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Chapter Title: Group Characteristics of Measures of Cyclical Price Movements

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One point calling for comment is the fact that none of these distributions falls in the heterotypic area. This is in sharp contrast to the situation portrayed by Figures 43 and 48, relating to distributions of price relatives. Of 190 distributions of price relatives which were analyzed in detail, 90 (47 per cent of the total) were heterotypic. There is reason to think that heterotypic distributions contain certain elements of instability, that the populations to which such distributions relate do not cohere as closely or are not as homogeneous as are populations from which distributions of more orthodox types are drawn. Judging from this evidence one would conclude that prices are least stable, are most exposed to the influence of unbalanced and disruptive forces, in respect to the degree of change between specific dates. Distributions which are much more stable, when tested in terms of their positive moments, are secured when the population of prices is sampled in regard to general variability, or in respect to the rates at which prices change over a period of years.[1]

## II  Group Characteristics of Measures of Cyclical Price Movements

A number of measures dealing with the behavior of commodity prices during cycles in general business have been described in the first chapter. These measures may be combined in various ways in a study of the price aspects of the business cycle. The timing, the duration and the magnitude of price changes during these cyclical swings may be studied, the emphasis being upon general tendencies and averages, rather than upon the behavior of individual price series. Each cycle may be studied as a unit and compared with other cycles in this analysis, or the average behavior of commodity prices, in combination, in all cycles, may be investigated. The detailed discussion of individual cycles may be preceded by a general survey of the price movements which have occurred during the cycles covered in the present study.

[1] It is important to note, however, that these latter distributions, which are stable when judged with reference to the probable errors of the descriptive statistics, contain many representatives of the families of U-curves and J-curves. (All the distributions of measures of frequency of price change are of the U-type, and all the distributions of measures of monthly price variability are of the J-type.) Most distributions of this type, it has been contended by R. A. Fisher, lie outside the area within which the method of moments may be efficiently applied in deriving from a sample information concerning a general population. In particular, it is questionable whether the first and second moments (as used in deriving means and standard deviations) furnish valid bases for generalization. Accordingly, although our constants may not be characterized by infinite probable errors when we sample the population of prices in respect to the attributes at present under discussion, other difficulties are encountered when we apply familiar methods to these samples. The outline of an alternative method appears in the memoir by R. A. Fisher which has been previously cited. ("On the Mathematical Foundations of Theoretical Statistics," *Phil. Trans. of the Royal Society*, Vol. 222A)

## 1. The Extent of Commodity Price Changes during Business Cycles

It is a matter of interest to determine the extent to which individual commodity price series are affected by the cyclical swings of general business. The following summary shows how the 209 price series included in the study of cyclical movements have behaved during each of the ten cycles which occurred in the United States between the revival of 1892 and the revival of 1924. In classifying the behavior of a given commodity during a specific cycle, account has been taken of the entries relating to a period of revival and to the succeeding period of recession. Thus if specific dates are recorded for an up-turn during revival and for a down-turn during the succeeding recession, a commodity is classed as having passed through a complete cycle. The periods are listed in section IV of Chapter I. The data relating to separate cycles are plotted in Figure 58.

TABLE 126

Percentage Classifications of 209 Commodity Price Series, Showing their Behavior during Each of Ten Business Cycles

| (1) Terminal dates of cycle | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|
| | Percentage of total number of commodities | | | | | | |
| | Passing through complete cycle | Constant during cycle | Rising during cycle | Sagging during cycle | Sharing in revival but not in following recession | Sharing in recession but not in preceding revival | All other[1] |
| Low of 1892 to low of 1895 | 66.5 | 7.2 | | 16.3 | .5 | 7.6 | 1.9 |
| Low of 1895 to low of 1897 | 69.4 | 11.0 | | 13.9 | 1.4 | 3.8 | .5 |
| Low of 1897 to low of 1901 | 78.0 | 3.8 | | | 17.7 | .5 | |
| Low of 1901 to low of 1904 | 65.1 | 6.7 | .5 | 1.4 | 12.9 | 11.0 | 2.4 |
| Low of 1904 to low of 1908 | 71.3 | 6.7 | | 1.4 | 8.1 | 11.5 | 1.0 |
| Low of 1908 to low of 1911 | 70.3 | 11.5 | | 2.4 | 8.6 | 5.8 | 1.4 |
| Low of 1911 to low of 1914 | 67.0 | 12.4 | | 2.9 | 12.0 | 3.8 | 1.9 |
| Low of 1914 to low of 1919 | 75.6 | | 2.9 | | 19.1 | 2.4 | |
| Low of 1919 to low of 1922 | 76.1 | | 1.4 | .5 | 1.9 | 19.1 | 1.0 |
| Low of 1922 to low of 1924 | 71.3 | 4.8 | | 4.8 | 16.2 | .5 | 2.4 |
| Percentages based on totals for 10 cycles | 71.1 | 6.4 | .5 | 4.3 | 9.9 | 6.6 | 1.2 |

[1] This category includes those not sharing in revival or recession but with mixed behavior during these phases, as sagging during revival and constant during recession.

In interpreting these figures the qualifications concerning the procedure which were mentioned in the first chapter should be borne in mind. Perhaps the most important of these, from our present view point, is that no attempt has been made to isolate cyclical movements from secular, seasonal and accidental changes. It is certain, therefore, that changes of the latter types are to some extent reflected in the summary given above. Moreover, movements in the prices of certain agricultural products which are affected by conditions not immediately related to business changes are included in the price fluctuations here tabulated. Yet all these changes, attributable to whatever factors, are of concern to business men, and there is justification for taking account of them in a description of price movements during business cycles.

## FIGURE 58

THE BEHAVIOR OF COMMODITY PRICES DURING BUSINESS CYCLES.

Percentage Distributions of 209 Commodities Classified according to Behavior during Ten Business Cycles.
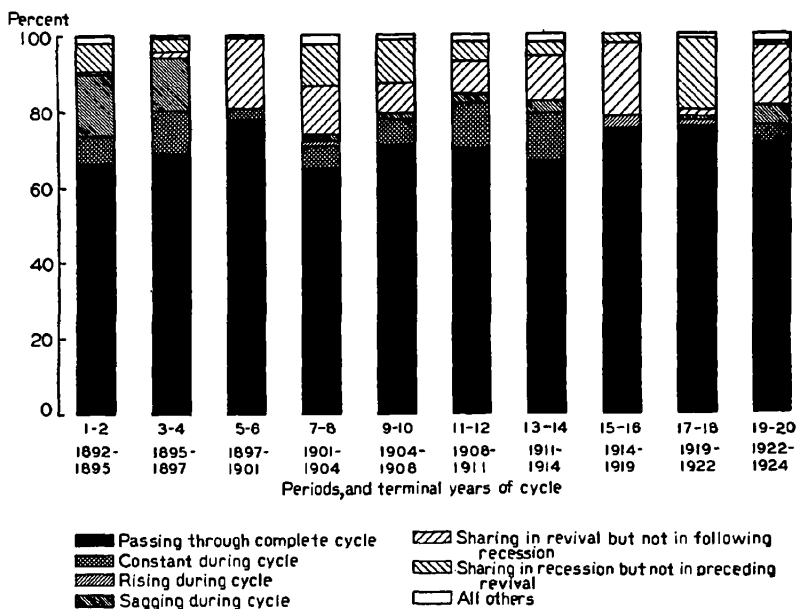


The proportion of commodities recorded as passing through the complete cycle varies from 65.1 per cent of the total, in the cycle from 1901 to 1904, to 78.0 per cent of the total, during the

cycle which began with the general price recovery of 1897 and culminated in the recession of 1900. The percentages for the cycles of 1914 to 1919, and of 1919 to 1922, are very close to this latter figure. The average for all ten cycles (computed from the absolute total, not from the percentages) is 71.1 per cent.

These figures are significant in several respects. It is a noteworthy fact that during every cycle some 70 per cent of all commodities experience price changes which have some connection in time with the cyclical turns in general business activity. The rough equality of the percentages for the separate cycles may be remarked.[1] This equality is doubtless due in part to the presence in any group of wholesale price series of a considerable number of highly variable series, which would be listed as passing through every cycle. The existence of such a body of variable price series is, of course, a fact of some importance. Material additions to this group, such as are found in the entries for the cycles beginning in 1897, in 1914 and in 1919, reflect deep disturbances, since they are due to fluctuations in the more stable price series which are not normally affected by the cycles in general business. The magnitude of these disturbances is greater than is indicated by the increases in the percentages listed in the table.

The proportion of commodities remaining constant in price throughout a complete cycle has averaged 6.4 per cent. In two cycles, those which ran their courses between 1914 and 1922, there were no commodities which were constant. The average proportion rising throughout given cycles has been .5 per cent, while the average proportion sagging has been 4.3 per cent. This latter figure has risen as high as 16.3 per cent, in the cycle between 1892 and 1895.

In the cycle which began in 1892 only .5 per cent of the commodities shared in revival but not in recession. This percentage reached 19.1 in the cycle beginning in 1914. The average percentage in this category, for all cycles, was 9.9. The proportion sharing in recession but not in revival varied between precisely the same limits, but the average has been only 6.6 per cent.

The entries on any one line of the above table provide a complete account, in summary, of the behavior of prices during a given cycle. A cycle-by-cycle study of these figures throws light on certain

[1] This equality would be broken if the short recession of 1919 and the ensuing revival were to be ignored. Approximately 95 per cent of the total number of commodities would then be listed as having passed through a cycle extending from a low in 1914 to a low in 1922.

interesting differences between cycles. Further comment here is unnecessary.

Somewhat more detailed information concerning price behavior during the cycle may be derived from a separate study of the phases of revival and recession. In Table 127 are shown the number of commodities for which a specific low date was recorded for each of the 11 periods of revival studied, the number classed as *constant* in price, the number *rising* and the number *sagging* in price during each of these periods. The number in each category is also expressed as a percentage of the total. The percentage distributions of commodities among the classes designated above are shown graphically in Figure 59

The proportion of commodities sharing in revival fluctuates somewhat from cycle to cycle, averaging approximately 80 per cent of the total. The smallest percentage is 67.0, recorded for the revival in period 1 (reference date May, 1892), and the next smallest is 67.4 for the revival in period 21 (reference date June, 1924). [If we include among those sharing in revival the commodities which were rising (i. e., continuing a rise which had begun prior to the revival in question) the figure for period 21 is raised somewhat. To get a true measure of the pervasiveness of a given revival the commodities classed as rising should probably be combined with those for which a definite low date has been recorded.] The revivals which were most widely reflected among commodity prices were those of period 5 and period 15, in each of which approximately 95 per cent of all commodities are recorded as sharing in revival. The former period, centering at May, 1897, marked the beginning of a sustained price advance which continued at a fairly regular rate until the price disturbances of the war years developed. The latter, centering at November, 1914, is the revival which culminated in the sharp advances of the war period. To the figure for period 15 might be added 4.8 per cent, representing commodities which were rising throughout this period, giving a total of 99.5 percent as the proportion which actually moved upward in price at this time.

There are considerable variations from period to period in the proportion of commodities falling in the other main classes The group of commodities listed as sagging is relatively large in periods 1 and 3 (18.7 and 13.9 per cent of the total), and then becomes negligible until the last two periods. The group classed as rising first becomes appreciable in period 7, centering at July, 1901, but

TABLE 127

CLASSIFICATIONS OF 209 COMMODITY PRICE SERIES, SHOWING THEIR BEHAVIOR DURING EACH OF ELEVEN PERIODS OF REVIVAL[1]

| Nature of entry | Period 1 | | Period 3 | | Period 5 | | Period 7 | | Period 9 | | Period 11 | | Period 13 | | Period 15 | | Period 17 | | Period 19 | | Period 21 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Per-cent | No. | Per-cent | No. | Per-cent | No. | Per-cent | No. | Per-cent | No. | Per-cent | No. | Per-cent | No. | Per-cent | No. | Per-cent | No. | Per-cent | No. | Per-cent |
| Low date recorded | 140 | 67.0 | 148 | 70.8 | 200 | 95.7 | 163 | 78.0 | 166 | 79.4 | 165 | 78.9 | 165 | 78.9 | 198 | 94.7 | 163 | 78.0 | 183 | 87.5 | 141 | 67.4 |
| Constant | 28 | 13.4 | 32 | 15.3 | 9 | 4.3 | 30 | 14.4 | 22 | 10.6 | 35 | 16.8 | 30 | 14.4 | 0 | 0 | 2 | .9 | 15 | 7.2 | 34 | 16.3 |
| Rising | 2 | .9 | 0 | 0 | 0 | 0 | 12 | 5.7 | 18 | 8.6 | 3 | 1.4 | 8 | 3.8 | 10 | 4.8 | 43 | 20.6 | 0 | 0 | 13 | 6.2 |
| Sagging | 39 | 18.7 | 29 | 13.9 | 0 | 0 | 3 | 1.4 | 3 | 1.4 | 6 | 2.9 | 6 | 2.9 | 1 | .5 | 1 | .5 | 11 | 5.3 | 20 | 9.6 |
| No quotation | | | | | | | 1 | .5 | | | | | | | | | | | | | 1 | .5 |
| Totals | 209 | 100.0 | 209 | 100.0 | 209 | 100.0 | 209 | 100.0 | 209 | 100.0 | 209 | 100.0 | 209 | 100.0 | 209 | 100.0 | 209 | 100.0 | 209 | 100.0 | 209 | 100.0 |

[1] For a definition of the periods here listed see p. 81.

FIGURE 59

THE BEHAVIOR OF COMMODITY PRICES DURING REVIVAL.

Percentage Distributions of 209 Commodities Classified according to Behavior during Eleven Periods of Revival.
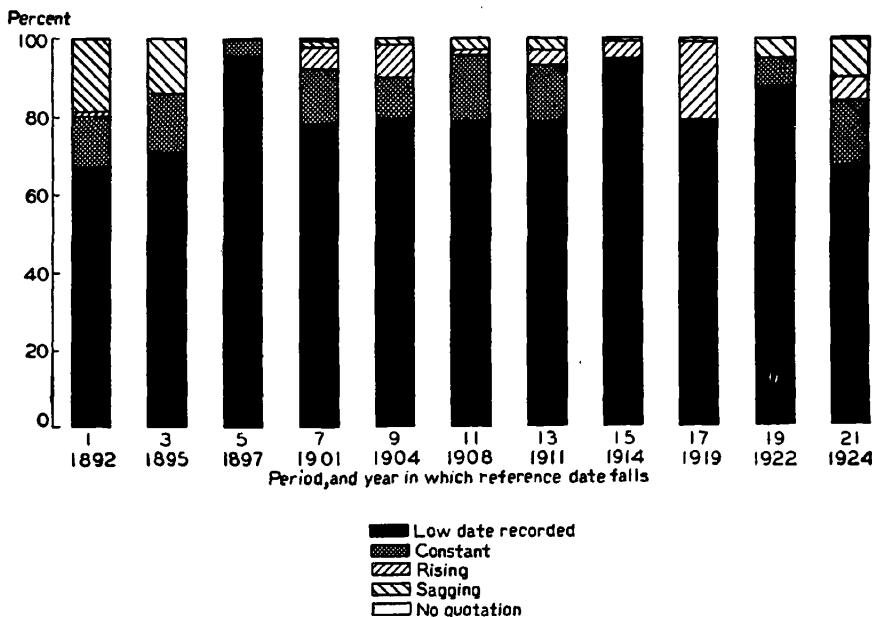


does not constitute a significant proportion of the total until period 17, centering at February, 1919. About 20 per cent of the total number of commodities rose in price throughout the recession of period 16 and the revival of period 17. The group which is constant in price during revival varies from 4 to 17 per cent of the total, except in two periods. It disappeared altogether in period 15, and amounted to but 1 per cent of the total in period 17.

Table 128 contains information relating to price behavior during business recessions, arranged in a form comparable to that of the preceding table. The percentage distributions of the commodities tabulated are shown graphically in Figure 60.

The percentage of commodities passing through definite recessions varies from cycle to cycle, being between 70 and 80 per cent of the total during most of the periods covered. It exceeds 80 per cent only in period 10 (which centers at October, 1907) and in period 18 (centering at May, 1920). In the second of these periods

TABLE 128

CLASSIFICATIONS OF 209 COMMODITY PRICE SERIES, SHOWING THEIR BEHAVIOR DURING EACH OF TEN PERIODS OF RECESSION[1]

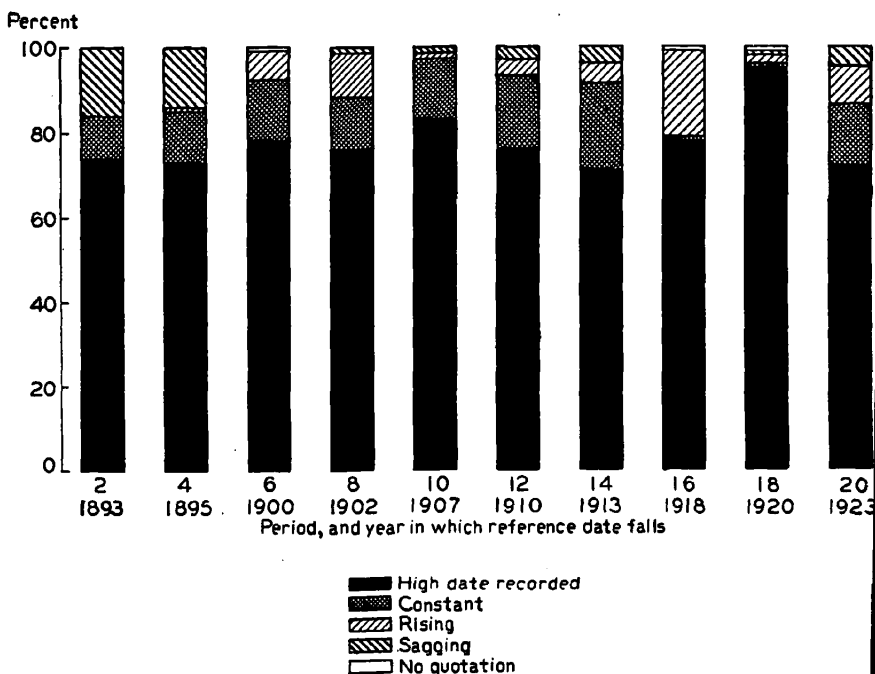| Nature of entry | Period 2 | | Period 4 | | Period 6 | | Period 8 | | Period 10 | | Period 12 | | Period 14 | | Period 16 | | Period 18 | | Period 20 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Per-cent | No. | Per-cent | No. | Per-cent | No. | Per-cent | No. | Per-cent | No. | Per-cent | No. | Per-cent | No. | Per-cent | No. | Per-cent | No. | Per-cent |
| High date recorded | 155 | 74.1 | 153 | 73.2 | 164 | 78.4 | 159 | 76.1 | 173 | 82.8 | 159 | 76.1 | 148 | 70.8 | 163 | 78.0 | 199 | 95.2 | 150 | 71.8 |
| Constant | 20 | 9.6 | 25 | 12.0 | 29 | 13.9 | 25 | 12.0 | 30 | 14.4 | 36 | 17.2 | 43 | 20.6 | 1 | .5 | 1 | .5 | 31 | 14.8 |
| Rising | 0 | 0.0 | 1 | .5 | 15 | 7.2 | 22 | 10.5 | 3 | 1.4 | 8 | 3.8 | 10 | 4.8 | 43 | 20.6 | 5 | 2.4 | 18 | 8.6 |
| Sagging | 34 | 16.3 | 30 | 14.3 | 0 | 0 | 3 | 1.4 | 3 | 1.4 | 6 | 2.9 | 8 | 3.8 | 0 | 0 | 1 | .5 | 10 | 4.8 |
| No quotation | | | | | 1 | .5 | | | | | | | | | 2 | .9 | 3 | 1.4 | | |
| Totals | 209 | 100.0 | 209 | 100.0 | 209 | 100.0 | 209 | 100.0 | 209 | 100.0 | 209 | 100.0 | 209 | 100.0 | 209 | 100.0 | 209 | 100.0 | 209 | 100.0 |

[1] For a definition of the periods here listed see p. 81.

it reaches 95.2 per cent.  The recession of 1920 was, of course, the most pervasive of those through which American business has passed within the period here covered.

FIGURE 60

THE BEHAVIOR OF COMMODITY PRICES DURING RECESSION.

Percentage Distributions of 209 Commodities Classified according to Behavior during Ten Periods of Recession.



Period, and year in which reference date falls

High date recorded
Constant
Rising
Sagging
No quotation

Sagging prices constituted a noticeable proportion of these entries during the first two periods only, when they amounted to 16.3 per cent and 14.3 per cent of the total.  Commodities marked by constant prices during recession have made up from 10 per cent to 20 per cent of the total, except during periods 16 and 18 (centering at September, 1918, and May, 1920), when they amounted to but one half of 1 per cent of the total.  Commodities which rose in price during recession constituted over 20 per cent of the total in period 16 (centering at September, 1918).  At other periods the number in this group has never exceeded 10.5 per cent of the total.

The story of price behavior during recession which these figures tell differs in details from that relating to revival, but the general account is much the same.  Prices of the large bulk of commodities are affected to some extent during general business revivals and recessions.  There remains, except during the most widespread movements, a considerable group of commodities which are unchanged in price during these cyclical swings, or which continue upward or downward movements which were under way prior to the coming of specific cyclical phases.

## 2. COMPARISON OF PRICE CYCLES, 1890-1925, IN RESPECT TO THEIR MAJOR CHARACTERISTICS

a.  *The Timing of Revival and Recession in Commodity Prices.*  A comprehensive view of the upward and downward turns in commodity prices may be gained from a study of the distributions in Table 129.  Each of these includes 1110 individual observations on the timing of price movements during cyclical turns, the observations relating to 149 commodities during the ten cycles which occurred between 1890 and 1925.[1]

The distribution of observations relating to the timing of revival (which are drawn from the first ten of the eleven periods of revival which have been studied) is shown graphically in Figure 61. The story of revival which this distribution tells is of scattered advances which precede by many months the up-turn in the general price index.  The number of price advances increases steadily as the origin (i. e. the date of up-turn in the general index) becomes closer.  The heaviest advance has come within the three-month interval centering at the reference date, but for nine months thereafter the advance has been general.  It is within this twelve-month period, which runs from 1.5 months before the base date to 10.5 months after that date, that the bulk of all commodities have felt the effects of revival.  The entries within this interval, in the distribution of 1110 individual observations, constitute 55 per cent of the total.  Following this period of general advance there is a sharp falling off in the number of commodities turning upward in price, but advances continue.  The tail of the distribution shown in Figure 61 tapers off to zero at a deviation of 37.5 months from

[1]This list of 119 commodities includes only those articles which passed through five or more cycles between 1890 and 1925, and which were not classed as "exceptional" in their price movements during business cycles. See p. 128 for a detailed description of this group.

TABLE 129

THE TIMING OF PRICE REVIVAL AND PRICE RECESSION

Frequency Tables Showing Distributions of 1110 Observations on 149 Commodity
Price Series during Ten Cycles

| (1)<br>Time of price turn (expressed as a deviation in months from the turning point of the all commodities index)[1] | (2)<br>Frequency<br>(periods of revival) | (3)<br>Frequency<br>(periods of recession) |
|---|---|---|
| —40.50 to —37.51 | | 2[2] |
| —37.50 to —34.51 | | |
| —34.50 to —31.51 | | |
| —31.50 to —28.51 | | |
| —28.50 to —25.51 | 3 | |
| —25.50 to —22.51 | 2 | 2 |
| —22.50 to —19.51 | 2 | 9 |
| —19.50 to —16.31 | 21 | 9 |
| —16.50 to —13.51 | 23 | 28 |
| —13.50 to —10.51 | 40 | 40 |
| —10.50 to — 7.51 | 75 | 78 |
| — 7.50 to — 4.51 | 67 | 95 |
| — 4.50 to — 1.51 | 90 | 124 |
| — 1.50 to + 1.49 | 188 | 211 |
| + 1.50 to + 4.49 | 166 | 167 |
| + 4.50 to + 7.49 | 133 | 129 |
| + 7.50 to +10.49 | 124 | 71 |
| +10.50 to +13.49 | 49 | 61 |
| +13.50 to +16.49 | 29 | 46 |
| +16.50 to +19.49 | 40 | 17 |
| +19.50 to +22.49 | 25 | 15 |
| +22.50 to +25.49 | 12 | 3 |
| +25.50 to +28.49 | 6 | 3 |
| +28.50 to +31.49 | 11 | |
| +31.50 to +34.49 | 2 | |
| +34.50 to +37.49 | 2 | |
| Totals | 1110 | 1110 |

[1]The minus sign (—) indicates a lead, the plus sign (+) indicates a lag with reference to the general price index.
[2]The two extreme entries in this table relate to the movements of zinc prices during period 16 (the period of recession for which the reference date is September, 1918). Zinc slab reached its war-time peak in June, 1915, and zinc sheet reached its peak in July, 1915, these being respectively 39 and 38 months before the reference date.

the base date (i. e. after the base date). The standard deviation of this distribution is 9.6 months.

A more detailed view of these periods of price rise is furnished by the graphs of the separate distributions which are plotted in Figure 62. Here one may compare the straggling advance which began in 1897 with the symmetrical and nicely balanced advance which began in 1901. Or the compact and sharply terminated advance of 1919 may be contrasted with the square central block

FIGURE 61

THE TIMING OF PRICE REVIVAL.

Column Diagram Showing the Distribution of 1110 Observations on Individual Commodity Price Series.



Deviation in months from the date of turn in wholesale price index.
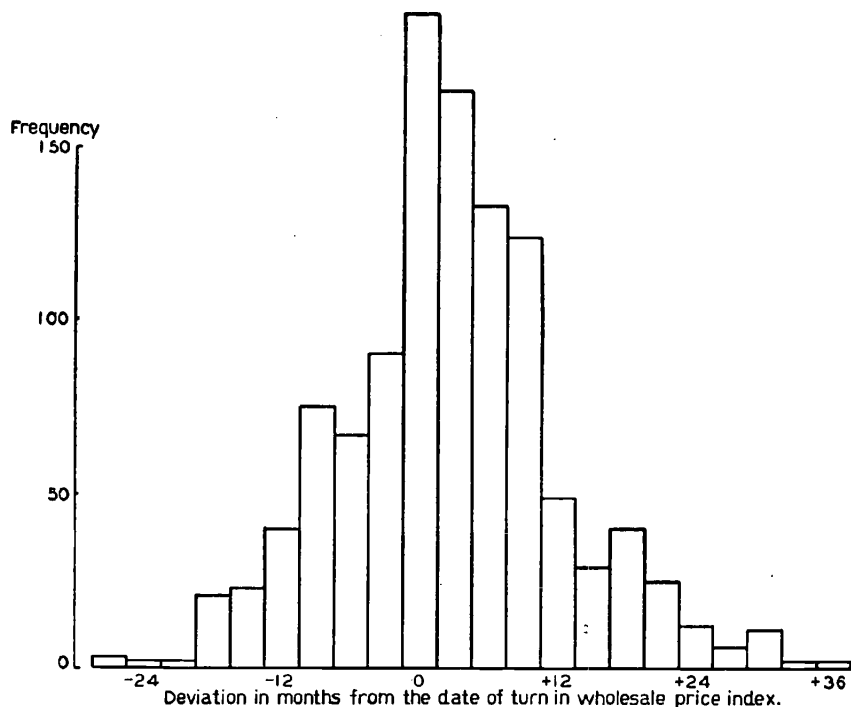
which marks the steady and uninterrupted flow of rising prices between the spring of 1921 and the end of 1922. The latter distribution is unique in the massive central concentration and in the absence of tapering extremities.

Averages and measures of variation relating to the several distributions discussed above are summarized in Table 130.

A study of the measures describing distributions for separate periods reveals points of similarity and difference between price revivals. During three revivals the average date of up-turn in the individual commodity price series has preceded the turn in the general index of wholesale prices. These were the revivals of 1892, 1895 and 1901. In each of the remaining eight revivals the average of the individual turning points has come later in time than the turning point of the price index, the amount of lag varying from

TABLE 130

THE TIMING OF PRICE REVIVAL

Averages and Measures of Variation for Eleven Periods of Revival, with Corresponding
Measures based on 1110 Individual Observations drawn from the first
Ten of the Periods listed

| (1)<br>Period[1] | (2)<br>No. of<br>observations | (3)<br>Mean | (4)<br>Standard<br>deviation |
|---|---|---|---|
| 1 (May, 1892) | 140 | − 1.8 | 7.8 |
| 3 (Mar., 1895) | 148 | − 2.8 | 7.3 |
| 5 (May, 1897) | 200 | + 5.8 | 14.8 |
| 7 (July, 1901) | 163 | − 1.0 | 10.6 |
| 9 (July, 1904) | 166 | + 5.7 | 11.8 |
| 11 (Feb., 1908) | 165 | +10.7 | 9.8 |
| 13 (June, 1911) | 165 | + 6.1 | 8.7 |
| 15 (Nov., 1914) | 198 | + 4.8 | 10.1 |
| 17 (Feb., 1919) | 161 | + 1.6 | 6.2 |
| 19 (Jan., 1922) | 184 | + 1.2 | 7.5 |
| 21 (June, 1924) | 136 | + .9 | 7.6 |
| Selected series, first ten periods[2] | 1110 | + 2.6 | 9.6 |

[1]The entries in parentheses are the reference dates for the several periods.
[2]See pp. 128-129 for an explanation of the principle of selection. The observations entering into this distribution are not equal to the total of the observations for the individual phases of revival. Many of the price series represented in the distributions for specific periods of revival have been omitted from the selected list furnishing the 1110 observations.

less than one month to more than ten months. The average lag, as computed from 1110 individual observations relating to ten periods, has been 2.6 months. This figure relates to 149 selected series, not to the entire list. As was made clear in the earlier discussion, this lag is typical. The price index generally moves upward on revival as a result of advances in a limited number of commodities. If the bulk of the commodities are sagging slightly, or are stationary at a low level, advances in the prices of a small group of commodities will cause a rise in the index.
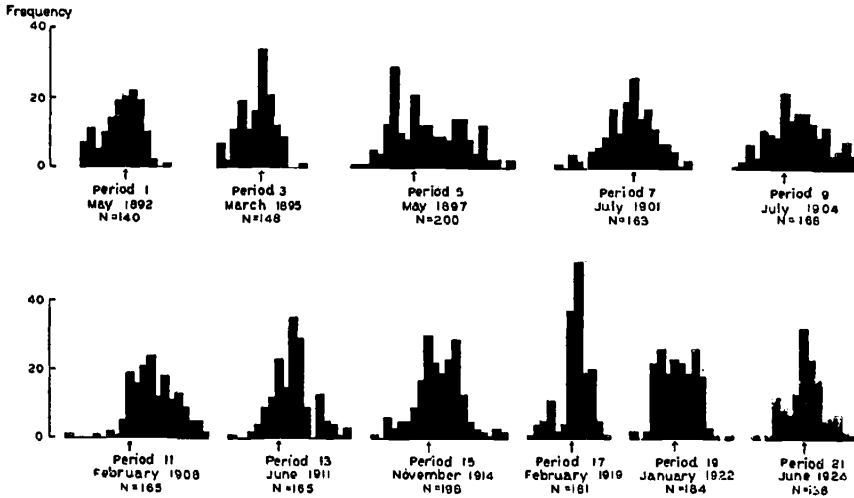
Not only do the averages of these distributions vary from cycle to cycle, but the degree of variation about the average varies, as is shown by the different values of the standard deviations given in column (4) of Table 130.[1] The most compact advance occurred during the revival of 1919 (standard deviation 6.2 months), while the most scattered advance was that for which the reference date is May, 1897 (standard deviation 14.8 months).

The distribution of individual observations on the timing of

[1]In interpreting these differences the methods employed in securing the original observations, and differences in the periods as originally defined, must be borne in mind.

## FIGURE 62

### THE TIMING OF PRICE REVIVAL.

Column Diagrams of Distributions Relating to Eleven Periods of Revival.[1]



Frequency

Period 1
May 1892
N=140

Period 3
March 1895
N=148

Period 5
May 1897
N=200

Period 7
July 1901
N=163

Period 9
July 1904
N=166

Period 11
February 1908
N=165

Period 13
June 1911
N=165

Period 15
November 1914
N=199

Period 17
February 1919
N=181

Period 19
January 1922
N=184

Period 21
June 1925
N=158

[1]The midpoint of the class centering at the origin (the date of turn in the wholesale price index) is indicated on the x-axis of each diagram by an arrow. The date of the origin is given below each diagram. The class interval is 3 months.

price recession, which was given in column (3) of Table 129, is shown graphically in Figure 63. The observations are drawn from ten periods of recession, occurring between 1892 and 1925. This distribution resembles very closely the distribution of measures relating to the timing of revival. It is fairly symmetrical (except for two cases at the lower limit of the range) and the concentration about the central tendency is pronounced. The standard deviation of this distribution is 8.4 months, as compared with 9.6 for the measures of revival. In general, the down-turn of prices which marks the recession phase of the cycle is more compact than is the upward movement of prices during revival.

It is very clear from this picture that recession does not strike the commodity markets in a single wave. This evenly balanced distribution indicates that many forces are affecting prices at such a time, and that they vary in strength with the passage of time. Viewing their effects in the aggregate, as we do in this distribution, we get a picture of a cumulative gain in intensity until the flood of falling prices has reached its maximum volume. Then comes

a decline in the intensity of these forces, a regular subsidence, which is almost perfectly symmetrical with the preceding increase.

FIGURE 63

THE TIMING OF PRICE RECESSION.

Column Diagram Showing the Distribution of 1110 Observations on Individual Commodity Price Series.



Deviation in months from the date of turn in the wholesale price index.
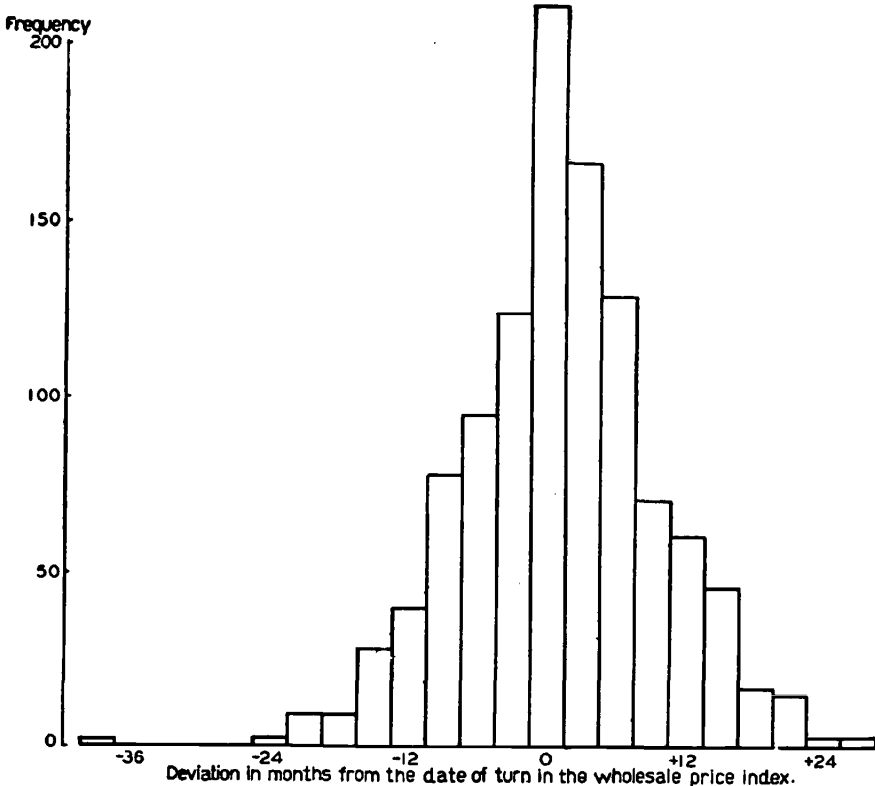
Distributions of measures relating to the timing of recession during ten separate cycles are represented by the column diagrams in Figure 64. These column diagrams will repay detailed examination, if the peculiarities of individual cycles are under investigation. The symmetrical and balanced distribution for the recession of 1893 stands in sharp contrast to the broken and uneven graph relating to the recession of 1900. There are distinct and important differences between the compact distribution for the recession of 1920 and the

distribution for the recession of 1907. Both of these distributions have well-defined central masses, which indicate that the bulk of the decline was closely concentrated in each case. The distribution for 1907 has, however, a long tail extending to the left, representing declines which started while prosperity was still in full bloom, while another tail, extending to the right, represents a rather greater proportion of delayed price recessions than appeared after the recession of 1920-1921.

FIGURE 64

THE TIMING OF PRICE RECESSION.

Column Diagrams of Distributions Relating to Ten Periods of Recession.[1]
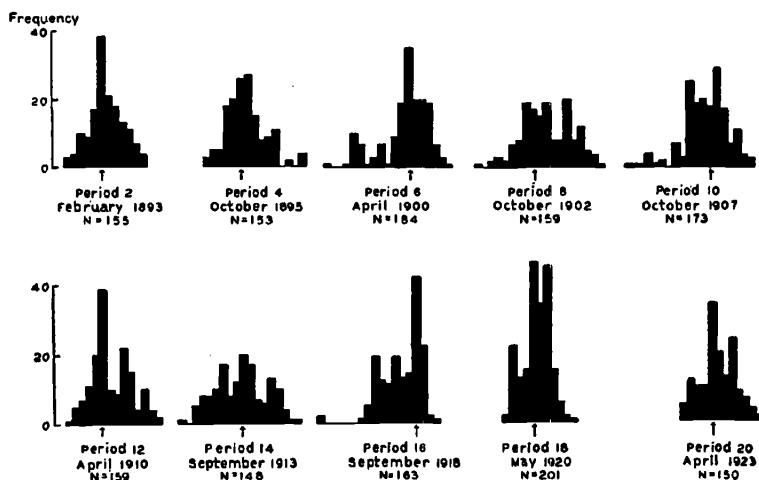


[1]The midpoint of the class centering at the origin (the date of turn in the wholesale price index) is indicated on the x-axis of each diagram by an arrow. The date of the origin is given below each diagram. The class interval is 3 months.

The arithmetic means and standard deviations of the distributions for the separate periods, and of the general distribution, are summrized in Table 131.

There is considerable variation from cycle to cycle in the values of these measures. The average time of recession varies from 3.6 months before the down-turn in the wholesale price index, in 1918, to 6.0 months after the turn in the index, in 1902. There is observable in these measures the same tendency for the average to lag behind the reference date as was found with the measures of revival, but it is much less pronounced. In four of the ten recessions the

TABLE 131

THE TIMING OF PRICE RECESSION

Averages and Measures of Variation for Ten Periods of Recession, with Corresponding Measures based on 1110 Individual Observations drawn from all Periods

| (1) Periods[1] | (2) No. of observations | (3) Mean | (4) Standard deviation |
|---|---|---|---|
| 2 (Feb., 1893) | 155 | +2.1 | 7.4 |
| 4 (Oct., 1895) | 153 | +2.3 | 8.5 |
| 6 (Apr., 1900) | 164 | —1.4 | 10.1 |
| 8 (Oct., 1902) | 159 | +6.0 | 10.8 |
| 10 (Oct., 1907) | 173 | —1.8 | 9.9 |
| 12 (Apr., 1910) | 159 | +3.3 | 8.5 |
| 14 (Sept., 1913) | 148 | —1.2 | 10.8 |
| 16 (Sept., 1918) | 163 | —3.6 | 8.5 |
| 18 (May, 1920) | 201 | +1.3 | 6.0 |
| 20 (Apr., 1923) | 150 | +2.7 | 7.4 |
| Selected series, all periods[2] | 1110 | +1.0 | 8.4 |

[1]The entries in parentheses are the reference dates for the several periods.
[2]See note 2, Table 130, concerning the selected series.

average down-turn in commodity prices came before the turn in the price index. The average of 1110 individual observations, relating to all recessions, is +1.0, indicating that the mean turning point in the individual price series came on recession just one month after the turn in the price index. (This may be compared with the value of +2.6, secured from the measures relating to the timing of revival.) The degree of compactness of the downward movement varies from the closely concentrated turn in 1920 (standard deviation 6.0 months) to the relatively scattered recession which centers at October, 1902 (standard deviation 10.8 months). Though the latter figure is relatively large, it is distinctly smaller than the largest standard deviation relating to the timing of revival. (This was 14.8 months, for the up-turn which began in 1897.) In the distributions relating to individual phases of revival and recession, as well as in the distributions composed of measures drawn from all cycles, there is found the same tendency toward greater concentration of price movements during recession than during revival.

The differences between the mean dates of revival and recession and the turning points of the general price index are attributable to several factors. In the first place, only 209 price series have been employed in this cyclical analysis. For the period since 1913 this falls considerably short of the total number of series in-

cluded in the index of the Bureau of Labor Statistics, which has
been used in defining the reference dates. Secondly, in the com-
putation of the mean date of turn in each period account has been
taken only of those commodities which shared in the given revival
or recession. Those which showed no turn in prices were omitted
from the calculations. These omitted commodities would, of course,
affect a general price index. In the third place, no weights have
been employed in deriving the mean turning points, while the
Bureau's index is a weighted average.

But probably the most important reason for the differences is
found in the nature of the averaging process by which the mean
turning points have been defined. The usual price index is an
average of the prices prevailing at a given date. (It is always com-
pared, of course, with a similar average of the prices prevailing at
some other date.) The mean turning points, as derived in the
present analysis, represent averages of deviations *in time* from fixed
reference points. The ordinary index may be thought of as an
average in the computation of which account is taken of vertical
deviations. In computing the average date of revival or recession
account is taken of horizontal deviations. The two measures tell
quite different stories. If interest attaches to movements of the
general price level a customary price index would be employed.
But if one wishes to determine the average date at which dealers in
commodities at wholesale feel the effects of revival or recession,
the measure based upon the actual time of the change in the price
of each commodity possesses significance.

## § Price Movements, 1919-1923

To make these differences somewhat clearer, and to reveal in greater
detail the nature of the price movements at two important turning points,
the following distributions relating to the recession of 1920 and the
revival of 1921-22 have been prepared. These are based upon a study
of 371 price series for which monthly wholesale price quotations are given
by the Bureau of Labor Statistics. The 371 entries include most of the
404 price series entering into the Bureau's index. A few series not in-
cluded in that index (though quoted by the Bureau) have been used
in the present examples, and a small number which do enter into the
Bureau's index have been omitted because the quotations needed in
defining the turning points were not available. These distributions
are shown graphically in Figure 65.

Table 132

FREQUENCY TABLES SHOWING DISTRIBUTIONS OF A SELECTED LIST OF COMMODITIES CLASSIFIED ACCORDING
TO DATES OF RECESSION AND REVIVAL DURING A POST-WAR BUSINESS CYCLE

| (1)<br>Time of price turn (expressed as a deviation in months from the date of turn of the Bureau of Labor Statistics Index) | (2) (3)<br>Frequency<br>Recession of 1919–1921<br>(ref. date, May, 1920)[1] | | (4) (5)<br>Frequency<br>Revival of 1921-1923<br>(ref. date, Jan., 1922)[2] | |
|---|---|---|---|---|
| | No. | Per cent | No. | Per cent |
| —19.50 to —16.51 | | | 2 | .6 |
| —16.50 to —13.51 | | | 0 | .0 |
| —13.50 to —10.51 | 3 | .8 | 6 | 1.9 |
| —10.50 to — 7.51 | 29 | 8.0 | 57 | 17.8 |
| — 7.50 to — 4.51 | 25 | 6.9 | 36 | 11.2 |
| — 4.50 to — 1.51 | 38 | 10.5 | 40 | 12.5 |
| — 1.50 to + 1.49 | 96 | 26.5 | 35 | 10.9 |
| + 1.50 to + 4.49 | 64 | 17.6 | 40 | 12.5 |
| + 4.50 to + 7.49 | 75 | 20.6 | 33 | 10.3 |
| + 7.50 to +10.49 | 19 | 5.2 | 38 | 11.8 |
| +10.50 to +13.49 | 10 | 2.8 | 25 | 7.8 |
| +13.50 to +16.49 | 3 | .8 | 5 | 1.5 |
| +16.50 to +19.49 | 1 | .3 | 3 | .9 |
| +19.50 to +22.49 | | | 0 | .0 |
| +22.50 to +25.49 | | | 1 | .3 |
| Totals | 363 | 100.0 | 321 | 100.0 |

Descriptive measures

| Recession | | Revival | |
|---|---|---|---|
| Mean | +1.13 mos. | Mean | + .44 mos. |
| Standard deviation | 5.44 mos. | Standard deviation | 7.52 mos. |

[1]Eight of the 371 series studied have been omitted from this table because no dates of price turn could be defined. Of these 8 series, 1 was marked by constant prices, 5 by rising prices and 1 by sagging prices. The grade to which the price quotation referred was changed in the case of 1 article.
[2]Fifty of the 371 price series studied have been omitted from this table. Of these, 23 were constant in price and 27 were sagging in price during the period of this revival.

The inclusion of a greater number of cases gives us more satisfactory distributions for the two periods to which they relate, but in their general characteristics the distributions are not unlike those derived from the smaller number of observations previously employed. For the recession of 1920 we have the same picture of few and scattered declines beginning about a year before the general index turned downward. The volume of declining prices began to increase materially about the first of April, 1920, and continued in a steady flow during the nine-month period between April 1, 1920, and January 1, 1921. After the latter date there was a sharp fall in the number of recessions, although there were isolated instances of commodities which did not feel the effect of the general recession until 1921.

The story is perhaps more clearly told when the number of recessions occurring during each of these three periods is expressed as a percentage of the total. During the twelve months prior to April 1, 1920, 26 per cent of the total number of commodities which were affected by the recession reached their maximum prices and started to decline. During the nine months between April 1, 1920 and January 1, 1921, 65 per cent of the total number reached their turning points. In the twelve months of 1921, 9 per cent of the total number of commodities moved downward in price.

FIGURE 65

THE TIMING OF PRICE REVIVAL AND PRICE RECESSION.

Column Diagrams Showing Distributions of Wholesale Price Series
Classified according to the Date of Recession (1919-1921)
and the Date of Revival (1921-1923).
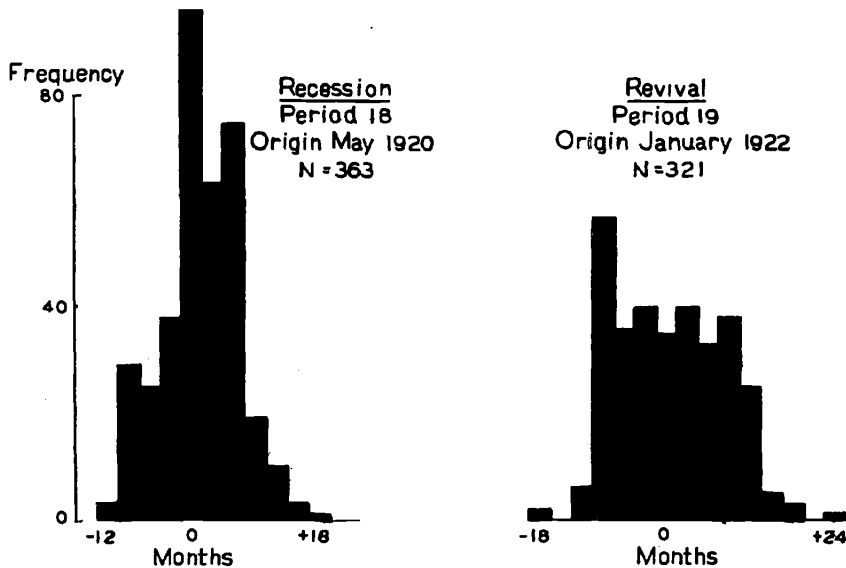


The mean date of decline came 1.13 months after the turning point
in the index of the Bureau of Labor Statistics. This places it approxi-
mately at June 19, 1920. The standard deviation is 5.44 months.

The picture of the ensuing price revival reveals a much less con-
centrated turn in prices. There was a steady upward movement of
prices during the 24 months between March 1, 1921, and March 1, 1923.
(This includes the eight central classes in which the frequencies are
heaviest.) The movement was somewhat stronger during the early part
of this period than it was toward the end, but there was no pronounced
slackening until the end of the period of 24 months. During this time
95 per cent of the total number of price up-turns occurred. The mean
date of revival is +.44, approximately half a month after the up-turn
in the general price index. The standard deviation is 7.52 months, a
measure materially greater than the corresponding figure of 5.44 for the
preceding recession.

b. *The Duration of Periods of Price Revival and Recession.*
Although the distributions of measures defining the duration of
cyclical price movements vary somewhat in form from period to
period, there is a fairly distinct type which predominates. This

type is exemplified by the following distributions, secured by combining 1110 individual measures of duration of price rise and price fall, relating to 149 commodity price series.  In securing these measures account has been taken only of those price movements which occurred between successive dates of revival and recession.

TABLE 133

DURATION OF CYCLICAL PRICE MOVEMENTS

Frequency Tables Showing Distributions of 1110 Observations on 149 Commodity Price Series during Ten Cycles

| (1)<br>Duration of price movement<br>(from low to ensuing high or from high<br>to ensuing low) in months | (2)<br>Frequency<br>(periods of price rise) | (3)<br>Frequency<br>(periods of price fall) |
|---|---|---|
| .50 to  3.49 | 32 | 57 |
| 3.50 to  6.49 | 79 | 107 |
| 6.50 to  9.49 | 102 | 100 |
| 9.50 to 12.49 | 94 | 133 |
| 12.50 to 15.49 | 95 | 134 |
| 15.50 to 18.49 | 111 | 130 |
| 18.50 to 21.49 | 93 | 121 |
| 21.50 to 24.49 | 73 | 108 |
| 24.50 to 27.49 | 68 | 71 |
| 27.50 to 30.49 | 74 | 57 |
| 30.50 to 33.49 | 72 | 37 |
| 33.50 to 36.49 | 49 | 17 |
| 36.50 to 39.49 | 35 | 11 |
| 39.50 to 42.49 | 39 | 14 |
| 42.50 to 45.49 | 24 | 1 |
| 45.50 to 48.49 | 24 | 6 |
| 48.50 to 51.49 | 11 | 2 |
| 51.50 to 54.49 | 19 | 2 |
| 54.50 to 57.49 | 7 | 2 |
| 57.50 to 60.49 | 5 | |
| 60.50 to 63.49 | 1 | |
| 63.50 to 66.49 | 3 | |
| Totals | 1110 | 1110 |

The distribution of measures relating to the duration of price rise is plotted as a column diagram in Figure 66.  The positive skewness is pronounced.  The duration of rise for the bulk of the entries is relatively short, but the distribution tapers out in a long tail to the right.
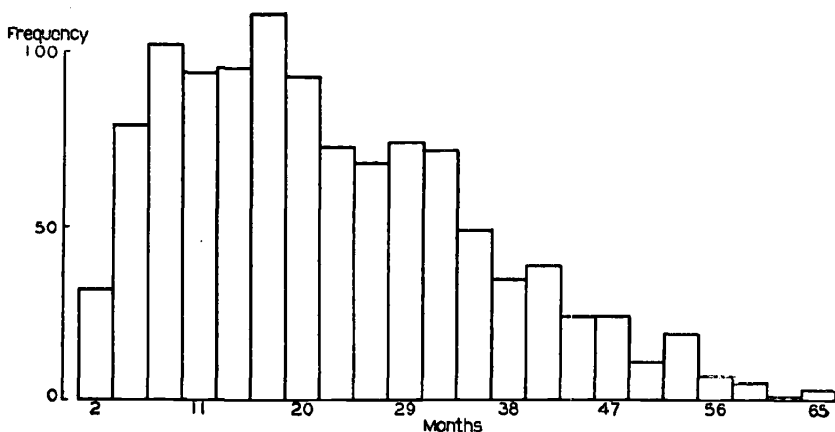
Distributions for the separate periods are shown in Figure 67.[1] With three exceptions these are all of the same type as the general

[1]The distributions for the separate periods include all the commodities sharing in the given price revivals.  They are not limited to the 149 commodities entering into the distribution shown in Table 133.

FIGURE 66

THE DURATION OF PRICE RISE DURING REVIVAL AND PROSPERITY.

Column Diagram Showing the Distribution of 1110 Observations
on Individual Commodity Price Series.



distribution shown above. The exceptions relate to the revivals for
which the reference dates fall in 1897, in 1904 and in 1914. The
distributions for these periods are fairly symmetrical, standing in
sharp contrast to the skew distribution which appears to be
typical. In each of these periods, it may be noted, the duration of
the phase of revival was long, both in months and in proportion to
the length of the cycle of which it was a part.

There is a suggestion here that the prolongation of a period of
revival gives opportunity for those forces which tend to produce
symmetry in a distribution to work themselves out. When the
general price advance continues for a sufficiently long period, the
wide variety of forces which initiate and check the advances of in-
dividual commodity prices produce a semblance of balance in their
cumulative action upon a considerable number of price series. This
was true during the advance from 1897 to 1900, from 1904 to 1907,
from 1914 to 1918. Normally, during the shorter advances of most
revivals, there is an unbalanced advance, of the type represented
by the distribution shown in Figure 66. This lack of balance is
evidenced by a pronounced tailing out above the mode, with no cor-
responding frequencies below the mode.

Differences between periods of revival in respect to the duration
of price rise are clearly revealed by the summary in Table 134 of the

FIGURE 67

THE DURATION OF PRICE RISE DURING REVIVAL AND PROSPERITY.

Column Diagrams of Distributions Relating to Ten Periods of
Revival and Prosperity.[1]
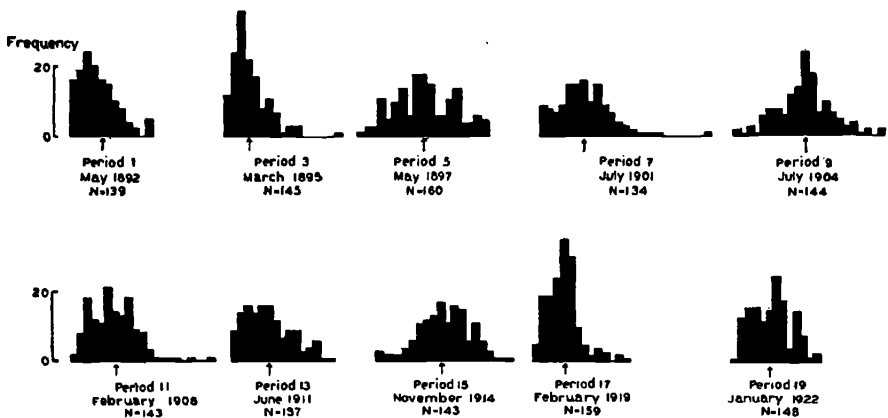


[1]The means and standard deviations of these distributions are given in Table 134. The location of the
mean on the x-axis of each diagram is indicated by an arrow. The class interval is 3 months, cen-
tering at 2, 5, 8, etc.
The date below each diagram defines the reference point for the given period.

measures descriptive of the various distributions. The point may
again be emphasized that the measures in this table relate only to
those commodities which reflect specific revivals, a number which
varies from period to period. As in the preceding table the measures
of duration apply to price increases which occurred between suc-
cessive dates of revival and recession. The averages given in column
(3) of this table are presented graphically in the upper half of Figure
68.

The period of rising prices has varied from an average of 11.7
months, in the revival which began early in 1895, to an average of
39.5 months, in the revival for which the reference date is November,
1914. When the various individual observations relating to 149
commodity price series are cast into a single distribution, an average
of 22.2 months is obtained. This is based upon 1110 observations.
The average rise was exceptionally short during the revivals which
began in 1892, in 1895 and in 1919, and exceptionally long in the
revivals beginning in 1897, in 1904 and in 1914.

Figures giving the duration of periods of rise in the wholesale
price index of the United States Bureau of Labor Statistics[1] have

[1]Supplemented by Falkner's index for the period 1890-1899.

TABLE 134

DURATION OF PERIODS OF PRICE RISE DURING REVIVAL AND PROSPERITY

Averages and Measures of Variation derived from Observations on Individual Commodities, with Measures relating to an Index of Wholesale Prices

| (1)<br>Period[1] | (2)<br>No. of<br>observations | (3)<br>Mean duration of rise<br>(from low to ensuing high)<br>in months | (4)<br>Standard deviation,<br>in months | (5)<br>Coefficient of variation | (6)<br>Duration of rise in wholesale price index, in months |
|---|---|---|---|---|---|
| 1 (May, 1892) | 139 | 12.7 | 8.2 | 64.1 | 9 |
| 3 (Mar., 1895) | 145 | 11.7 | 7.6 | 64.9 | 7 |
| 5 (May, 1897) | 160 | 29.9 | 12.9 | 43.3 | 35 |
| 7 (July, 1901) | 134 | 23.1 | 11.7 | 50.4 | 15 |
| 9 (July, 1904) | 144 | 31.7 | 12.1 | 38.2 | 39 |
| 11 (Feb., 1908) | 143 | 19.5 | 10.2 | 52.4 | 26 |
| 13 (June, 1911) | 137 | 19.9 | 10.1 | 50.7 | 27 |
| 15 (Nov., 1914) | 143 | 39.5 | 11.4 | 28.9 | 46 |
| 17 (Feb., 1919) | 159 | 14.0 | 7.1 | 50.7 | 15 |
| 19 (Jan., 1922) | 148 | 18.1 | 8.6 | 47.5 | 15 |
| Selected series, all periods[2] | 1110 | 22.2 | 13.3 | 59.8 | |

[1] The entries in parentheses are the reference dates for the several periods.
[2] See note 2, Table 130, concerning the selected series.

been placed in Table 134, for comparison with the averages derived from the duration measures for individual commodities. There is a general agreement between the two sets of figures, but certain rather considerable differences are found. Thus the price rise shown by the index for the revival following the 7th period (reference date July, 1901) lasted for 15 months. The average duration of rise as computed from the individual measures for this period was 23.1 months. One reason for the difference is found in the fact that the price index for a given date represents a cross-section of the price situation at that date. A change in the value of the index between any two dates is a net change. Diverse movements may cancel, or partially cancel, each other. In averaging the duration measures for individual commodities there is no off-setting of this character. Each movement is given full weight in arriving at the average. Again, the price index measures the net change in all commodities, whereas the average of the individual commodity measures is based only upon those commodities which actually rose in price.

Whether the measure of duration given by the index or the average secured from the individual records should be accepted in a given case depends upon the purpose in mind. If interest attaches to changes in the price level the record of the index would be employed. If the extent of the disturbance in individual commodity prices is of interest, the average of the separate measures has distinct significance.

FIGURE 68

AVERAGES MEASURING THE DURATION OF PERIODS OF PRICE REVIVAL
AND PRICE RECESSION DURING TEN CYCLES.
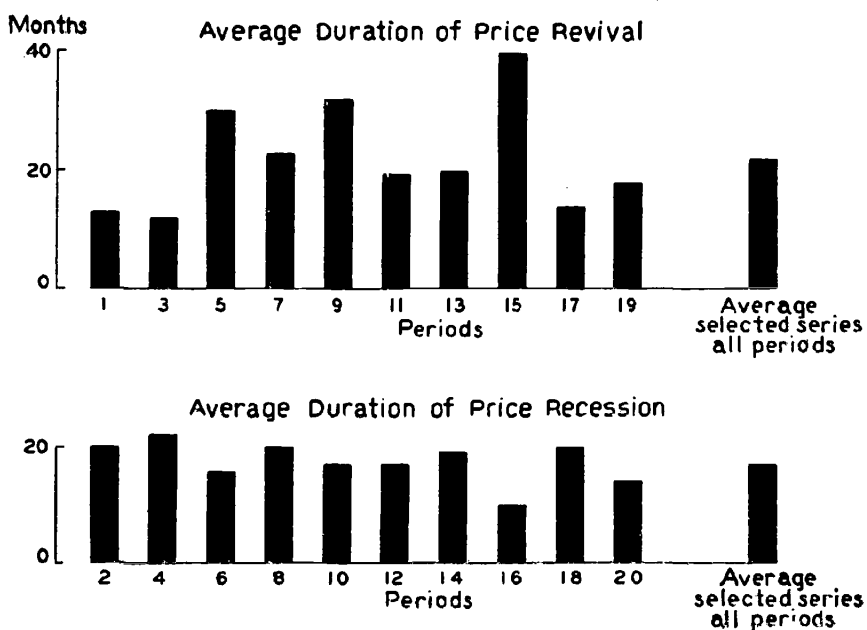


The variation of the individual observations on duration of rise was least during the rise beginning in 1919 (standard deviation 7.1 months). The variation was greatest during the rise which began in 1897 (standard deviation 12.9 months). As measured in absolute terms, the degree of variation tends to increase with an increase in the average duration of rise. The coefficient of variation, measuring the relative spread, shows a reverse tendency.

There are some differences between the distributions of measures of the duration of rise and measures of duration of fall, although the general distributions are of much the same type. The class fre-

quencies for the distribution relating to price recessions were given
in column (3) of Table 133.   The distribution is shown graphically
in Figure 69.

FIGURE 69

THE DURATION OF PRICE FALL DURING RECESSION AND DEPRESSION.

Column Diagram Showing the Distribution of 1110 Observations
on Individual Commodity Price Series.
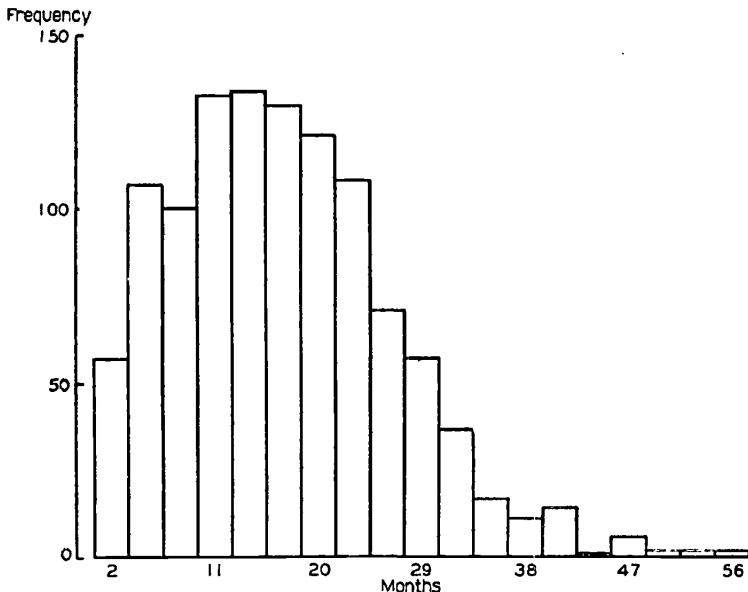


This distribution, like most of those previously presented, is
skewed in a positive direction.   The bulk of the observations are
concentrated near the lower end of the scale, and a tail extends to
the right.   The skewness is less, however, than that of the dis-
tribution relating to duration of price rise.

The distributions of duration measures for individual cycles,
which appear in Figure 70, approximate this general type.   The
measures descriptive of these distributions appear in the following
table.   The averages given in column (3) are presented graphically
in the lower half of Figure 68.

The average length of the period of price decline has varied
from 10.3 months, for the recession which began in 1918, to 21.6
months, for the recession which began in the latter part of 1895.
The average for the ten periods of recession, as computed from 1110

TABLE 135

DURATION OF PERIODS OF PRICE FALL DURING RECESSION AND DEPRESSION

Averages and Measures of Variation derived from Observations on Individual Commodities, with Measures relating to an Index of Wholesale Prices

| (1)<br>Period[1] | (2)<br>No. of<br>observations | (3)<br>Mean<br>duration of<br>fall (from<br>high to en-<br>suing low)<br>in months | (4)<br>Standard<br>deviation,<br>in months | (5)<br>Coefficient<br>of variation | (6)<br>Duration<br>of fall in<br>wholesale<br>price index,<br>in months |
|---|---|---|---|---|---|
| 2 (Feb., 1893) | 121 | 20.2 | 8.2 | 40.9 | 25 |
| 4 (Oct., 1895) | 149 | 21.6 | 12.6 | 58.1 | 19 |
| 6 (Apr., 1900) | 156 | 15.5 | 8.9 | 57.2 | 15 |
| 8 (Oct., 1902) | 149 | 19.6 | 11.6 | 59.3 | 21 |
| 10 (Oct., 1907) | 154 | 16.7 | 9.1 | 54.4 | 4 |
| 12 (Apr., 1910) | 142 | 17.1 | 7.7 | 45.1 | 14 |
| 14 (Sept., 1913) | 148 | 18.6 | 9.1 | 48.9 | 14 |
| 16 (Sept., 1918) | 161 | 10.3 | 7.8 | 76.0 | 5 |
| 18 (May, 1920) | 181 | 20.0 | 6.7 | 33.7 | 20 |
| 20 (Apr., 1923) | 122 | 13.9 | 7.1 | 51.2 | 14 |
| Selected series, all<br>periods[2] | 1110 | 17.0 | 9.6 | 56.5 | |

[1] The entries in parentheses are the reference dates for the several periods.
[2] See note 2, Table 130, concerning the selected series.

observations relating to 149 commodities, has been 17.0 months. In two respects these figures stand in sharp contrast to those relating to the duration of price rise. The average is distinctly shorter (17.0 as compared with 22.2), and the variation from cycle to cycle in the length of the period of decline is distinctly less than the variation from cycle to cycle in the duration of the period of price rise. This latter difference is brought out clearly by a comparison of the graphs in the upper and lower portions of Figure 68.

As in respect to duration of rise, there are certain differences between the measures of duration of decline derived from the general index of wholesale prices and the averages derived from individual commodity records. The duration of decline in the 10th period, the recession for which the reference date is October, 1907, was only 4 months as measured by the price index, but the average computed from the individual records is 16.7 months. The offsetting influence of conflicting price movements is responsible for the very short period of decline in the price index. The higher figure probably gives a truer account of the duration of the downward movements

in the prices of those commodities which were affected by this recession.

FIGURE 70

THE DURATION OF PRICE FALL DURING RECESSION AND DEPRESSION.

Column Diagrams of Distributions Relating to Ten Periods of Recession and Depression.[1]
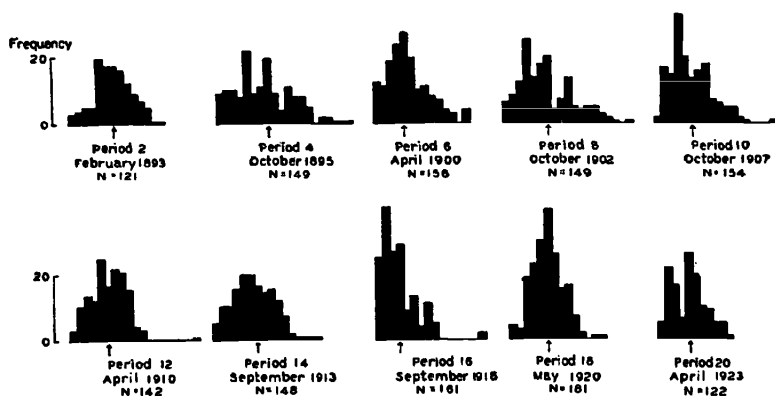


[1]The means and standard deviations of these distributions are given in Table 135. The location of the mean on the x-axis of each diagram is indicated by an arrow. The class interval is 3 months, centering at 2, 5, 8, etc. The date below each diagram defines the reference point for the given period.

The variation of the individual observations about the mean was least for the recession beginning in 1920 (standard deviation 6.7 months). This was a compact downward movement, marked by a relatively close approach to uniformity in the duration of decline. This figure is smaller than any of the corresponding measures relating to duration of price rise. The absolute variation was greatest during the recession which began in 1895 (standard deviation 12.6 months).

As measured in absolute units (i. e. in months) the variation in duration of decline is less than the variation in duration of rise in 8 of the 10 cycles to which the above figures relate. The downward movements of commodity prices during business cycles are not only shorter, on the average, than the up-swings, but the recessions are more compact in respect to duration than are the upward movements.[1]

c. *The Degree of Price Change during Revival and Recession.* As in respect to all other aspects of price behavior, there is con-

[1]There is approximate equality in the matter of variation if coefficients of variation instead of standard deviations be compared. The comparison in terms of months seems more significant for the present purpose.

siderable variation in the degree to which prices rise during revival
and decline during recession. The extent and character of the vari-
ation during revival may be appreciated from an inspection of
the following distribution, based upon 1110 individual cases of
price rise, occurring during ten periods of revival. (This distribu-
tion includes only those commodities which did rise in price dur-
ing specific periods of revival. Account has been taken in earlier
summaries of those commodities which did not share in these cyclical
movements.) The increase is expressed in each case as a percentage
of the ensuing high value. The distribution is shown graphically
in Figure 71.

TABLE 136

DEGREE OF PRICE INCREASE DURING REVIVAL AND PROSPERITY

Frequency Table Showing the Distribution of 1110 Observations on 149 Commodity
Price Series during Ten Periods of Revival and Prosperity

| Degree of rise (as a percentage of the ensuing high) | Frequency |
|---|---|
| .50 to 6.49 | 68 |
| 6.50 to 12.49 | 100 |
| 12.50 to 18.49 | 126 |
| 18.50 to 24.49 | 139 |
| 24.50 to 30.49 | 131 |
| 30.50 to 36.49 | 126 |
| 36.50 to 42.49 | 92 |
| 42.50 to 48.49 | 93 |
| 48.50 to 54.49 | 69 |
| 54.50 to 60.49 | 52 |
| 60.50 to 66.49 | 40 |
| 66.50 to 72.49 | 33 |
| 72.50 to 78.49 | 30 |
| 78.50 to 84.49 | 10 |
| 84.50 to 90.49 | 1 |
| Total | 1110 |

This distribution is positively skewed, resembling in this respect
distributions secured from many other measures of price behavior.
There is marked concentration at the lower end of the scale. The
modal increase, as defined by the crude mode, was 21.5 per cent
(true mode 19.3) and the mean increase was 32.8 per cent. (This
latter value is equivalent to an increase of about 50 per cent of the
low price preceding the rise, or of about 39 per cent of the average of
high and low prices.) The variation about the mean is considerable,
as is evidenced by a standard deviation of 19.2 and a coefficient of
variation of 58.7.

FIGURE 71

THE DEGREE OF PRICE RISE DURING REVIVAL AND PROSPERITY.

Column Diagram Showing the Distribution of 1110 Observations
on Individual Commodity Price Series.
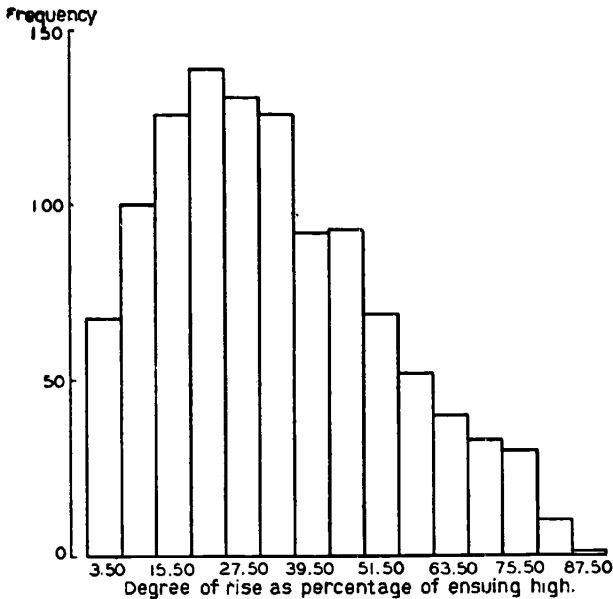


The frequency distributions composed of measures of price in-
crease relating to individual cycles, which are shown in Figure 72,
are in general positively skewed.  There is a tendency toward sym-
metry during certain periods (in the revivals for which the reference
dates fall in 1897, in 1901, in 1904 and in 1919), and in one case,
during the war-time advance, a negatively skewed distribution is
obtained.  Extreme advances predominated and small gains were
the exception at this time.

The changes from cycle to cycle in the matter of price rise
are revealed by the summary in Table 137 of means and measures of
variation.  Corresponding percentages of increase in the general
index of wholesale prices (U. S. Bureau of Labor Statistics, sup-
plemented by Falkner's) are included for the purpose of comparison.
The averages in column (3) of this table are shown graphically in
the upper portion of Figure 73.

## FIGURE 72
### THE DEGREE OF PRICE RISE DURING REVIVAL AND PROSPERITY.
Column Diagrams of Distributions Relating to Ten Periods of
Revival and Prosperity.[1]
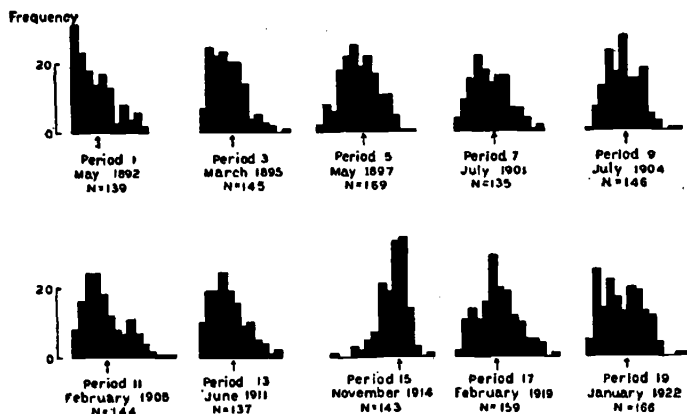


[1]The degree of rise, expressed as a percentage of the ensuing high, is measured on the x-scale.
The means and standard deviations of the several distributions are given in Table 137. The location
of the mean on the x-axis of each diagram is indicated by an arrow. The class interval is 6, cen-
tering at 2.5, 8.5, etc.
The date below each diagram defines the reference point for the given period.

The average degree of rise in price, expressed as a percentage
of the ensuing high values, has varied from 20.6 during the revival

### TABLE 137
### DEGREE OF PRICE RISE DURING REVIVAL AND PROSPERITY
Averages and Measures of Variation derived from Observations on Individual Com-
modities, with Measures relating to an Index of Wholesale Prices[1]

| (1)<br>Period[2] | (2)<br>No. of<br>observations | (3)<br>Mean | (4)<br>Standard<br>deviation | (5)<br>Coefficient<br>of variation | (6)<br>Degree of<br>rise in whole-<br>sale price<br>index |
|---|---|---|---|---|---|
| 1 (May, 1892) | 139 | 20.6 | 16.2 | 78.4 | 3.1 |
| 3 (Mar., 1895) | 145 | 24.4 | 14.0 | 57.5 | 1.9 |
| 5 (May, 1897) | 169 | 37.9 | 16.5 | 43.5 | 20.0 |
| 7 (July, 1901) | 135 | 31.1 | 15.8 | 50.6 | 14.3 |
| 9 (July, 1904) | 146 | 32.9 | 14.4 | 43.6 | 12.5 |
| 11 (Feb., 1908) | 144 | 28.3 | 18.3 | 64.6 | 16.2 |
| 13 (June, 1911) | 137 | 25.1 | 15.1 | 60.4 | 11.5 |
| 15 (Nov., 1914) | 143 | 66.1 | 12.1 | 18.3 | 52.5 |
| 17 (Feb., 1919) | 159 | 34.5 | 19.9 | 57.7 | 21.6 |
| 19 (Jan., 1922) | 166 | 30.7 | 17.2 | 55.9 | 12.9 |
| Selected series, all<br>periods[3] | 1110 | 32.8 | 19.2 | 58.7 | |

[1]The entries in columns (3), (4), and (6) are in percentages, the bases of the percentages being the
high values succeeding the rises in the several periods.
[2]The entries in parentheses are the reference dates for the several periods.
[3]See note 2, Table 130, concerning the selected series.

beginning in 1892, to 66.1 during the industrial expansion of the war period.  These averages are in all cases greater than the percentages of rise recorded by the general price index, the differences being pronounced in one or two instances.  In the revival which culminated late in 1895 the price index shows an advance of but 1.9 per cent, but the average percentage of rise in the prices of 145 commodities was 24.4 per cent.  A large part of the difference is
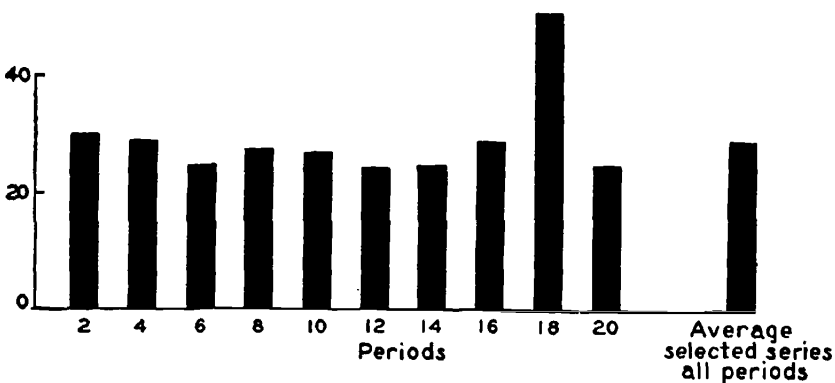
FIGURE 73

AVERAGES MEASURING THE DEGREE OF PRICE RISE AND PRICE DECLINE DURING TEN CYCLES.

Average Degree of Price Rise during Revival
(As percentage of ensuing high)
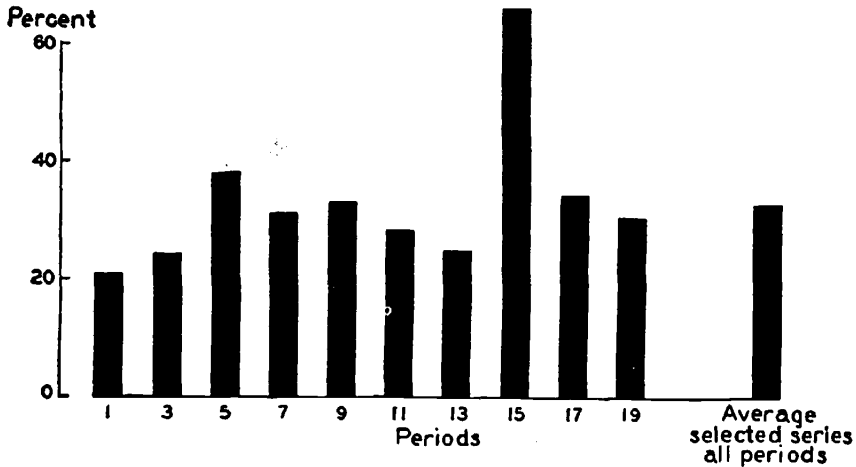


Average Degree of Price Decline during Recession
(As percentage of preceding high)

due to the fact that in the computation of the latter figure only those commodities have been included which shared in the advance. The offsetting influence of the commodities which fell in price or remained constant (these groups making up some 30 per cent of the total in this case) is in part responsible for the small increase registered by the general index. Perhaps more important in tending to reduce the change in the index is the fact that the price advances of particular commodities were not concurrent, and the resulting irregularities of movement in part neutralized each other.

The degree of variation in the percentage of rise, as measured by the standard deviation, has not varied greatly from cycle to cycle. It was least (12.1) in the rise which began in 1914. This was the most compact upward movement, in respect to amount of change, which we have recorded. The variation of the individual observations was greatest (standard deviation 19.9) in the rise which began in 1919. For all other periods the measures varied between 14 and 18. The coefficients of variation vary between wider limits.

The general distribution of measures of price decline during recession and depression differs somewhat from the distribution of measures of price increase. The table which follows gives the details of this distribution, which appears in graphic form in Figure 74. The observations relate to the 149 selected price series which have been employed in previous examples.

TABLE 138

DEGREE OF PRICE FALL DURING RECESSION AND DEPRESSION

Frequency Table Showing the Distribution of 1118 Observations on 149 Commodity Price Series during Ten Periods of Recession and Depression

| Degree of fall (as a percentage of the preceding high) | Frequency |
|---|---|
| .00 to 5.99 | 63 |
| 6.00 to 11.99 | 122 |
| 12.00 to 17.99 | 165 |
| 18.00 to 23.99 | 157 |
| 24.00 to 29.99 | 142 |
| 30.00 to 35.99 | 116 |
| 36.00 to 41.99 | 111 |
| 42.00 to 47.99 | 76 |
| 48.00 to 53.99 | 63 |
| 54.00 to 59.99 | 37 |
| 60.00 to 65.99 | 27 |
| 66.00 to 71.99 | 20 |
| 72.00 to 77.99 | 13 |
| 78.00 to 83.99 | 5 |
| 84.00 to 89.99 | 1 |
| Total | 1118 |

   This distribution has the positive skewness which characterized the distribution of measures of price increase.  The average percentage of price decline is 28.9, which is lower than the average percentage of price increase (32.8).  (The averages are comparable, since the individual percentages of rise and decline are measured

FIGURE 74

THE DEGREE OF PRICE DECLINE DURING RECESSION AND DEPRESSION.

Column Diagram Showing the Distribution of 1118 Observations
on Individual Commodity Price Series.
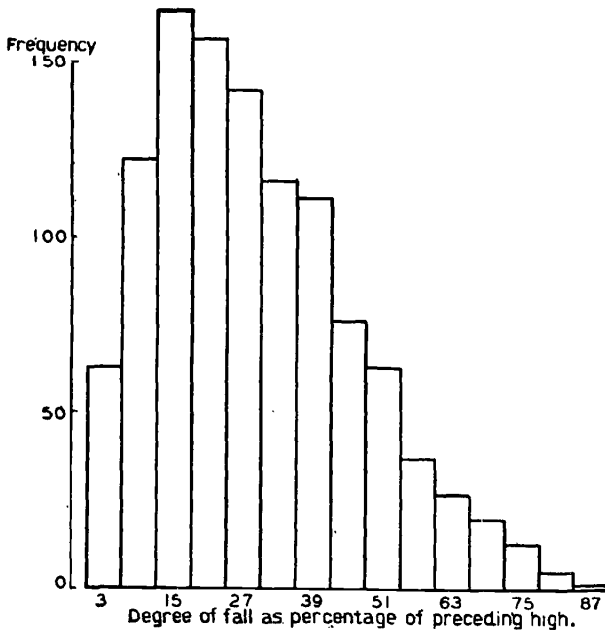


from the same base.  The mean decline would be approximately 34 per cent of the average of high and low prices.)  The differences between individual measures of price decline are somewhat less than the differences between measures of price increase, when the variation is measured in absolute units.  The standard deviation has a value of 17.3 for the above distribution, as compared with 19.2 for the distribution of measures of degree of price rise during revival.  The coefficients of variation are of almost equal value, however (59.7 for the measures of price fall, and 58.7 for the measures of price increase).

The distributions relating to individual phases of recession are shown in Figure 75. The positive skewness found in the general distribution is characteristic of all these diagrams, with the single exception of that relating to the down-swing of 1920-21, which is negatively skewed. Extreme declines predominated during this recession, and minor declines were relatively few.

FIGURE 75

THE DEGREE OF PRICE DECLINE DURING RECESSION AND DEPRESSION.

Column Diagrams of Distributions Relating to Ten Periods of
Recession and Depression.[1]
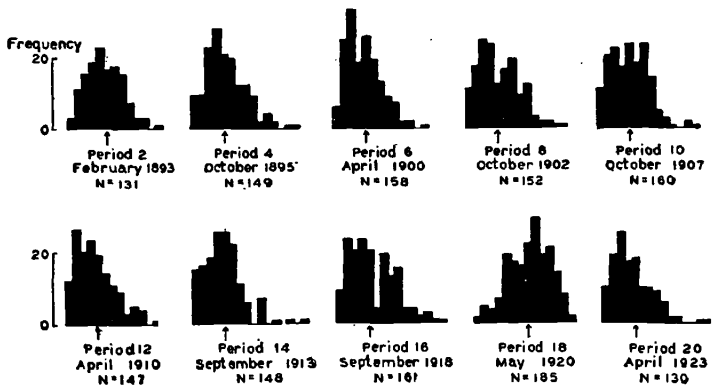


[1]The degree of fall, expressed as a percentage of the preceding high, is measured on the x-scale.
The means and standard deviations of these distributions are given in Table 139. The location of
the mean on the x-axis of each diagram is indicated by an arrow. The class interval is 6, centering
at 2.5, 8.5, etc.
The date below each diagram defines the reference point for the given period.

Averages and measures of variation for these various distributions are summarized in Table 139, together with measures of the degree of decline of the general price index (U. S. Bureau of Labor Statistics, supplemented by Falkner's) during the various recessions. The averages in column (3) of this table are shown graphically in the lower portion of Figure 73.

The degree of recession is in general less than the degree of rise, which follows, of course, from the fact that the general course of prices was upward during most of the period covered. In only three of the ten recessions did the average fall exceed the preceding rise. These were the recessions beginning in 1893 and 1895, which came when the trend of general prices was downward, and the recession of 1920-21.

The average decline, as measured by the figures in column (3),

TABLE 139

DEGREE OF PRICE DECLINE DURING RECESSION AND DEPRESSION

Averages and Measures of Variation derived from Observations on Individual Commodities, with Measures relating to an Index of Wholesale Prices[1]

| (1)<br>Period[2] | (2)<br>No. of<br>observations | (3)<br>Mean | (4)<br>Standard<br>deviation | (5)<br>Coefficient<br>of variation | (6)<br>Degree of<br>decline<br>in<br>wholesale<br>price index |
|---|---|---|---|---|---|
| 2 (Feb., 1893) | 131 | 29.8 | 14.6 | 49.1 | 12.9 |
| 4 (Oct., 1895) | 149 | 28.8 | 16.5 | 57.3 | 7.4 |
| 6 (Apr., 1900) | 158 | 24.6 | 14.1 | 57.3 | 4.9 |
| 8 (Oct., 1902) | 152 | 27.4 | 16.5 | 60.3 | 7.7 |
| 10 (Oct., 1907) | 160 | 26.8 | 15.5 | 57.6 | 8.3 |
| 12 (Apr., 1910) | 147 | 24.3 | 15.6 | 64.2 | 14.3 |
| 14 (Sept., 1913) | 148 | 24.7 | 15.7 | 63.5 | 4.7 |
| 16 (Sept., 1918) | 161 | 29.0 | 18.8 | 64.8 | 5.2 |
| 18 (May, 1920) | 185 | 51.8 | 17.1 | 33.1 | 43.9 |
| 20 (Apr., 1923) | 130 | 24.6 | 16.1 | 65.4 | 8.9 |
| Selected series, all<br>periods[3] | 1118 | 28.9 | 17.3 | 59.7 | |

[1]The entries in columns (3), (4) and (6) are in percentages, the bases of the percentages being the high values preceding the declines in the several periods.
[2]The entries in parentheses are the reference dates for the several periods.
[3]See note 2, Table 130, concerning the selected series.

is greater in all cases than the corresponding decline in the wholesale price index. The reasons for this have been suggested above.

As in respect to the duration measures, the average percentage of decline is more uniform from cycle to cycle than is the average percentage of rise. With the exception of the great recession of 1920-21, the degree of decline has varied between 24 per cent and 30 per cent.

d. *The Duration of Cycles in Commodity Prices.* Measures of the duration of commodity price cycles may be combined in frequency distributions relating to specific cycles, or into a general distribution for all cycles. When all the duration measures for 149 selected commodities are combined we have the distribution given in Table 140. This is shown graphically in Figure 76.

The 1110 cycles, classified according to duration, form a distribution with a fairly regular increase in frequencies up to a mode at 35 months and an even decline in frequencies thereafter. There is some concentration near the lower end of the scale, giving a positive skewness to the distribution. The mean length of the price cycle for these commodities, during the period 1890-1925, was 39.2 months, and the standard deviation was 12.9 months.

TABLE 140

DURATION OF CYCLES IN COMMODITY PRICES

Frequency Table Showing the Distribution of 1110 Observations on 149 Commodity Price Series during Ten Business Cycles

| Duration of cycle[1] (from low to ensuing low) in months | Frequency |
|---|---|
| 7.50 to 12.49 | 7 |
| 12.50 to 17.49 | 27 |
| 17.50 to 22.49 | 61 |
| 22.50 to 27.49 | 115 |
| 27.50 to 32.49 | 139 |
| 32.50 to 37.49 | 186 |
| 37.50 to 42.49 | 167 |
| 42.50 to 47.49 | 124 |
| 47.50 to 52.49 | 122 |
| 52.50 to 57.49 | 67 |
| 57.50 to 62.49 | 52 |
| 62.50 to 67.49 | 15 |
| 67.50 to 72.49 | 15 |
| 72.50 to 77.49 | 8 |
| 77.50 to 82.49 | 2 |
| 82.50 to 87.49 | 2 |
| 87.50 to 92.49 | 0 |
| 92.50 to 97.49 | 1 |
| Total | 1110 |

[1]In interpreting these figures the method by which the original measures were obtained must be borne in mind. The procedure is explained in detail in Chapter I.

Ten column diagrams, representing distributions of measures of cycle duration for the ten price cycles between 1890 and 1925, are shown in Figure 77. Because of the limited number of cases in each period the distributions relating to individual cycles lack the regularity of the distribution made up of entries for all cycles. They show distinctive characteristics, however, and important differences are discernible between the distributions for different cycles. A heavy concentration of frequencies, such as is found in the distribution relating to the cycle between 1919 and 1922, represents a fairly high degree of uniformity in cycle duration. There are few commodities that depart widely from the average for this cycle. Quite different are the distributions representing the four cycles occurring between 1895 and 1908. These four vary somewhat in type, but they are alike in that they reflect wide dissimilarities between commodities in respect to the duration of price cycles.

Differences between the distributions for the different cycles are not restricted to differences in degree of concentration. The

FIGURE 76

DURATION OF CYCLES IN COMMODITY PRICES.

Column Diagram Showing the Distribution of 1110 Observations
on Individual Commodity Price Series.
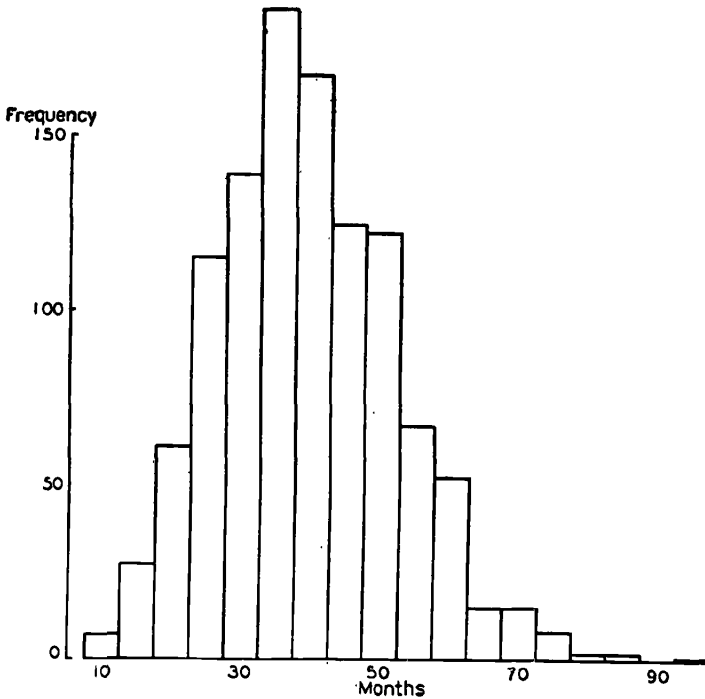


fairly symmetrical distributions relating to the cycles which oc-
curred between 1904 and 1908, and between 1911 and 1914, stand
in contrast to the curious irregularities of the distribution given by
the measures for the war-time cycle.

The means and standard deviations of the various distributions
shown in Figure 77 are given in Table 141.  For purposes
of comparison, figures showing the duration of cycles in the whole-
sale price index of the Bureau of Labor Statistics (supplemented by
Falkner's index for the period 1890-99) are included in the table.
The averages, and the measures descriptive of the behavior of the
wholesale price index, are shown graphically in Figure 78.

FIGURE 77

DURATION OF CYCLES IN COMMODITY PRICES.

Column Diagrams of Distributions Relating to Ten Business Cycles.[1]
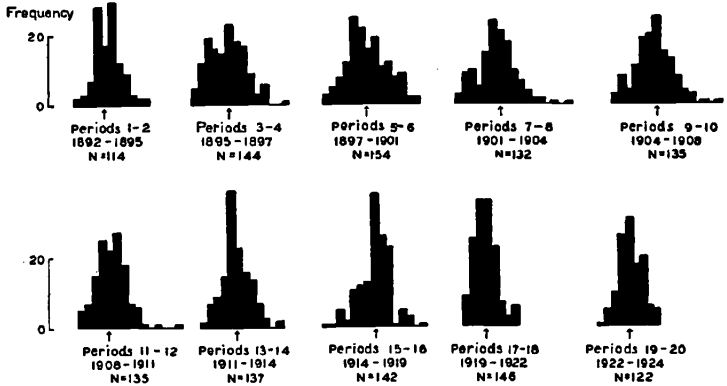


[1]The means and standard deviations of these distributions are given in Table 141. The location of the mean on the x-axis of each diagram is indicated by an arrow. The class interval is 5 months, centering at 10, 15, etc.

There are differences in detail between the averages shown in the upper part of Figure 78 and the measures of cycle duration

TABLE 141

DURATION OF CYCLES IN COMMODITY PRICES

Averages and Measures of Variation derived from Observations on Individual Commodities, with Measures relating to an Index of Wholesale Prices

| (1) Terminal dates of cycle[1] | (2) No. of observations[2] | (3) Mean duration of cycle (from low to low) in months | (4) Standard deviation, in months | (5) Coefficient of variation | (6) Duration of cycle in wholesale price index, in months |
|---|---|---|---|---|---|
| 1892 to 1895 | 114 | 32.3 | 9.4 | 29.2 | 34 |
| 1895 to 1897 | 144 | 33.3 | 13.0 | 38.8 | 26 |
| 1897 to 1901 | 154 | 45.1 | 14.3 | 31.8 | 50 |
| 1901 to 1904 | 132 | 42.7 | 12.8 | 30.0 | 36 |
| 1904 to 1908 | 135 | 47.9 | 13.3 | 27.8 | 43 |
| 1908 to 1911 | 135 | 36.4 | 10.8 | 29.8 | 40 |
| 1911 to 1914 | 137 | 38.4 | 10.3 | 26.8 | 41 |
| 1914 to 1919 | 142 | 50.0 | 11.1 | 22.3 | 51 |
| 1919 to 1922 | 146 | 33.4 | 8.0 | 24.1 | 35 |
| 1922 to 1924 | 122 | 31.1 | 8.3 | 26.8 | 29 |
| Selected series, all periods[3] | 1110 | 39.2 | 12.9 | 33.0 | |

[1]The terminal years given are those in which fall the reference dates for successive periods of revival. The dates upon which the measures of duration for individual commodities are based may, of course, fall beyond the terminal dates here given.

[2]The number of cases here listed is in all cases smaller than the proportion given in column (2) of Table 126. In preparing Table 126 a commodity was classed as passing through a complete cycle if a revival and a succeeding recession were recorded. In measuring duration of cycle, however, it was necessary that a specific date for the next revival should be available.

[3]See note 2, Table 130, concerning the selected series.
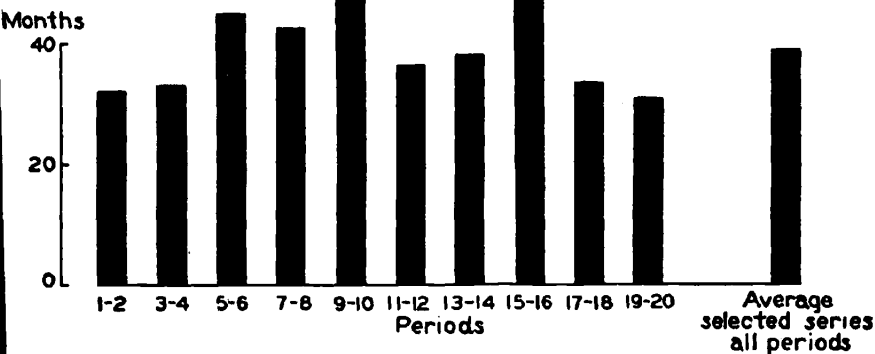
derived from the wholesale price index, which are plotted in the lower half of the chart.   In computing each average only those commodities have been included which passed through a complete cycle, from low to low.   This accounts, in part, for the differences. Again, there are offsetting movements in the individual price changes which affect the dates of high and low recorded by the general index.   These do not affect the averages, as each commodity is treated as a unit in determining the length of its price cycle.

FIGURE 78

DURATION OF CYCLES IN COMMODITY PRICES.

Comparison of Averages Computed from Individual Observations with Measures Derived from the Index of Wholesale Prices of the United States Bureau of Labor Statistics.

Averages Computed from Individual Observations



Measures Derived from the Index of Wholesale Prices of the United States Bureau of Labor Statistics
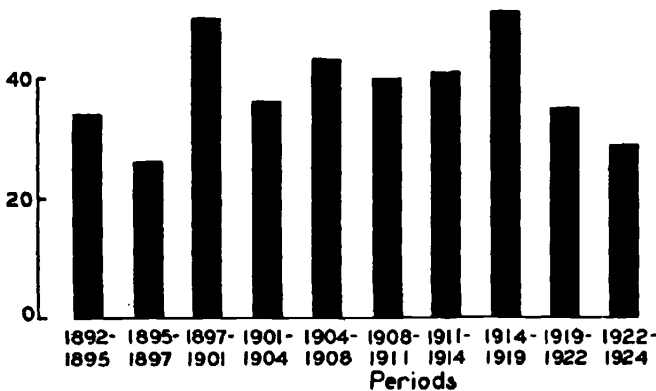
In showing that the duration of complete cyclical movements varies from cycle to cycle, the above records merely substantiate other evidence on this point. Of greater interest, perhaps, are the measures of variation for the individual cycles, which are given in columns (4) and (5) of Table 141. These indicate the degree to which the individual commodity price series depart from uniformity in respect to the duration of the cycles recorded. The degree of variation was least, as measured in absolute units, during the cycle which extended from the low of 1919 to the low of 1921-22 (standard deviation 8.0 months). The variation was greatest, in absolute units, during the cycle which extended from the low of 1897 to the low of 1901 (standard deviation 14.3 months). The variation relative to the duration of the cycle was least for the cycle extending from 1914 to 1919 (coefficient of variation 22.3) and greatest for the cycle extending from 1895 to 1897 (coefficient of variation 38.8). These measures represent considerable departures from uniformity. Not only does the duration of the price cycle vary from cycle to cycle, but within each cycle there are material differences between individual commodities in duration of cyclical swings.

e.   *The Amplitude of Cycles in Commodity Prices.* One of the measures of price behavior which was explained in Chapter I was an index of cyclical variability, a measure of the amplitude of cyclical swings in the prices of individual commodities.[1] In the following table a number of such indexes, relating to the behavior of 149 price series during the period between 1890 and 1925, are combined in a frequency distribution. The distribution is shown graphically in Figure 79.

This distribution of measures of cyclical variability shows the positive skewness characteristic of price distributions. The value of the crude mode is 21.5. (This may be interpreted as a percentage, if it be remembered that the base of the percentage is the high value in each cycle.) The mean is 30.8 and the standard deviation 15.5. The coefficient of variation, 50.3, is considerably higher than the corresponding measure of 33.0, for the measures of cycle duration. (The coefficient of variation relating to amplitude of cyclical fluctuations would still be higher than that relating to cycle duration, though by a smaller margin, if the percentages measuring cyclical variability were based upon the mean price in each cycle, instead of the high value.) These relative measures of variability indicate that prices differ among themselves in respect

[1]See pp. 85-86 for an explanation of this index.

TABLE 142

AMPLITUDE OF CYCLES IN COMMODITY PRICES

Frequency Table Showing the Distribution of 1110 Observations on 149 Commodity Price Series during Ten Business Cycles

| Amplitude of cycle (as measured by the index of cyclical variability) | Frequency |
|---|---|
| .50 to 6.49 | 27 |
| 6.50 to 12.49 | 92 |
| 12.50 to 18.49 | 148 |
| 18.50 to 24.49 | 181 |
| 24.50 to 30.49 | 145 |
| 30.50 to 36.49 | 134 |
| 36.50 to 42.49 | 133 |
| 42.50 to 48.49 | 80 |
| 48.50 to 54.49 | 79 |
| 54.50 to 60.49 | 48 |
| 60.50 to 66.49 | 30 |
| 66.50 to 72.49 | 6 |
| 72.50 to 78.49 | 4 |
| 78.50 to 84.49 | 3 |
| Total | 1110 |

to the amplitude of their cyclical swings more than they do in respect to the duration of these movements.
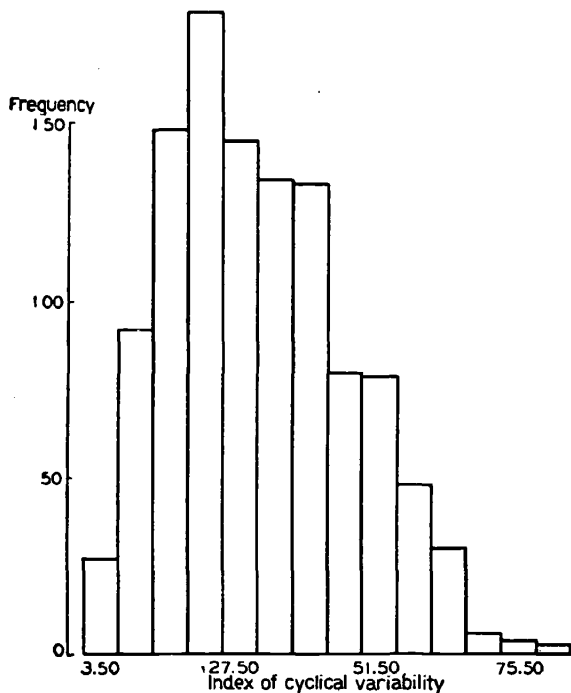
When we combine the indexes of cyclical variability relating to individual cycles, the distributions represented in Figure 80 are secured. Although there are some differences from cycle to cycle, the type represented by the general distribution is approximated by most of these distributions for specific cycles. The presence of a small group of highly variable commodities introduces a fairly consistent tendency toward positive skewness. There is a concentration of cases near the lower end of the scale, with a tail extending to the right. It is worthy of note that the two distributions which depart most widely from the type of the general distribution shown in Figure 79 are those relating to the cycles which occurred between 1914 and 1919, and between 1919 and 1922. These are much more symmetrical than any of the others. These are, of course, the cycles during which the amplitude of price fluctuations was greatest. When nearly all commodities change materially in price, the commodities which are normally more variable in price than the rest do not stand out as an exceptional group.

For effective comparison the means and measures of variation

FIGURE 79

AMPLITUDE OF CYCLES IN COMMODITY PRICES.

Column Diagram Showing the Distribution of 1110 Observations
on Individual Commodity Price Series.



of these individual distributions are needed. These are summarized
in the following table, together with indexes of cyclical variability
derived from the wholesale price index of the Bureau of Labor Sta-
tistics (supplemented by Falkner's index for the period prior to
1900). The averages and the measures derived from the wholesale
price index are shown graphically in Figure 81.

For two cycles, that extending from the low of 1914 to the low
of 1919 and that extending from the low of 1919 to the low of 1921-
22, the average of the indexes of variability exceeds 45. The max-
imum value is 48.5, recorded in the cycle during which war-time
expansion occurred. For all other cycles the averages vary between
25 and 32. The approximate uniformity of these averages, except
for the two cycles mentioned, is noteworthy. In the usual cycle,
which is not complicated by the effects of such extreme inflation

and deflation as marked the years between 1915 and 1921, the average range of price fluctuations for those commodities which share

TABLE 143

AMPLITUDE OF CYCLES IN COMMODITY PRICES

Averages and Measures of Variation derived from Observations on Individual Commodities, with Measures relating to an Index of Wholesale Prices

| (1)<br>Terminal dates of cycle[1] | (2)<br>No. of observations[2] | (3)<br>Mean | (4)<br>Standard deviation | (5)<br>Coefficient of variation | (6)<br>Amplitude of cycles in wholesale price index |
|---|---|---|---|---|---|
| 1892–1895 | 120 | 25.6 | 13.0 | 50.8 | 8.0 |
| 1895–1897 | 145 | 26.6 | 13.9 | 52.2 | 4.6 |
| 1897–1901 | 161 | 31.4 | 14.1 | 45.1 | 12.4 |
| 1901–1904 | 135 | 29.6 | 15.5 | 52.3 | 11.0 |
| 1904–1908 | 140 | 30.7 | 13.8 | 44.8 | 10.4 |
| 1908–1911 | 138 | 27.0 | 16.0 | 59.3 | 15.2 |
| 1911–1914 | 137 | 25.4 | 13.1 | 51.6 | 8.1 |
| 1914–1919 | 142 | 48.5 | 13.8 | 28.5 | 28.8 |
| 1919–1922 | 147 | 45.2 | 14.7 | 32.5 | 32.7 |
| 1922–1924 | 129 | 28.6 | 15.5 | 54.1 | 10.9 |
| Selected series, all periods[3] | 1110 | 30.8 | 15.5 | 50.3 | |

[1] The terminal years given are those in which fall the reference dates for successive periods of revival. The dates of the turns upon which the measures of cyclical variability for individual commodities are based may fall beyond the terminal dates here given.
[2] The number of cases here listed is for most cycles slightly greater than the corresponding number in Table 141. In certain cases (as when a commodity failed to rise in price at the end of a given cycle but remained constant in price for one or more cyclical phases thereafter) it was possible to measure the amplitude of the cyclical swing, but not the duration.
[3] See note 2, Table 130, concerning the selected series.

FIGURE 80

AMPLITUDE OF CYCLES IN COMMODITY PRICES.

Column Diagrams of Distributions Relating to Ten Business Cycles.[1]
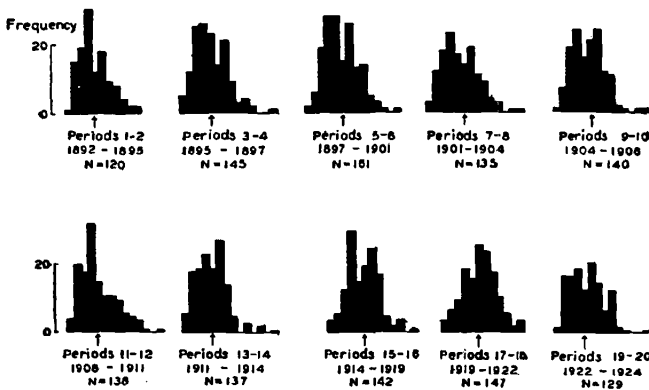


[1] The means and standard deviations of these distributions are given in Table 143. The location of the mean on the x-axis of each diagram is indicated by an arrow. The class interval is 6 (in units of the index of cyclical variability), centering at 2.5, 8.5, etc.

in the cycle amounts to from 25 per cent to 32 per cent of the high
value or, approximately, from 29 per cent to 38 per cent of the aver-
age value.

FIGURE 81

AMPLITUDE OF CYCLES IN COMMODITY PRICES.

Comparison of Averages Computed from Individual Observations
with Measures Derived from the Index of Wholesale
Prices of the United States Bureau of Labor
Statistics.

Averages Computed from Individual Observations
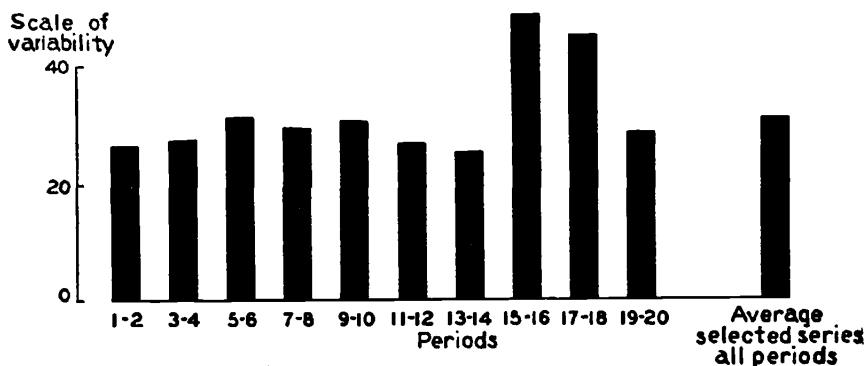


Measures Derived from the Index of Wholesale Prices
of the United States Bureau of Labor Statistics
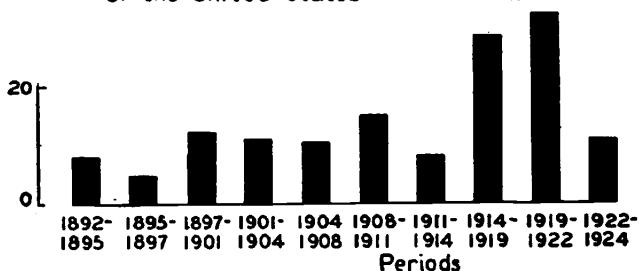


Within each cycle the individual commodities vary from the
average, however. The standard deviation ranges from 13 to 16,
averaging about 15, or 50 per cent of the mean. The measure of
average amplitude represents, of course, only a central tendency.
The variations both above and below this value are pronounced and
important.

As might be expected, the averages of the variability measures
for individual commodities are much higher than the measures of

cyclical variability derived from the wholesale price index. The averages are based only upon measures for those commodities which reflected given cycles in their price movements, whereas the general index is influenced by those commodities which did not pass through the cycle, as well as by those which did. Again, the fact that all commodities do not reflect the cyclical movements of business at precisely the same time leads to some offsetting, which tends to lessen the degree of fluctuation of the general index. Only when the cyclical swings are generally reflected among commodity prices, as during the two cycles which occurred between 1914 and 1922, do the measures relating to the index approach the averages derived from individual commodities.

### § Comparison of Distribution Types

In earlier sections attention has been paid to the general character-istics of the population of commodity prices. Comparisons have been made with other populations, biological and economic, in determining the degree of stability which the population of prices appears to possess. The measures which, in combination, enable group characteristics to be studied relate in each case to a particular attribute of prices, or to a par-ticular type of behavior. We may, in summarizing the behavior of prices during business cycles, consider the characteristics of these mea-sures when combined as frequency distributions. Such distributions have been presented above, in following changes from cycle to cycle, but the descriptive measures have been confined to measures of central tendency and variation. These and other attributes are summarized in the table on page 432. The present analysis has been restricted to distributions of individual measures, as combined for all cycles. The measures com-bined in the several distributions range in number from 1110 to 1118. The observations included relate to the behavior of 149 price series dur-ing the ten cycles between 1890 and 1925.[1]

Points defined by the criteria $\beta_1$ and $\beta_2$ for these distributions are plotted in Figure 57, in an earlier section of this chapter (p. 385).

These distributions constitute the most uniform group of any so far studied. They vary somewhat among themselves, six being of Type I and two of Type IV, but the degree of variation is much less pronounced than that found among any of the other groups analyzed. It is quite probable that wider variation would be found if distributions for the separate cycles were analyzed in detail, but this has not been attempted.

Points representing two of these distributions, those relating to the timing of revival and to the timing of recession, fall fairly close to the axis of symmetry. In respect to the time of movement during major cyclical turns there is an almost symmetrical distribution about the

[1]Commodities classed as exceptional and commodities which reflected in their price movements less than five of the ten cycles during this period have been omitted from these tabulations.

TABLE 144

STATISTICAL CONSTANTS RELATING TO DISTRIBUTIONS OF MEASURES OF CYCLICAL PRICE BEHAVIOR

| (1)<br>Cyclical movement | (2)<br>Mean | (3)<br>Median | (4)<br>Standard deviation | (5)<br>Coefficient of variation | (6)<br>$\beta_1$ | (7)<br>$\beta_2$ | (8)<br>Skewness | (9)<br>Kurtosis | (10)<br>$\kappa_1$ | (11)<br>$\kappa_2$ | (12)<br>r | (13)<br>Pearsonian curve type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Timing of revival | +2.5920 | +2.2953 | 9.6237 | ¹ | .0620 | 3.6257 | .0942 | .6257 | 1.0654 | .0446 | 14.4379 | IV |
| Timing of recession | +.9810 | +.8886 | 8.4453 | ¹ | .0144 | 3.8842 | .0400 | .8842 | 1.7252 | .0064 | 9.9807 | IV |
| Duration of rise | 22.1729 | 19.8548 | 13.2570 | 59.8 | .4198 | 2.8238 | .7255 | —.1762 | —1.6118 | —.2200 | 5.2264 | I |
| Duration of fall | 16.9514 | 16.0538 | 9.5835 | 56.5 | .5049 | 3.6380 | .3828 | .6380 | —.2387 | —1.7872 | 53.6179 | I |
| Duration of cycle | 39.1575 | 38.0990 | 12.9220 | 33.0 | .1950 | 3.2831 | .2221 | .2831 | —.0188 | —8.1582 | —666.4149 | I |
| Percentage of rise | 32.7596 | 30.0878 | 19.2282 | 58.7 | .2698 | 2.5346 | .6997 | —.4654 | —1.7402 | .1273 | 4.3609 | I |
| Percentage of fall | 28.9266 | 26.1972 | 17.2806 | 59.7 | .4507 | 2.9430 | .6625 | —.0570 | —1.4661 | .2605 | 6.1072 | I |
| Index of cyclical variability | 30.8294 | 28.9274 | 15.5076 | 50.3 | .2241 | 2.6511 | .4595 | —.3489 | —1.3701 | —.1315 | 6.2492 | I |

¹Not significant, because of the arbitrary nature of the reference date from which deviations are measured.

mean. The other distributions are somewhat less symmetrical, but in no case do we get the extreme skewness found in the distributions of price relatives and in the distributions relating to monthly variability.

In one other respect these distributions differ significantly from most of those previously studied. Four of the eight distributions in this group are flat-topped (i. e. the measures of kurtosis are negative). In each of these four distributions (which relate to duration of rise, percentage of rise, percentage of fall and degree of cyclical variability) there is less concentration in the neighborhood of the mode than there is in a corresponding normal distribution. Most of the distributions secured by combining measures of price behavior are characteristically peaked.

As in the case of the other distributions represented by points in Figure 57, the present group contains no examples of heterotypic distributions. There is no evidence here of the presence of those presumably disruptive elements which carry a distribution into the heterotypic area. The contrast between these distributions and the distributions of fixed base and link relatives which were presented in Chapter III is apparent.[1]

### III  Summary

1. In investigating the behavior of prices in combination all the measures descriptive of the behavior of individual commodities have been combined in the form of frequency distributions. The third chapter dealt with price relatives in combination. Characteristics of combinations of the other measures described in earlier sections are discussed in the fourth chapter.

2. Distributions of measures of monthly price variability show a heavy concentration of frequencies at the lower end of the scale, a condition which indicates a relatively low degree of variability for the great bulk of commodities. A small number of commodities, however, are marked by extremely high price variability. The presence of these two elements—markedly stable and highly variable commodities—is reflected in many of the distributions made up of measures of price behavior, and accounts for certain important attributes of the system of prices.

[1]It should be noted that the two sets of distributions are not fully comparable. The distributions of cyclical measures include a great many more observations, since they are drawn from all periods, and for this reason would be expected to have somewhat more stable characteristics. Again, the distributions of cyclical measures are based upon a selected list of commodities, certain ones being excluded because they are classed as exceptional, or because they did not reflect in their price movements the major cyclical swings of general business. Perhaps more important than these limitations is the fact that the rules governing the derivation of the individual cyclical measures (see pp. 76-82, 89-90) are in some respects arbitrary, whereas the price relatives are derived by a purely objective process. Finally, measures of cyclical movements have been secured only for those commodities which share in specific cycles. Those which fail to conform are of necessity excluded from the compilation, although account has been taken of them elsewhere.