland-Allison Act, succeeded in passing a more comprehensive measure in 1890 which was known as the Sherman Act. The attempt on the part of the Government to keep silver on a monetary equality with gold at a ratio far different from the relative market values resulted disastrously. Federal gold reserves were rapidly depleted, falling from $190,000,000 in 1890 to $80,000,000 in 1893. Public confidence in the monetary situation weakened, and reached its lowest ebb when the British Government closed the mints in India to the free coinage of silver in May of 1893.

The uncertainty in the monetary situation was quickly reflected in banking and industry generally. The failure of the Chemical National Bank in Chicago on May 9, 1893, precipitated a panic which became country-wide. With credit conditions extremely stringent, industry soon came to a standstill.[11] The repeal of the Sherman Act on October 30, 1893, was a belated attempt to rectify damage which had already been done. Business conditions recovered gradually, but it was close to 1896 before the effects of the crisis had definitely terminated.

The crisis of 1907.—The crisis of 1907 ended almost as quickly as it began. The cause was purely financial. Banking was still being conducted under legislation passed in 1863 under the emergencies of war times, which made the circulating currency dependent upon the volume of United States bonds outstanding. The banks of the country followed a policy of independence from each other rather than one of inter-

[11] "The production of coal, both anthracite and bituminous, fell off; the output of pig iron, which had been about 9,157,000 tons in 1892, fell to 6,657,000 tons in 1894; new railway construction almost ceased; in 1894 there were 156 railways, operating a mileage of nearly 39,000 miles, in the hands of receivers; among these were three great railway systems,—the Erie, Northern Pacific, and Union Pacific."—D. R. Dewey, "Financial History of the United States," p. 446.

dependence. Under reserve legislation, the surplus funds of the country found their way to New York at all times of the year except at the harvests, when the funds were withdrawn. Consequently each fall found credit conditions decidedly stringent with adverse effect upon business in general.

The credit situation in New York in the fall of 1907 was more difficult to handle than in previous years. This was due to the increase in speculative transactions during the year immediately preceding, and to the prevalence of credit stringency abroad as well as at home. The banks found their cash reserves perilously low and were obliged to curtail loans and to advance interest rates to extremely high points. The Knickerbocker Trust Company failed on October 22, 1907, and this failure was followed by those of other financial institutions. The banks eventually met the situation by issuing clearing-house certificates in various cities. Moreover, the close of the harvest brought a lessened strain upon the banks, and, by the end of the year, the critical phase was passed.

The crisis of 1920.—Although there had been a general expectancy that the close of the World War would bring a speedy termination to the feverish activity which prevailed during the hostilities, such was not the immediate result. The late winter and early spring months of 1919 witnessed a certain decline in business, but by the beginning of 1920 commercial conditions were more active than during the War. Practically all the barometers of business reflected unprecedented activity. A high degree of optimism prevailed with general confidence that no drastic reaction was in sight.

The index of manufacturing activity in January of 1920 stood at 115 per cent and by June had declined to 107 per cent, not a serious recession. Moreover, pig-iron production remained unchanged and unfilled steel orders showed a substantial increase. The index of wholesale commodity prices actually increased from 248 in January (233 revised) to 272 in May (247 revised). In these, the more popular barometers of business, there was little basis for apprehension in the situation as it stood in midsummer. The financial barometers were less assuring, however. The average rate on four to six months commercial paper advanced from 6 per cent in January to 7.75 per cent in June. The Federal Reserve discount rate at New York was raised to 6 per cent in January

and to 7 per cent in May. The Reserve ratio was reported at 42.2 per cent in May, or close to the legal minimum of 40 per cent.

By early fall it became obvious that the credit facilities of the country were inadequate to carry a large volume of current business and excessive inventories at high prices. Defla-

WHOLESALE PRICES OF SELECTED COMMODITIES IN 1920

	–Index Numbers–		——————Price per Pound——————			
Month	*Dept. Labor*	*Bradstreet*	*Silk*	*Wool*	*Cotton*	*Rubber*
Jan.	233	$20.36	$14.05	95¢	39.25¢	51.75¢
Feb.	232	20.87	16.85	95	39.15	51.25
Mar.	234	20.80	14.20	100	40.25	46.25
Apr.	245	20.71	13.50	95	41.75	46.75
May	247	20.73	9.45	95	41.50	42.00
June	243	19.88	6.75	85	40.00	39.00
July	241	19.35	6.80	72	39.25	35.50
Aug.	231	18.83	5.00	72	40.00	29.75
Sept.	226	17.97	5.00	70	30.25	30.00
Oct.	211	16.91	6.45	65	25.00	25.50
Nov.	196	15.68	6.30	62	22.50	21.50
Dec.	179	13.63	6.50	50	16.65	20.50

tion became imperative with the effect culminating unfortunately at the time of the year when the seasonal demand for credit was at its peak. With the sudden curtailment of credit, commodity prices dropped precipitously, adversely affecting both agricultural and industrial activity. A period of drastic depression ensued, resulting in an alarming degree of unemployment by the summer of 1921. It was not until well into 1922 that recovery was definitely under way.

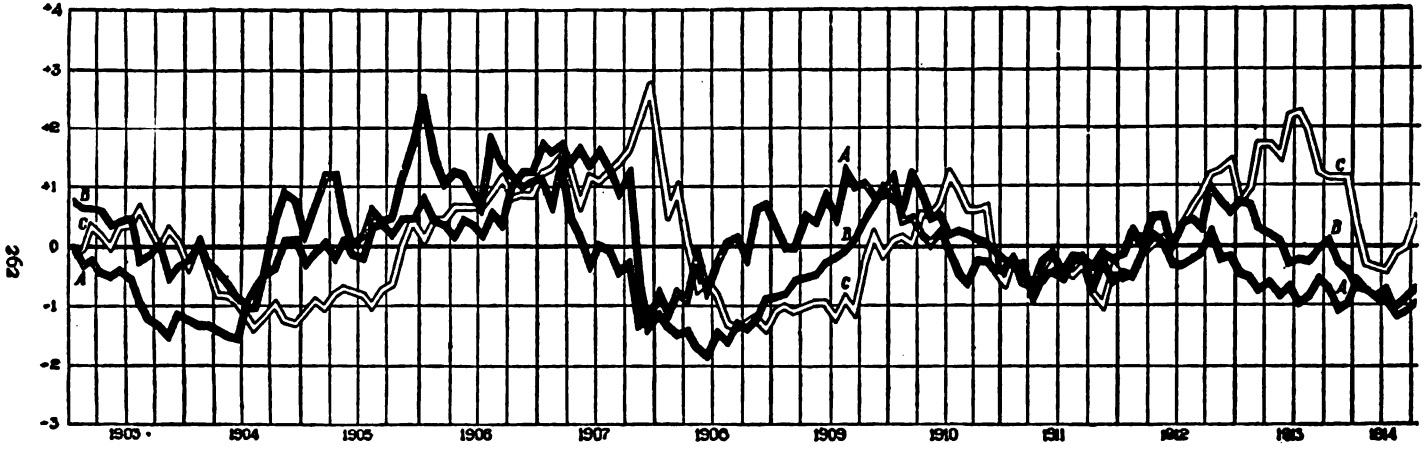
The effects of the crisis of 1920 were so disastrous that the question might well be raised, Is the country now immune from a repetition of that unfortunate experience? The answer is in the future, but there is reason to believe that many years must elapse before so drastic a crisis can recur. A wholesome respect for the cycle, growing out of greater knowledge of its causes and fluctuations, is causing business to keep within conservative bounds, especially in its advance commitments. While such practice continues, the variations of activity will not be great. But should the lure of large spectacular and speculative profits again get the upper hand, reaction must inevitably come with its accompanying painful adjustments.

APPENDIX

THE PROFESSIONAL ECONOMIC SERVICES

(Extracts from published literature prepared by the compilers of the respective services, giving in certain detail the basis of the system of forecasting employed.)

THE TEST-PERIOD INDEX, 1903–14



Curve A — Speculation
New York City bank clearings, prices of securities, averaged.

Curve B — Business
Wholesale commodity prices, bank clearings outside of New York City, pig-iron production, averaged.

Curve C — Money
Interest rates on commercial paper, loans and deposits of New York City banks, averaged.

1. HARVARD ECONOMIC SERVICE

PREPARED BY HARVARD UNIVERSITY COMMITTEE ON ECONOMIC RESEARCH, CAMBRIDGE, MASS.

The forecasts of the Harvard Economic Service are not based upon the theory that every cycle runs its course in the same length of time. Nor are its predictions based upon the assumption that for every action in business there is necessarily an equal and opposite reaction. Rather the forecasts are based upon the important economic discovery that there is an established sequence in movements in the speculative, business, and money markets which can be measured statistically, and shown graphically on an index chart.

The Index of Business Conditions on which the forecasts of the Harvard Service are based appears on the opposite page. This chart is the result of years of exhaustive study in the field of economic statistics and was constructed for the period 1903-14, to prove its dependability over a representative period of time before its release for commercial use. It is reproduced here to illustrate the fundamental principles on which the forecasting system rests.

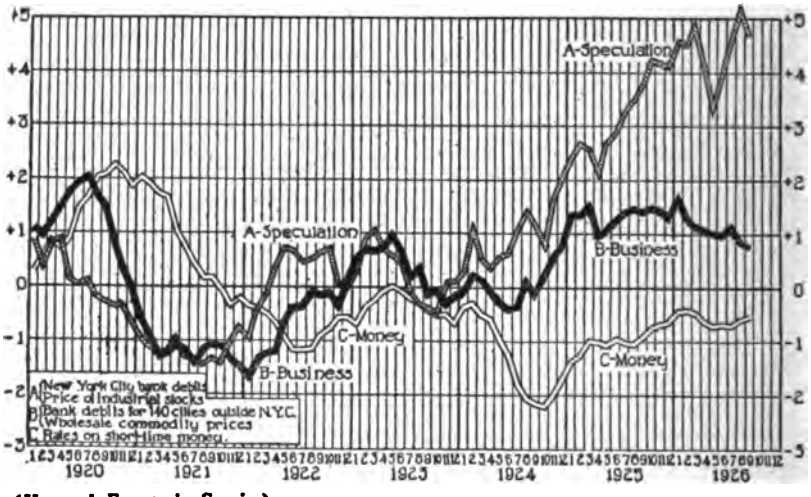
The Underlying Principle

It will be seen that logical and important relationships exist in the movements of the three curves recorded on this chart. First of all it is clear that there is an interval of several months between the movements of each of the three curves. It is further evident that the turning points, whether upward or downward, always come in the same order. The turning points in curve A, speculation, precede, either up or down, the turning points in curve B, business, by from six to ten months throughout the entire eleven years. Similarly the turning points in Curve B, business, precede the turning points in curve C, money, by from two to eight months. It is this

regularity in the sequence of the movements of the three curves which affords a logical and practical basis for scientific business forecasting. Curve A moves first, B second, C third—speculation, business, money.

The Index Forecasts Business for Eleven Years

The recession in commodity prices and business activity, curve B, which began in March, 1903, was clearly forecast in the fall of 1902 by the inauguration of a major downward



(Harvard Economic Service)

The Monthly Index Chart.

movement in security prices accompanied by advancing money rates. The recovery of business which began in the late summer of 1904 was anticipated by a reversal in the movements of the money and speculative curves of this chart. That is, the upward movement of speculation, curve A, and the downward movement of money rates, curve C, in the fall of 1903, was the signal that business would begin to revive within a period of from six to ten months.

The sharp decline of curve A, speculation, which began in November, 1906, accompanied by high money rates, clearly anticipated by ten months the sharp break in commodity prices and business activity which was inaugurated in the fall

of 1907. Again, the recovery of business which began in the early summer of 1908 was preceded by a reversal in the trends of curves A and C, the upward movement of speculation and the downward movement of money rates which began in the late months of 1907 providing a substantial basis for the forecast that within a period of from six to ten months business would begin to recover from the depression. Throughout the remainder of the period the same general relations continued to be maintained.

The Index also Forecasts Speculation

It will be observed that throughout the entire period of eleven years a progressive advance in business and commodity prices over a period of several months, followed by a persistent rise in interest rates, was the forerunner of a decline in security prices; and that after such a decline in security prices a decline in business of several months' duration when followed by a decline in money rates was the signal for a revival in speculative activity and advance in security prices.

The Current Index Chart

It is clear from an examination of the 1903-14 Index Chart that if this Index had been available at the time, the important changes of the eleven years which it covers could have been forecast with very great certainty. The current Index Chart presented on the opposite page is based upon the same fundamental principles as underlie the construction of the prewar chart explained in the preceding pages. Its record of performance since the beginning of the Harvard Economic Service in 1919 is noteworthy.

It will be seen from an examination of the current Index Chart that the interrelations of the three curves—speculation, business, and money—which obtained during the prewar period 1903-14 have not been altered despite the unprecedented business unsettlement which has prevailed. Immediately following the Armistice, curve B, measuring wholesale prices and business activity, declined sharply while curve A, speculation, moved in a sidewise direction until March, when

it turned abruptly upward, clearly signaling the tremendous business boom which began two months later.

The persistent rise of curve C, money rates, and the equally persistent decline in curve A, speculation, both movements beginning in November, 1919, forecast that a decline in commodity prices and business activity would be inaugurated by the summer of 1920. Liquidation began in the spring in certain industries that were in the weakest position and by summer the depression had become general.

In early 1921 the reversal of trend in money rates was followed first by increasing bond prices and in August, 1921, by advancing stock prices, these movements indicating that business was soon to enter the recovery phase of a new cycle. The pronounced downward movement of money rates and the equally pronounced advance in speculation, both movements beginning in the middle of 1921, clearly forecast that a period of business recovery and advancing prices would be inaugurated within a period of from six to ten months. This forecast, like the previous ones, had been fully confirmed by actual market conditions as reflected by the movement of curve B, business, of our Index Chart since early 1922.

Interpreting the Index Chart

In interpreting the Index of General Business Conditions on which the Harvard forecasts are based there are three factors to consider:

1. The direction of the movement of each curve in relation to the movements of the other curves.
2. The direction of the immediately preceding movements.
3. The magnitude of such movements.

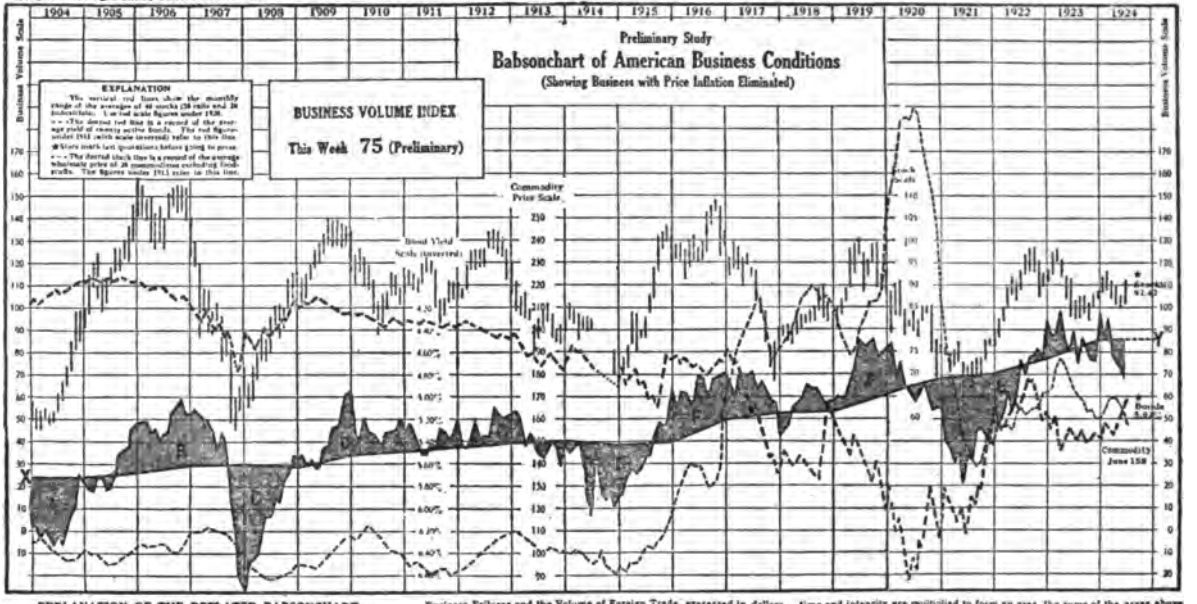
These points are of basic significance in forecasting because they indicate the precise phase of the business cycle and the phase which is in prospect.

Take for purposes of illustration the situation revealed by our Index Chart in the fall of 1919. Curve A, speculation, began to decline sharply. This downward movement was particularly significant for three reasons. First, it represented a reversal in the direction of the trend of security prices after one of the most persistent and most spectacular advances in stock prices on record. Second, it was accompanied by a

pronounced advance in curve C, representing money rates. Third, curve B, business, showed that commodity prices and business activity were approaching unhealthy levels.

The conclusions to be drawn from this combination of circumstances were first, that the downward movement of speculation, accompanied by advancing money rates, was the beginning of a major downward swing in security prices; and second, that the decline in speculation would be followed, after an interval, by a marked recession in commodity prices and industrial activity.

In order to determine the interval which was likely to intervene between the upward movement of money rates and the downward movement of security prices on the one hand and a major decline in commodity prices and business activity on the other, it was necessary to examine similar business situations during the period 1903-14. For example, a close correspondence between the relationships of the curves of our Index Chart in November, 1919, and similar situations during the eleven years preceding the war is revealed on our test-period Index Chart in the fall of 1902, the fall of 1906, the late summer of 1909, and in the early winter of 1912. A business depression followed these dates occurred from six to ten months after the beginning of a persistent advance in money rates and a pronounced decline in security prices. On the basis, therefore, of prewar experience, a major downward movement in commodity prices and business activity was forecast to begin from six to ten months after November, 1919, or some time between April and August, 1920.



EXPLANATION OF THE DEFLATED BABSONCHART

This study of the Babsonchart, deflated, is based as far as possible on the same subjects which make up the Babsonchart of Business Value. These subjects, treated to eliminate price inflation where depending on dollar values, are as follows: Check Transactions, Failures, Pig Iron Production, New Building, Domestic and Foreign Money Rates, Volume of Foreign Trade, Railroad Earnings and Crops. Stocks (Rails and Industrials), and an Index of Canadian Business Conditions are also included.

The purpose is to represent the volume of transactions, irrespective of any change in the general price level thruout the period, i.e., the volume of business expressed in physical units. Because of the difference in retail and wholesale price movements since 1913, we have used since that date a weighted price index in which both wholesale and retail price changes have been considered.

Business Failures and the Volume of Foreign Trade, expressed in dollars, are corrected by Bradstreet's Index of Wholesale Prices thro 1913 and by our weighted price index since that date. The proportion of price movement which will be reflected in Bank Clearings (or Check Transactions) has been estimated at 75%. Check Transactions (Bank Clearings before 1919) in this plot are therefore corrected by the weighted index adjusted to show three-quarters of the actual price movement. New Building, expressed as value of permits, has been corrected by the average of Babson's Building Materials Indices. Railroad Earnings are deflated to correspond with changes in railroad rates.

The same scale tables are used for the various subjects as in the Babsonchart of Business Value. The X-Y Line is located in the same way as in that Babsonchart, except that it is corrected to eliminate the effect of price changes.

The line X-Y represents the country's net gain or growth. Based on the economic theory that "action and reaction are equal" when the two factors of time and intensity are multiplied to form an area, the sums of the areas above and below said line X-Y must, over sufficiently long periods of time, be equal, provided enough subjects are included and properly weighted.

In our office studies each area is divided into halves by a narrow white line. This is to emphasize the fact that the first halves of Areas A, C and E are really reactions from the extravagance, inefficiency and corruption which existed during the latter half of the preceding "overexpansion" area. Contrariwise, the first halves of Areas B, D and F are really based upon the economy, industry and righteousness developed during the hard times just preceding. These lines are not drawn on the areas of overexpansion until those areas are completed, but are drawn on each depression area when said area equals one-half of the preceding area of overexpansion.

Further details as to how the Babsonchart is compiled and the X-Y Line located will be sent to any one on application. Questions are always welcomed.

2. BABSON'S REPORTS

PREPARED BY BABSON'S STATISTICAL ORGANIZATION, INC., BABSON PARK, MASS.

The Barometer Letter and Babsonchart

The Babson Cornerstone

If you will open the accompanying copy of the Barometer Letter and turn to the inner page, you will see the Babsonchart. This is the foundation of the Babson Reports and they should all be read with this in mind. The two principles on which the Service is built are as follows:

1. A combination of statistics on representative business subjects is an accurate barometer of business.
2. The Law of Action and Reaction applies to business as well as to the sciences.

Business Barometers

Some business men have a barometer or trade indicator by which they judge conditions. Many look at the figures on Pig Iron, on Crops, or on Bank Clearings, and say that business is bad or business is good. It is our belief, however, that no one subject taken alone can be a reliable indicator. For instance, we have had *good general business* in *poor crop years*. We have proved, however, that a composite of twelve representative subjects *does give an accurate picture of business conditions*.

Equal and Opposite Reaction

Isaac Newton discovered in Physics that for every action there is an equal and opposite reaction and showed that it applied throughout the universe. The tide ebbs and flows. The pendulum swings to the right and to the left.

In 1907 Roger W. Babson applied this law to Business. He charted new building figures and every other business barometer that had ever been considered. From this he showed that for every upward movement greater than the normal, there was a corresponding movement downward; *that for every boom,* there was a corresponding *period of depression;* and that the two counterbalanced each other. *The action and reaction were equal.*

The Law and the Babsonchart

If you will turn again to the Babsonchart, you will see how it illustrates this law. On the chart you see 7 areas of irregular outline shaded black, and lettered A, B, C, D, E, F, G. The upward areas are periods of good business; the downward areas are periods of depression. You will see that they *alternate.* As Mr. Dooley says of Panics, "Th' top iv good times is hard times an' the bottom iv hard times is good times." In other words, a period of overexpansion paves the period of depression. Out of the stagnation period in turn will come good business.

Business Cycles

A boom period and a depression together make a *cycle.* The first black area, A, is the second half of a previous cycle, the first of which is not shown. B and C together make a complete cycle; D and E another. We are now in area G,—a depression period. You will notice that each area is divided by a white line. This emphasizes the fact that each period is the reaction from the preceding area. The first half of area C—the first slump of depression—is the direct result of over-spending and the over-development of period B. The second half of C is momentum from the first half. The saving, thrift, and industry of this same time made possible the prosperity which followed in area D.

The X-Y Line

The base line across the Babsonchart from X on the left to Y on the right is the line of normal business growth for this country. It is not easy to say arbitrarily what this growth ought to be. After years of experiment, we have found that

the best indicator of the normal growth is bank clearings. The X-Y line is based primarily upon bank clearings.

Summary Figures from Week to Week

This is the way the Babsonchart is made: Month by month we take the published statistics on Business Failures, Bank Clearings, Labor, and the other barometers of business, and reduce them all to a common denominator or index figure. These index figures are then averaged together giving the *summary index figure.* The fluctuations of this summary figure from week to week determine the outline of the Babsonchart and indicate the relative position of business activity. The last point at the right is where we stand to-day.

Area Theory

The X-Y line is then located and the areas above and below the X-Y line are shaded black. The thing which counts in studying the chart is not alone the height of the areas above the line, or the length of time the area has run, *but these two factors taken together.* If you are going to carpet a floor, you do not take the width of the room alone, or the length of the room alone. You take the product of the two, or the *area.* In the same way we shade these areas black to show that they represent these two factors. The time alone does not count, and neither does the intensity alone. It is the product of the two which is important.

Area B is not so high as Area C but it is longer. As a result, the two areas are practically equal. Period D lasted longer than period E, but was not so intense. But the space they occupy is very nearly the same. After a period of prosperity we know that we shall have an area of depression of equal size, but the Chart does not tell what shape the area will be.

Stocks, Bonds, and Commodities

You will find on the Babsonchart also separate records in chart form on the following: (1) The rallies and decline of forty active stocks, a solid red line; (2) the average yield of

twenty bonds, a broken red line; (3) the average wholesale price of certain commodities, a broken black line. Each subject is charted on a scale of its own, but bears a definite relation to the Babsonchart in point of time.

Many Kinds of Charts

The idea of the Babsonchart originated with Roger W. Babson. Others to-day are working out similar charts on much the same plan. We are glad to notice that while many of these other statisticians are using different methods of approach, their results are almost identical with the original Babsonchart.

Weekly Message

The framework of the Barometer Letter is the Babsonchart. The meat of it is the Babson organization's weekly message, which gives its views on the current situation and its forecasts of what is to come. Our organization of 300 people is every day drawing up the threads of the complicated business fabric. Thus the organization is in an unequaled position to see the pattern as it develops, to look ahead to its future, and to tell you what it sees.

3. BROOKMIRE ECONOMIC SERVICE

PREPARED BY THE BROOKMIRE ECONOMIC SERVICE, INC., NEW YORK CITY

In this particular barometer there are four factors used in the construction of the fundamental forecasting composite. A large number of other factors which seem logically to have connection with the movements we are seeking to forecast were mathematically tested, but these are the four factors which, when mathematically tested, proved to have a close correlation with the changes in Bradstreet's index of commodity prices. These factors are:

1. *Physical volume of production in primary basic industries.*—The people of any given country tend over a long period of years to establish a standard of living which becomes almost a habit, and when the physical volume of commodities moving into the domestic market is greater than necessary to maintain that standard of living, we should expect (other things being equal) that goods will accumulate in the warehouses and on the shelves of producers and distributors, and that this condition will bring about liquidation. This condition is measured by a composite of various measures of physical volume of activity in physical units, no monetary measures being involved.

The raw figures for this factor are those for pig iron production, steel ingot production, lumber cut, and cotton consumption, each figure of the series being for a calendar month. There are other industries, such as the motor industry, which are fully as important as the ones used, but which are purposely omitted, because, by actual statistical tests, their figures are indexes or "thermometers" of current business rather than "barometers" forecasting coming movements. The same is true of figures covering railway transportation or shipping. It is the belief of the writer that it would be desirable to include the consumption of power units but, to date, the statistical problems of combining coal figures, oil figures and elec-

trical power units into a composite have not been satisfactorily solved.

2. *Ratio of imports to exports.*—If merchandise imports are exceptionally heavy relatively to merchandise exports this has the same effect as an exceptionally heavy volume of domestic goods coming to market. Conversely, if exports are heavy relatively to imports the effect is the same as that of a small volume of domestic commodities coming to market. This factor is tested by the ratio of import values to export values, a six months' sliding average being used to obviate meaningless monthly fluctuations. It will be noted that this measure is not expressed in monetary values, but it is a ratio for which monetary values are divided by monetary values, thus automatically removing the effect of inflation or deflation.

3. *Turnover of bank deposits.*—The people of any country would always be glad to live beyond their regular standard if they had the requisite purchasing power, and sometimes when such purchasing power is available they do live beyond their average standard for months or even years at a time. Conversely, it is always possible to fall below the regular standard, in case of necessity, without coming to the actual starvation point. And for months or even years at a time, when purchasing power is low, such a temporarily lowered standard of living does exist. The point then is to find a symptom of the time when purchasing power will permit or compel, as the case may be, a return to more normal conditions, and we seek a ratio which will measure the relationship between purchasing power in existence and that necessary to keep up the current standard of living whether it be above or below the average. To do this we turn to Professor Fisher's suggestion. It is impossible to measure in any consecutive and satisfactory way the speed at which actual cash is being circulated, but the turnover of bank deposits through a clearing house can be obtained every week, and it is evident that in a commercially organized country the greater factor in purchasing power is bank deposits rather than cash carried in the pockets of the population. Therefore, we measure this by the ratio between the average clearings of clearing house banks and trust companies each week and the deposits of the same banks and trust companies. When that is higher than the average, after allowances for seasonal variation, existing

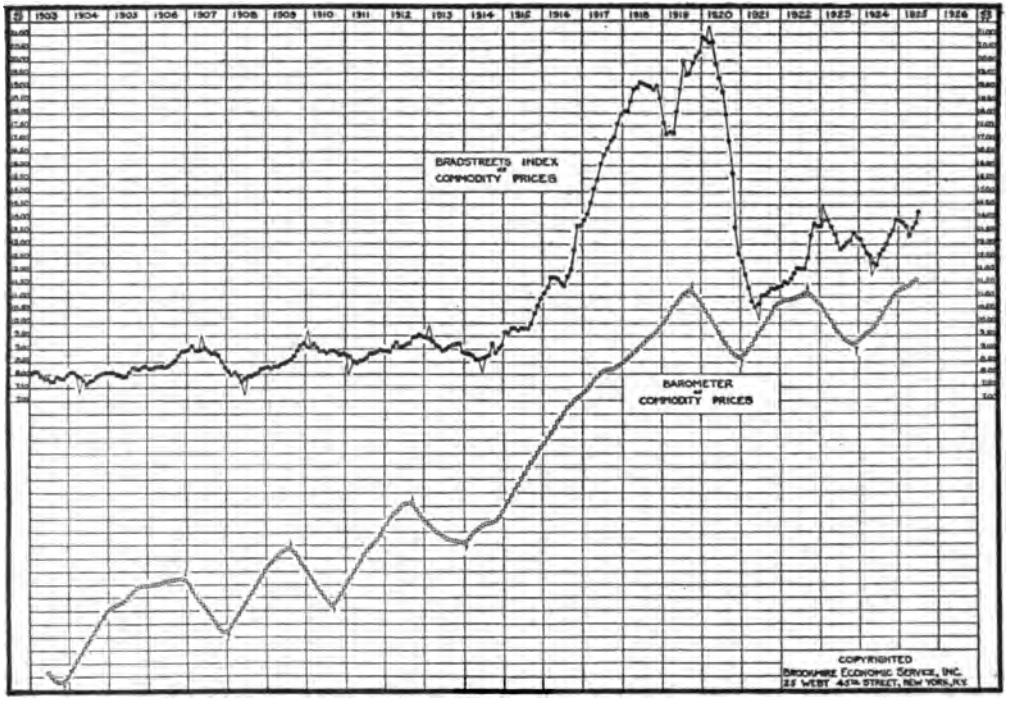


CHART NO. 9

BAROMETER OF COMMODITY PRICES

The arrows on the Barometer indicate the month of change from a favorable to an unfavorable position and *vice versa*.

The bases of the triangles on Bradstreet's Index of Commodity Prices include the fourth, fifth and sixth month after the month of change in the Barometer.

The Brookmire Chart.

purchasing power is being overworked and (other things being equal) a period of liquidation may be expected. Conversely, if it is lower than the average then savings are being accumulated from current incomes and a period of expanding prices first of stocks and then of commodities is in prospect.

The raw figures for this factor are taken from the statements of the New York Clearing House, the significant figure for each week being the quotient of the clearings divided by the average daily deposits of the same week. This figure is subject not only to a fairly regular seasonal variation but also to meaningless weekly variations. The figures are corrected for seasonal variation and the erratic weekly tendency obviated by the use of a three months' sliding average.

4. *Commercial paper rates.*—The deposits of any bank are not a rigid number of dollars, but can be increased or decreased as the bank expands or contracts its loans, since most of the deposits are only loans in another form. Therefore, in great constructive periods of activity the population of a country, by a steady increase of credit accommodations, may continue to spend more than their current income for months and even for years at a time. There comes a time, however, when this increase reaches the limit and loans must be liquidated. The approach to that point is always heralded by a sharp rise in the rates for commercial loans; therefore, we measure its approach by the rate on commercial paper.

The raw figures for this factor are the rates on four to six months prime commercial paper in New York City. Its favorable or unfavorable significance is a matter not only of height but also of immediately preceding direction of movement. For illustration, 5 per cent has been the normal or average rate on such paper for as many years as its quotations can be traced with accuracy. Therefore we might arrive at a theoretical conclusion that a 5 per cent commercial paper rate invariably carries a neutral forecasting significance. Practical experience, however, shows that a 5 per cent rate reached by an upward movement from 4½ per cent, or from any other rate lower than 5, is really of unfavorable significance, while a 5 per cent rate reached by a downward movement is really a favorable factor. Similarly a 6 per cent rate reached by a rising movement carries a greater unfavorable significance

than 6 per cent reached by a falling movement, and the favorable significance of a 4 per cent rate is greater or less according to whether that level has been reached by a falling or a rising movement. In order to make allowance for this condition the commercial paper rate factor in this barometer is made up as a series which in itself is an average of the coincident items of two series, one of which is the height of commercial paper rates dispersed from 5 per cent as a normal and the other the direction and extent of movement of that rate dispersed from 100 per cent as a normal. In each series the individual items for months are a sliding average based on the actual figures of three months. When the combined position for a single month is above normal the significance is unfavorable; when below, it is favorable.

Weighting of Factors

The matter of assigning weights to these factors for the construction of a composite opens up a whole field of technical discussion. It could not be covered in the space limits of this book and, if the space were taken, much of the discussion would be unintelligible to the general reader. Briefly, various weights suggested by reason have been subjected to statistical tests and the scale showing the best correlation with actual price movements has been adopted. That weighting is:

1. Physical volume of primary basic production, 1 weight.
2. Import-export ratio, 3 weights.
3. Turnover of bank deposits, 1 weight.
4. Commercial-paper rates, 2 weights.

Under certain conditions additional weight is assigned to the first and third factors for the following reasons:

1. When a downward movement of commodity prices has actually started it very seldom stops until the volume of domestic production has fallen below normal. Hence in such a situation an unfavorable (above normal) position of that factor is given triple weight.

2. When an upward movement of commodity prices has actually started, it very rarely stops until bank deposits have turned over at more than a normal rate for several months. Hence in such a situation a position of that factor below normal is given triple weight.

The composite resulting from this weighting is shown in Chart No. 9. With it is shown a graph of *Bradstreet's* Index of Commodity Prices in order to illustrate the correlation.

The arrows on the Barometer indicate the month of change from a favorable to an unfavorable position and vice versa.

The bases of the triangles on *Bradstreet's* Index of Commodity Prices include the fourth, fifth and sixth months after the month of change in the Barometer.

Correlation with Commodity Prices

When the composite of these factors crosses the neutral zone from a favorable to an unfavorable position the upward movement of commodity prices as shown by Bradstreet's Index will, on the average, reach its highest point five months later. The same lag prevails between a favorable crossing of the neutral zone and the bottom of a downward price movement. In actual practice the high or low point of prices occurs with a four or with a six months lag fully as frequently as with a five months lag. Therefore it is best to say that the turn of commodity prices will lag four to six months after the turn of the accumulated Forecasting Line.

The manufacturer or merchant has then at least four months' warning during which he may increase or decrease inventory before the change in direction of the commodity price movement occurs. Usually he will have five months, and in some cases six months' warning can be given. When the lag has been six months the damage to those who finished the operation in four months has rarely been large, and when the lag is only four months the damage to those who required six months for the operation has not been much larger.

4. FRANKLIN STATISTICAL SERVICE

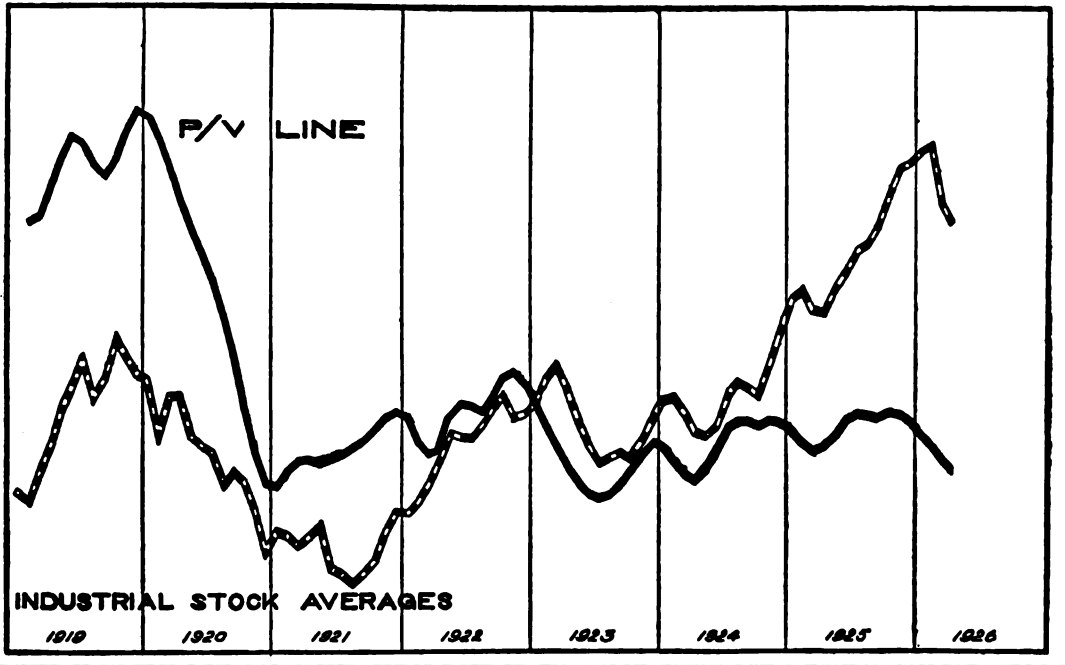
PREPARED BY FRANKLIN STATISTICAL CORPORATION, NEW YORK CITY

In forecasting the general trend of business this Service proceeds on the basis developed in the New York University Bureau of Business Research under the direction of Dr. Lewis H. Haney. The methods used have been in successful operation for several years and have been adopted by the Franklin Statistical Service as the best available, certain refinements being made to adapt them better to the special purpose of forecasting stock market trends.

The chief statistical device is the "P-V Line," which is believed to be the best barometer of business and industry yet invented. This barometer forecasts the trend of commodity prices and industrial earnings. (We consider the trend of commodity prices to be the most important single factor in determining business conditions.)

When two forces combine to produce a known result, and one of the forces is known and measured, the amount of the other force can be determined by comparing changes in the known force with accompanying changes in the result, and noting how the result varies from that which the known force alone would cause. The difference must be due to changes in the unknown force. The P-V Line is based on the theory that demand and supply determine prices, and that, by comparing the changes in supply (known) with those which occur in prices (known), the changes in demand can be determined. In other words, by taking the ratio of price (the result) to quantity supplied (one of the forces determining price), there is revealed the strength of the other determinant, or demand. P stands for price and V for physical volume. The ratio, P:V, as it changes from month to month, shows the trend of the demand factor.

In the past, the P-V Line has usually forecast the trend of business by about five months. The stock market is also



The heavy black curve is the P/V Line, or ratio of commodity prices to the physical volume of trade. The other curve is the average price of 201 industrial stocks, as compiled by the Standard Statistics Co. Comparison of the two curves will show that the P/V Line generally anticipates turns in the stock market by several months. It touched bottom in December, 1920, fully six months before the stock market. It then rose to a minor peak in December, 1921, followed by a corresponding peak in the stock market in May, 1922. Two succeeding slumps in the P/V Line anticipated similar breaks in the market. The bottom of the 1923 decline in the P/V Line occurred three months ahead of the low point in stocks, and the upturn in 1924 forecast the stock market by a similar space of time. The break in stocks last February was clearly anticipated. Other barometers developed by the Franklin Service check or supplement the P/V Line.

The Franklin Chart.

a barometer which anticipates the trend of business. If, therefore, any other barometer anticipates the trend of business sooner than the stock market, it thereby becomes a stock market forecaster. This is exactly what the P-V Line does. It reflects the approach of business ups and downs sooner than the stock market does. In short, it forecasts the general trend of stock prices.

This is demonstrated by the accompanying chart, which shows side by side the P-V Line and the trend of the stock market during the last six years. It will be noted that all the major moves of the stock market average are anticipated by turns in the P-V Line.

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