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## CYCLICAL FLUCTUATIONS IN CORPORATE BOND FINANCING

CERTAIN standard techniques for cyclical analysis developed by the National Bureau of Economic Research have been utilized in Chapters 2 and 3 to obtain a general picture of the behavior of the basic annual bond series over business cycles. Our purpose now is to develop the analysis more thoroughly and to take advantage of the additional information provided by monthly estimates of offerings, extinguishments, and net changes in outstandings (Tables A-14, A-15, and A-16).<sup>1</sup> The monthly series for all industries can be used directly; quarterly estimates derived from the monthly series will be used in treating the major industry groups individually. Because of the difficulty of estimating bond refundings on a monthly or quarterly basis (cf. Chapter 3, footnote 10), the estimates dealt with here will relate principally to total offerings, total extinguishments, and the net changes, though a further examination of the annual data on new-money offerings, refundings, and repayments will also be included.

After describing briefly the standard National Bureau method for analyzing business cycles, we apply it successively to the bond series, to stock offerings, and to selected series on security prices. The period 1900-1938 is analyzed first as a unit, in an effort to determine any typical patterns of behavior that can be observed in it. Then, in view of the many important institutional changes affecting the money markets within the period, we wish also to learn whether important changes in cyclical behavior are observable in the bond data. The results of a preliminary analysis of that question form the concluding section of the chapter.

### SUMMARY OF FINDINGS

Analysis of the entire period 1900-1938 yields important general conclusions about the relationship of bond to stock financing over the various stages of the business cycle.

While bond extinguishments usually rise through the expansion

<sup>1</sup> The method of constructing the monthly series is described in Appendix B.

phase of the cycle and fall through the contraction phase, bond offerings are usually inverted, rising during most of the contraction phase and falling during most of the expansion. The net change in outstandings—the difference between offerings and extinguishments—consequently shows an inverse relationship to the rise and fall of general business activity.

The movements of the net change in bond financing at turning points in the cycle are interesting. The net change series generally leads turning points in business activity, its rise before business peaks being initially caused by a fall in extinguishments and afterward reinforced by a rise in offerings. Similarly, the fall at business troughs, initially caused by a rise in extinguishments, is later reinforced by a fall in offerings.

The conclusion that, on balance, corporations obtain an increasing volume of funds through the bond market during periods of contraction and a decreasing volume during periods of expansion leads to the question, Where, then, do corporations obtain funds to meet the increasing monetary requirements of expansion phases? Among the alternative sources of capital funds employed by corporations, a principal one during the period studied was the stock market. The behavior of stock offerings shows that corporations typically obtain an increasing volume of funds in the stock market during expansion stages, when net bond financing declines, and a decreasing amount during contraction stages, when net bond financing expands. Stock and bond financing thus appear to complement each other over the various stages of the cycle.<sup>2</sup>

The complementary relation between the two markets is most accurately expressed when net changes in bond financing are predicated by one or more cycle stages, inasmuch as net changes in bond financing typically lag behind stock offerings by at least one stage. While both the stock and the net bond series typically lead the general business cycle at turning points, stocks lead by a longer interval than bonds.

<sup>2</sup> Other sources of funds, not examined in this study, were important in particular periods: for example, retained earnings in the twenties and the forties, and tax accruals during World War II. Sergei P. Dobrovolsky in *Corporate Income Retention, 1915-43* (National Bureau of Economic Research, 1951), pp. 14-16, shows that retained earnings move over the business cycle in the same way as stock financing, hence exerting an additional pressure on the bond market.

From analysis of the cyclical movements in the net-change series and its components in relation to bond and stock prices, it appears that both the new-money component and total offerings tend to be directly associated with bond prices, while both repayments and total extinguishments are associated with stock prices (and stock offerings). Since the relation between bond and stock prices during business cycles is complex, and since the price factors do not play with equal strength on the components of the net change in bond financing, no simple formula in terms of bond or stock prices seems adequate to explain the behavior of the net change. In general, however, when the ratio of stock to bond prices turns downward during the contraction stages of the business cycle, corporations tend to shift their financing from the stock to the bond market; and conversely, when the ratio of stock to bond prices turns upward during expansion stages, corporations shift from the bond to the stock market.

Analysis of changes in the cyclical behavior of the bond series within the period 1900-1938 reveals a fair degree of stability. The most noteworthy change was a shift in the timing and amplitude of the net change in outstandings around 1919, attributable partly to a change in the timing of new-money offerings during business expansions and partly to the growing influence of repayments on the net change. No satisfactory explanation for the apparent shift in the pattern of new-money offerings appears; but the growing influence of repayments in the later years of the period is not surprising, since funded debt grew less rapidly after 1919 than before.

#### THE NATIONAL BUREAU METHOD FOR ANALYZING BUSINESS CYCLES

For analytic purposes, movements in economic time series may be thought of as resulting from the interplay of seasonal, cyclical, secular, and random forces. In essence, the National Bureau method for analyzing business cycles consists in (1) eliminating the effect of seasonal variation, (2) dividing the seasonally adjusted series into cycle segments, and (3) describing the standing of the series at nine cycle stages within each segment.<sup>3</sup>

<sup>3</sup> The National Bureau techniques have been described fully in *Measuring Business Cycles* (National Bureau of Economic Research, 1946) by Arthur F. Burns and Wesley C. Mitchell.

Step 2—the division of the series into cycle segments—is done in two ways: first, to correspond to cycles in general business activity (reference cycles) and second, to correspond to cycles appearing in the series itself (specific cycles). Under either system, stage I covers the three months centered at the initial trough of the cycle, stage V the three months centered at the peak, and stage IX the three months centered at the terminal trough. The interval between stages I and V is divided into three stages of equal length, designated as expansion stages II-IV; and the interval between stages V and IX is likewise divided into three stages, designated as contraction stages VI-VIII. Except for certain arithmetical simplifications which reduce the burden of the work without affecting the results, the actual operations performed in deriving the patterns are carried out along the following lines:

#### 1. *Elimination of the Seasonal Component*

The usual National Bureau method for eliminating the seasonal component from economic time series is to divide each of the original observations for a given month (or quarter) by a seasonal index number of a "relative" type. The seasonal index numbers are determined by striking averages of the ratios of the original observations to twelve-month moving averages centered at the respective observation dates. The averages are computed over periods usually ranging from about eight to fifteen years in length during which the seasonal pattern appears to be fairly uniform. Index numbers so constructed represent in effect the typical monthly standing of the series relative to the annual averages over the period in question. Such indexes were applied, in the present study, against the series for bond offerings and extinguishments.

The method described above is inapplicable to any series that may sum to values close to zero in certain years. In such cases seasonal index numbers of an "additive" type may be determined by averaging the differences between the original observations and their twelve-month moving averages. The resulting index numbers are then added to or subtracted from the original data to obtain the seasonally adjusted values. The only series to which the additive method would apply in the present case are those for net changes in outstandings. Theoretically such series could be adjusted indirectly by subtracting adjusted extinguishments from adjusted offerings. But the size of the erratic factor in the monthly bond data did not permit us to eliminate the seasonal in that way, and the monthly net-change series for the combined industries was finally adjusted independently by the additive method. The monthly data for the major industry groups were so erratic that it was necessary to adjust them on a quarterly basis; and adjusted net-change series for the quarterly data were

found to be tolerably free of the seasonal when obtained by the indirect method.<sup>4</sup>

## 2. *Division into Cycle Segments*

After a series is adjusted for the seasonal, it is marked off into segments, each covering one full cycle. In a standard analysis the cycle segments are marked off in two ways: first, to correspond with specific cycles appearing in the series itself; second, to correspond with cycles in general business activity as indicated by the National Bureau's chronology. "Specific cycles," obtained under the first method, are used here only in studying the timing of the turning points in the series relative to the turning points of the general business cycle; "reference-cycle patterns," obtained under the second method, are used to describe the movements of the series during business cycles and for general comparative analysis.

Other types of segmentation are occasionally employed. For example, the segments in the bond series might be marked off to correspond with turning points in some other series, such as stock offerings, with which they are to be compared. But where there is considerable uncertainty as to the exact timing of certain of the specific-cycle turns, as is the case with the financial series being dealt with here, such a procedure would be questionable. The bond series, therefore, are to be compared with one another and with other financial series over business cycles always by bringing together the reference-cycle patterns of the series being compared.

## 3. *Calculation of Reference-cycle Patterns*

Once a series has been marked off into cycle segments, the calculations performed to obtain reference-cycle patterns are straightforward. A "cycle base" for each segment is first determined by averaging the seasonally adjusted observations within the segment, and "cycle relatives" are then computed by dividing the observations by the cycle base. (For a series whose cycle base may take on values close to zero, "cycle deviations" are preferable to cycle relatives, and are calculated by subtracting the cycle base from the values of the seasonally adjusted observations within the segment. The several series for net changes in bond outstandings were adjusted in that way.) The process of taking differences or relatives frees the original

<sup>4</sup> The seasonal adjustment factors for the bond series are presented in Tables A-26 and A-27. Owing to the highly erratic nature of the original data, these factors were extremely difficult to estimate and are more than usually liable to error. Although the estimated seasonal patterns have shifted markedly and erratically over time, the indexes for bond offerings and the net changes usually exhibit a high at the beginning of the year and a low in August-October. The seasonal indexes for extinguishments are usually highest around the middle of the year and have a secondary high in December or January.

data of secular or intercycle trend but leaves undisturbed the trend within cycles (intracycle trend).

A nine-stage cycle pattern is then obtained for each cycle by averaging the cycle relatives or deviations within each cycle stage. Finally, the individual reference-cycle patterns are averaged to obtain an average pattern summarizing the behavior of the series over all the business cycles observed.

The process of averaging cycle relatives or deviations within stages and over business cycles reduces but does not entirely eliminate the effects of random or erratic elements in the original series. When the erratic component is large in comparison with the systematic or cyclical component, we can therefore never be sure that the cyclical patterns are entirely free of disturbing influences. This uncertainty must be kept constantly in mind in working with monthly and quarterly bond data, since their erratic components are large. In effect, each conclusion must be checked in several ways.

#### 4. *Construction of Conformity Indexes*

Another part of the National Bureau method for measuring business cycles is the construction of various indexes showing the degree of conformity of a series with cycles in general business activity. Three types of conformity index are computed at the National Bureau: for the full cycle, for the expansion phase, and for the contraction phase. The preliminary computations are the same for all three. The series is first analyzed to determine when, during business cycles, it typically rises and when it typically falls. For example, bond offerings for all industries typically rise over reference stages VI-II (from the first third of contraction to the first third of expansion) and fall over reference stages II-VI (from the first third of expansion to the first third of contraction). Average monthly rates of change in the reference-cycle relatives are computed over the successive phases of typical rise and fall.

For the full-cycle index, each of the average rates of change corresponding to a phase of reference contraction is compared with the rate over the preceding reference expansion, and also, to eliminate a possible bias, with the rate over the succeeding reference expansion. Positive conformity is indicated whenever a contraction rate is below an expansion rate, and a value of +100 is assigned in each case. Negative or inverted conformity is indicated in converse situations, and a value of -100 is assigned in each case. The tallies are then averaged to obtain the full-cycle conformity index.

The conformity index for expansions is computed by first assigning a value of +100 or -100, respectively, each time the series increases or decreases over an expansion phase and then striking an average of the tallies. The conformity index for contractions is constructed analogously except that decreases are assigned a value of +100, and increases, a value of -100.

The conformity indexes have the value +100 for series with

perfect positive conformity, the value 0 for series with 50 percent positive and 50 percent negative conformity, and the value  $-100$  for series with perfect negative conformity. It is evident from the way the indexes are constructed that they are quite sensitive to lapses from perfect conformity. For example, an index of  $+50$  indicates 75 percent positive conformity. (For series such as those for corporate bonds, which cover ten reference cycles, a full-cycle conformity index of  $+50$  would imply positive conformity in 15 out of 20 comparisons.) Similarly, an index of  $+40$  is equivalent to 70 percent positive conformity.

#### 5. *Analysis of Annual Data*

Essentially the same methods of analysis are applied to annual as to monthly data, but in considerably simplified form. Reference-cycle patterns are computed for a five-stage cycle only, corresponding to stages I, III, V, VII, and IX on the monthly basis. The choice of typical expansion and contraction stages is thus restricted, but otherwise the conformity indexes are computed as described above.

Special problems were encountered in applying the National Bureau methods to the monthly and quarterly series for corporate bonds. Bond financing is a "lumpy" process when considered over periods as short as a month or a quarter, for relatively few offerings or extinguishments occur in such short periods and these few may vary considerably in size. From the viewpoint of time-series analysis, in effect, the underlying systematic nature of the economic process is obscured by large erratic or random fluctuations in the bond financing data. The large differences between patterns for individual cycles that are observed may conceivably be attributable either to differences in the length and severity of individual business cycles, to isolated economic occurrences that have particularly affected the bond market, to systematic structural changes in its functioning, or simply to the myriad factors affecting bond flotations and extinguishments by individual firms. Accordingly, to attempt to explain many of the individual differences among cycles or to trace minor structural changes in cyclical behavior would be unwarranted. Analysis will be limited for the most part to an investigation of the typical behavior of the series during all cycles covered by the data. In pursuing this objective, however, we shall find that the reference patterns and conformity indexes for the various bond series—even though they are not particularly reliable in themselves—agree broadly with one another and with the conclusions already reached by examina-



tion of annual data in preceding chapters. Moreover, the reference-cycle patterns for bonds usually show the behavior we should expect when they are compared with those for other capital market series.

Owing to the size of the random component in the bond data, it has often been necessary to relax the criteria ordinarily imposed by the National Bureau for a proper seasonal adjustment.<sup>5</sup> Although the amplitude of seasonal variation in the bond series is fairly large as such indexes go, it is usually small in relation to the cyclical variation. Thus errors committed in over- or under-elimination of the seasonal should not materially affect the accuracy of most of the final conclusions. Nevertheless, such errors undoubtedly occurred and may have affected the timing of certain specific-cycle turning points.

#### CYCLICAL FLUCTUATIONS IN BOND OFFERINGS, EXTINGUISHMENTS, AND NET CHANGES IN OUTSTANDINGS

The cyclical movements of bond offerings, extinguishments, and net changes will be studied in two ways: first, by examining the correspondence of turning points in specific cycles with turning points in reference cycles; and second, by comparing the behavior of the several series as it is shown by their reference-cycle patterns and conformity indexes.

##### *Correspondence between Specific- and Reference-cycle Turning Points*

The degree of correspondence between specific- and reference-cycle turning points may be analyzed by plotting the seasonally adjusted data against the reference dates and noting the number of correspondences at turning points and the lengths of leads and lags. The specific-cycle turning points in the bond data and other related series are presented schematically in Chart 15. Since

<sup>5</sup> For a seasonal index of the relative type, the principal criterion is that the annual totals after adjustment should not depart by more than 10 percent from the totals of the unadjusted data. For an index of the additive type no such simple criterion is available, since the difference between the annual totals before and after adjustment must necessarily be small. For the additive type of index the principal requirement is that the seasonally adjusted series be smoother than the original series and pass through it in an acceptable way.

timing rather than amplitude is in question here, all series are depicted as rising or falling uniformly between their specific-cycle turns. For comparative purposes, the general level of business activity is also portrayed as moving uniformly between reference turns.

The first of the angle graphs at the top of Chart 15 represents general business activity, which is portrayed as expanding between December 1900 and September 1902, as contracting between September 1902 and August 1904, and so on.<sup>6</sup> The next three angle graphs represent the specific cycles observed in the series for bond offerings, extinguishments, and net changes in outstandings. The remaining angle graphs represent other capital market series to be compared with the bond data at a later point in the chapter. To afford appropriate timing comparisons at turning points, bond offerings and net changes, which have negative conformity with business cycles, have been inverted on the chart; bond extinguishments and the other capital market series, considered here as having positive conformity, are shown in the usual way.

Chart 15 may be used first to compare the number of specific cycles in the bond series with the number of reference cycles occurring in the period covered by the bond data. Reference cycles are customarily counted from trough to succeeding trough; so also are specific cycles that show positive or low conformity with reference cycles; and specific cycles that show negative conformity are counted from peak to peak. Accordingly, the period from December 1900 (the initial trough covered by the bond data) through May 1938 (the last reference trough covered) spans 10 full reference cycles. Over roughly the same period, 13 specific cycles can be identified in bond offerings (inverted), 11 in extinguishments, and 12 in net changes in outstandings (inverted). Thus bond offerings have three cycles more than are recorded in general business activity, and the net changes have

<sup>6</sup> Dates of reference-cycle turning points used throughout this chapter are those developed by Burns and Mitchell (*op.cit.*, p. 78). Since the completion of the analysis for corporate bonds, three minor changes have been made in the reference chronology: the revised dates are July instead of September 1921, November instead of December 1927, and June instead of May 1938. These changes do not alter any of the basic conclusions to be advanced here, and the series have not been reanalyzed to take them into account.

two extra cycles. Extinguishments also have two extra cycles, but one of them is offset by a reference cycle skipped between January 1912 and December 1914. The average duration of reference cycles covered by Chart 15 is 44.9 months; the average duration of specific cycles in bond offerings is 34.8 months, in bond extinguishments 41.0 months, and in net changes 37.3 months.

Comparisons of the number of specific and reference cycles occurring in a given period and of their average duration are imperfect measures of the degree of correspondence between a series and general business activity. A better measure can be obtained by using some rule of thumb that permits us to decide whether or not specific turning points match reference turning points. Briefly stated, the common-sense rule developed by the National Bureau's division of business cycle studies for use in the calculation of average leads and lags at turning points is as follows: A specific trough (peak) is said to match a reference trough (peak) if no other specific or reference turn occurs within the interval defined by the pair of turning points under consideration. (For series with negative conformity the rule is modified so that specific peaks are compared with reference troughs, and specific troughs with reference peaks.) To illustrate: the specific peak in the inverted net-change series of July 1928 is said to match the reference peak of June 1929, since no other specific or reference peak or trough intervenes between July 1928 and June 1929. On the other hand, the peak of June 1933 in the same series (the peak of an extra specific cycle) matches neither the reference peak of June 1929 nor the reference peak of May 1937, since the specific troughs of June 1930 and April 1936 intervene.

When extra cycles occur in a series, unqualified application of the above rule of thumb occasionally gives questionable results, and an amendment is required. Consider, again, the extra cycle in the net-change series between June 1929 and May 1937. Under the rule as stated, the specific trough in the inverted series of June 1930 matches the reference trough of March 1933 although it is nearly as far from that reference trough as is the succeeding specific trough of April 1936. When such an extra cycle occurs, the specific turn that meets the rule is compared with the reference turn only if it deviates from the reference turn by no more than three months. Under the rule as amended the trough in net

changes (inverted) of June 1930 is not matched with the reference trough of March 1933.

The mechanical application of both the rule and its amendment may be relaxed to permit comparisons, where other evidence clearly indicates a relationship, in the case of "well-conforming" series (series having a full-cycle conformity index numerically greater than 50).<sup>7</sup> Both bond offerings and extinguishments have conformity indexes numerically greater than 50, and occasionally their turning points have been compared with reference turns despite the rule. For example, the specific peak in bond offerings (inverted) of August 1903 is matched with the reference peak of September 1902 although a specific trough in October 1902 intervenes.

The matching turns in specific cycles are indicated on Chart 15 by arrows pointing in the direction of corresponding reference turns. The maximum possible number of matching turns for the 10 reference cycles covered by the bond data is 21, the total number of reference turns. From the timing viewpoint, bond offerings (inverted) are especially well behaved, matching at all 21 reference turns. For the net changes in outstandings (inverted), specific turns match reference turns in 17 cases (9 comparisons at reference peaks and 8 at reference troughs), which is well in excess of the number to be expected if the turning points in the series were totally unrelated to turning points in general business activity.<sup>8</sup> The correspondence of specific turns with reference-cycle turns was somewhat less marked for bond extinguishments (14 comparisons out of a possible 21).

From the dynamic point of view the most important variable of the three is the net change in outstandings, since it reflects the net volume of credit expansion or contraction through corporate bond financing. The specific-cycle turning points for the net changes, which matched reference turns in 17 cases out of 21, would have matched in 20 cases out of 21 had it not been for the two extra cycles: May 1902 through February 1904 and June 1930 through April 1936. It is suggestive that the extra

<sup>7</sup> Cf. Burns and Mitchell, *op.cit.*, pp. 120-23.

<sup>8</sup> The statement is based not on probability considerations, which are rather complex for a model such as this, but on impressions obtained by the National Bureau's division of business cycle studies in working with large numbers of conforming and nonconforming series.

cycles occurred under rather unusual but roughly similar economic circumstances. We shall see that over most periods of business contraction, stock prices and stock offerings fall while the net change in bond outstandings rises. In the two periods in question, however, unsettled conditions in the capital markets touched off an extra contraction in the net volume of bond financing at early points in reference contraction, namely October 1902 and June 1930. At both times (and particularly at the latter date), stock prices were falling from unusually high levels at an unusually rapid rate, and unsettled conditions in the stock market spread to the bond market. In consequence the normal rise in the net change in outstandings during business contractions was choked off at an early stage by a disorganized bond market, monetary stringency, and high money rates.

The lengths, in months, of leads (—) and lags (+) at turning points for those specific-cycle turns that match reference turns are shown on Chart 15 directly above or below the arrows indicating the direction of the reference comparison. The data are summarized in Table 15, which shows the number of leads and lags and the average length of lead or lag at reference peaks and at reference troughs. On the average, specific-cycle turning points in bond offerings lag reference-cycle turns, while bond extinguishments and net changes both lead. These averages must be accepted with caution, since they cover only a small number of matching turning points and there is considerable disparity in timing at the turns. Other evidence is to be developed later that will help in judging the reliability of the averages.

The timing comparisons for the major industry groups seem even less reliable on the whole and are therefore not presented in the table. Inverted bond offerings for railroads show a pronounced tendency to lag at reference troughs, as do offerings of the combined industries. Moreover, bond extinguishments rather consistently led at both turning points, the exception being the railroads, which behaved irregularly. The inverted net-change series for the several industry groups show a mixed pattern, the railroads lagging at reference troughs, the utilities behaving irregularly, and the industrials showing a pronounced tendency to lead at both reference turns (with an average lead of 11.2 months at reference peaks and 8.0 months at reference troughs). On the whole, it appears that while inverted bond offerings for



the combined industries usually lag turning points in reference cycles and extinguishments and net changes lead, there is some dissimilarity in the timing for the industrial components.

For future reference it may be noted that stock offerings and prices usually show longer leads at turning points than do inverted net changes in bond outstandings (Chart 15). The average lead for stock offerings is 6.9 months at reference peaks and 5.8 months at reference troughs, and for stock prices 4.6 months at peaks and 7.4 months at troughs. On the other hand, bond prices typically lag, the average lag being 6.1 months at reference peaks and 12.6 months at reference troughs.<sup>9</sup>

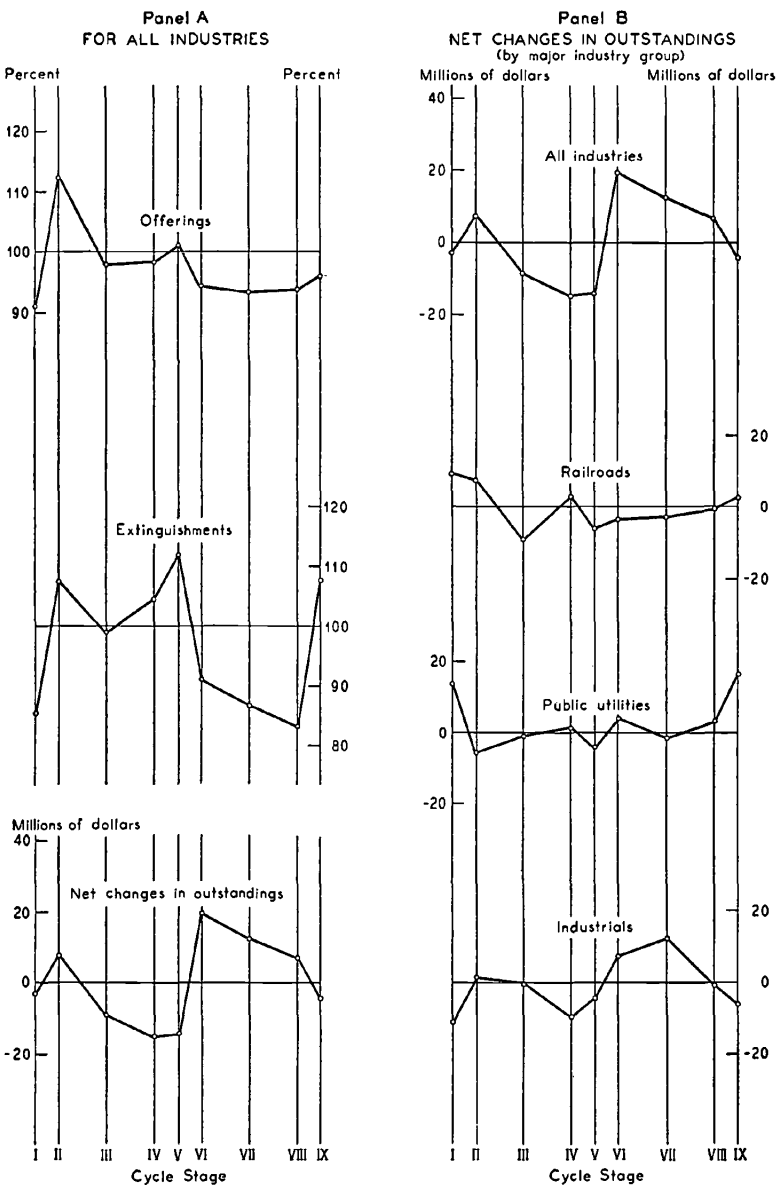
#### *Reference-cycle Patterns and Conformity Indexes*

The preceding analysis of the timing of turning points in the various bond series relative to reference turns makes use of only a fragment of the information contained in the standard National Bureau analyses of the bond series. Additional information concerning the behavior of the series at each of the nine stages in the business cycle may be obtained from the average reference-cycle patterns presented in Chart 16.<sup>10</sup> For simplicity in presentation, an arbitrary time scale of uniform length has been used in plotting Chart 16 and later charts of the same type, with expansion phases portrayed as equal in length to contraction phases. Actually, of course, the lengths of expansion and contraction

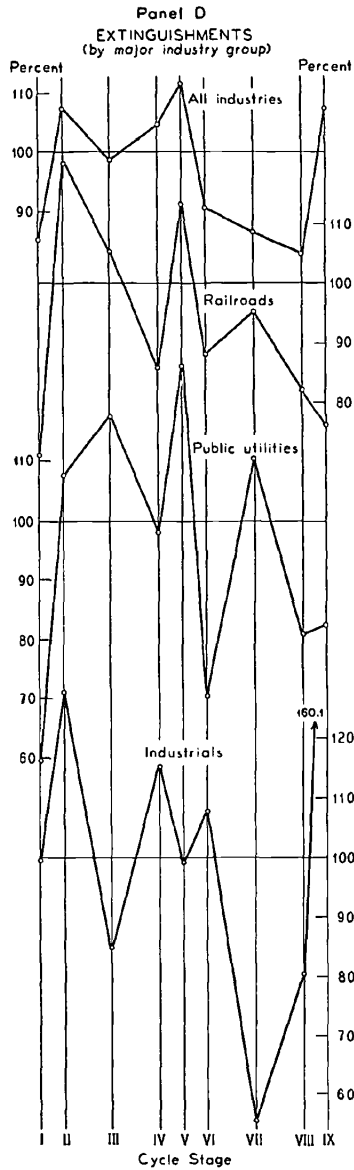
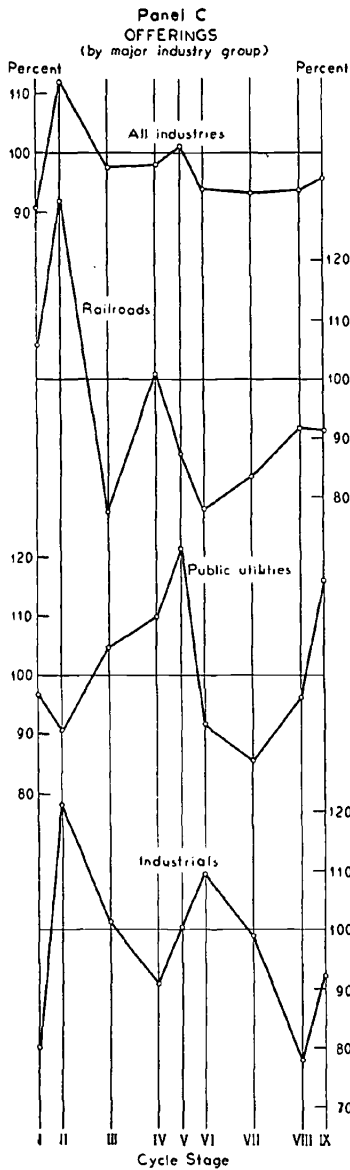
<sup>9</sup> Since bond prices are obtained by taking the reciprocal of yields, the turning points of the two series are necessarily identical. Both series are "neutral" with respect to the business cycle in the sense that their peaks and troughs typically occur midway in reference expansions and contractions. In determining the averages mentioned in the text above, bond yields were treated as conforming positively and bond prices as conforming invertedly (both with a lag). Alternatively, the two series could both be treated as leading series, bond yields in this case conforming invertedly and bond prices positively. On Chart 15, the bond price line is plotted on a positive basis for purposes of comparison with stock prices, but the timing comparisons are made on an inverted basis.

<sup>10</sup> The averages are based on all ten reference cycles covered by the bond data. Owing to possible inaccuracies in the bond data in the first decade studied and to the extremely erratic behavior of the series in that period (see Appendix B), a parallel analysis was made for only the eight cycles 1908-38. The results did not materially alter the conclusions drawn from the ten-cycle analysis.

CHART 16—Average Reference-cycle Patterns for Corporate Bond Offerings, Extinguishments, and Net Changes in Outstandings, 1900-1938







Based on Tables A-14, A-15, and A-16, for straight bonds, used as monthly data for all industries combined and converted to quarterly data for the breakdowns by major industry group.

Bond offerings and extinguishments are expressed in terms of cycle relatives (percents), and net changes in terms of cycle deviations (millions of dollars).

phases, as well as the over-all lengths of business cycles, vary considerably from one cycle to the next.

Panel A of Chart 16, covering bonds of the combined industries, shows that bond offerings fall irregularly between cycle stages II and VI (that is, throughout most of the expansion and the early contraction stages of the cycle) and rise between stages VI and II (that is, throughout most of the contraction and the early expansion stages). Bond extinguishments, although they too are erratic, show a slightly more systematic pattern of behavior over business cycles and have a larger amplitude of variation than offerings. Extinguishments typically rise between cycle stages VIII and V (that is, throughout the late contraction and the entire expansion stages of the cycle) and fall between stages V and VIII (that is, from the reference peak through most of the contraction). Consequently the net changes in outstandings are clearly inverted with respect to business cycles, although the exact timing of the typical stages of expansion and contraction is not so well defined for the net changes as for the other two series.<sup>11</sup>

Chart 16 also shows that extinguishments usually stand above the cycle base during reference expansions and at reference peaks and below the cycle base during reference contractions. Net changes, on the other hand, are typically below the cycle base in reference expansions and above the cycle base at most stages of reference contraction.

Panel B of Chart 16 compares the average reference-cycle patterns of the net changes for the major industry groups with the pattern for the combined industries. The patterns for the major industry groups are irregular but exhibit certain of the characteristics of the pattern for the combined industries. They usually stand, on the average, below their cycle bases during most stages of reference expansion and are well below at the reference peak (stage V). The rise in each series between stages V and VI accounts for the sharp rise in the total net change at that time; and throughout the remaining stages of reference contraction, the several series usually stand close to or above their cycle bases.

Panels C and D of Chart 16 present average reference-cycle patterns for offerings and extinguishments by major industry

<sup>11</sup> Because of the ambiguity in its timing, two alternative periods of typical expansion have been assigned to the net-change series in our analysis, viz. stages V-IX and IV-VII.

group. The patterns for the combined industries clearly reflect the influence of the industry components. For example, the major peak in offerings at stage II corresponds with peaks in railroad and industrial offerings, and the minor peak at stage V corresponds with the peak in utility offerings. In extinguishments of the combined industries, major and minor peaks at stages V and II, respectively, correspond with peaks at or near those stages in each of the industry components.

Conformity indexes for the various bond series are given in Table 16. The typical expansion stages shown there were determined partly on the basis of the average reference cycles and partly from the movements of the series over individual cycles. (Movements over individual cycles are shown for the net changes in Chart 18 but are not shown separately for offerings and extinguishments.) Over most cycles, bond offerings of the combined industries are dominated by the railroads and expand with them between cycles stages VI and II. Offerings of public utility and industrial bonds behave less systematically and are classified in the table as irregular. On the other hand, these latter industry groups govern the all-industry figures for extinguishments. Extinguishments typically expand during late contraction stages and throughout early expansion; they contract fairly abruptly immediately at or before the reference peak and continue to decline until middle or late contraction. Unlike rail offerings, rail extinguishments are classified as irregular.

A detailed examination of the movements in the net-change series over individual reference cycles shows that it usually begins to rise at cycle stage IV or V and frequently rises abruptly between stages V and VI (see Chart 18). The abrupt rise near the reference peak is attributable largely to the fall in extinguishments, since the bond market is frequently unsettled then and offerings are falling. By stage VI, offerings are rising and the net changes continue upward. Since the net change is the resultant of rather erratic components, there is some question as to when its expansion ends (in midcontraction for industrials and possibly all industries; in early expansion for rails). It appears that in most cases the downturn in the net changes is caused by a more rapid rise in extinguishments than in offerings.

The conformity indexes for the various bond series in Table 16 are presented for the ten cycles 1900-1938 and also, to eliminate

TABLE 16—Conformity Indexes, and Average Rates of Change per Month in Reference-cycle Relatives, for Corporate Bond Offerings, Extinguishments, and Net Changes in Outstandings, 1900-1938

SERIES	INDUSTRY	Typical expansion stages	INDEXES OF CONFORMITY FOR						AVERAGE CHANGE PER MONTH (TEN CYCLES) IN REFERENCE-CYCLE RELATIVES <sup>a</sup> DURING	
			TEN CYCLES, 1900-1938			EIGHT CYCLES, 1908-1938				
			Expansion	Contraction	Full cycle	Expansion	Contraction	Full cycle	Expansion	Contraction
Offerings	All industries	VI-II	-40	-64	-70	-25	-50	-60	-0.86	+1.35
Offerings	Railroads	VI-II	-40	-45	-60	-25	-25	-47	-1.90	+2.08
Offerings	Public utilities	Irregular <sup>b</sup>	+60	-20	+26	+50	-25	+20	+0.19	-0.90
Offerings	Industrials	Irregular <sup>b</sup>	+40	+40	+26	+50	+25	+20	+0.71	-0.20
Extinguishments	All industries	VIII-V	+80	+40	+58	+75	+25	+47	+1.27	-1.66
Extinguishments	Railroads	Irregular <sup>b</sup>	+40	+60	+58	+25	+50	+47	+1.60	-1.99
Extinguishments	Public utilities	VIII-V	+60	+40	+58	+75	+25	+47	+2.64	-4.19
Extinguishments	Industrials	VII-IV	+80	+60	+79	+75	+50	+73	+1.63	-4.28
Net changes	All industries	V-IX	-40	-20	-16	-75	-25	-33	-1.0	+1.0
		IV-VII	-20	-50	-47	-25	-63	-60	-1.5	+2.3
Net changes	Railroads	V-II	-50	-40	-58	-50	-25	-47	-0.8	+0.3
Net changes	Public utilities	Irregular <sup>b</sup>	0	0	-16	-25	0	-33	-1.3	+1.3
Net changes	Industrials	IV-VII	-70	-70	-79	-100	-75	-93	-0.9	+1.7

Based on monthly data for all industries combined and on quarterly data for major industry groups, Tables A-14, A-15, and A-16.

<sup>a</sup> The monthly rates of change are in terms of cycle relatives (percents) for offerings and extinguishments, and in terms of cycle deviations (millions of dollars) for the net changes; cf. page 136.

<sup>b</sup> Series classified as irregular are those for which no systematic stages of expansion or contraction could be assigned with confidence. There is some evidence, however, that the offerings series for industrials and the extinguishment series for railroads expand over stages I-V and that the net-change series for public utilities expands over stages V-IX. For purposes of computing the conformity indexes, all series classified as irregular are considered as if expanding over stages I-V and contracting over stages V-IX.

the influence of possible errors in the underlying data in the early years, for the eight cycles 1908-38. The indexes for bond offerings of the combined industries indicate high inverse conformity with business cycles. Extinguishments exhibit positive conformity with general business activity over the full cycle, their conformity being somewhat better during expansion than during contraction stages. Disregarding signs, the monthly rates of change in the cycle relatives for extinguishments are considerably above the corresponding changes for bond offerings. Consequently the net changes for the combined industries are inverted with respect to business cycles, declining in expansion stages and rising in contraction. These conclusions for the combined industries support the ones obtained from annual data in Chapter 2.

With the exception of bond offerings, the conformity indexes of the various series for the major industry groups are in remarkably close agreement with those for the combined industries, considering the erratic nature of the data. As to offerings, the railroads exhibit pronounced inverse conformity, while public utilities and industrials exhibit low (possibly positive) conformity. (See, however, Table 4, where the annual indexes for the latter two series suggest possible negative conformity.)

All full-cycle indexes for extinguishments for the major industry groups, like those for the combined industries, indicate positive and rather high conformity with business cycles; and supporting evidence is given by the conformity indexes for expansions and contractions. In addition, the average monthly rates of change indicate that over expansion stages the cycle relatives for extinguishments for each of the major industry groups rise more rapidly than do the corresponding relatives for offerings, and that over contraction stages they fall more rapidly.

The conformity indexes for the resultant net-change series indicate negative conformity for each industry group, the full-cycle indexes being highest for the industrials and lowest for the public utilities. In the case of the public utilities, irregular movements in bond offerings sometimes obscure the effect on net changes of systematic movements in extinguishments. Offerings of the industrial group also show irregular movements, but these are more than offset by pronounced cyclical swings in extinguishments, so that the net-change series exhibits high negative conformity with business cycles.

Annual data examined in Chapter 3 indicated that the two components of total offerings—new-money offerings and refundings—behave somewhat similarly over reference cycles, while the two components of total extinguishments—refundings and repayments—do not behave alike. Monthly or quarterly data by means of which the annual conformity indexes for new-money offerings, refundings, and repayments might be supplemented are not available; but an analysis of reference-cycle patterns based on our annual series confirms the conclusions drawn before.

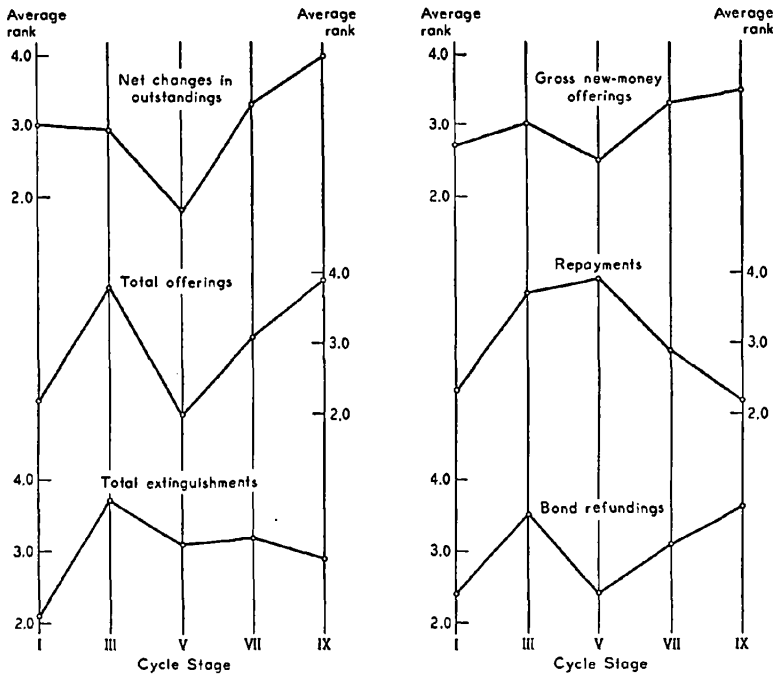
Average rank patterns of the total and component series for all industries are presented in Chart 17. These patterns were obtained by first ranking the reference-cycle standings at stages I, III, V, VII, and IX of each reference cycle (that is, assigning to the highest standing the rank 5, to the next highest standing the rank 4, etc.), and then striking averages of the ranks for each stage over all cycles. The use of annual data and the process of ranking eliminate most of the erratic disturbances characteristic of monthly and quarterly bond data, but obscure certain timing differences.<sup>12</sup> Nevertheless the patterns for the net changes and for total offerings and extinguishments are not unlike the corresponding patterns in Chart 16. The net changes and total offerings are clearly inverted, while total extinguishments show rough positive conformity.

The rank patterns for new-money offerings, repayments, and refundings serve to explain those movements. Both components of total offerings (new-money and refundings) have roughly similar patterns, rising during reference contractions and early expansions, and falling only during late expansions. Thus they reinforce one another so that the total shows a greater amplitude of variation than either component taken separately. On the other hand, the movements of the two components of total extinguishments (refundings and repayments) offset one another over most cycle stages. Repayments exhibit pronounced positive conformity, rising continuously from reference trough to peak, and falling from peak to trough; but refundings are inverted, rising from

<sup>12</sup> The timing is particularly obscure during reference contractions, because all except one of the reference contractions during 1900-1938 last but one year on an annual basis. In such cases the standing at stage VII is simply the arithmetic average of the standings at the peak year and at the subsequent trough year.

cycle stages v to iii, and falling only during late expansions. Because of these timing differences, total extinguishments show their most pronounced rise during early reference expansions, when the two components move upward together. At other times

CHART 17—Average Annual Rank Patterns for Selected Corporate Bond Series during Cycles in General Business Activity, 1900-1938



Based on annual data, from Table A-12, for straight bonds.

the components move in opposite directions and total extinguishments move irregularly downward.

The cyclical behavior of the net changes in outstandings is explained most readily by eliminating refundings from total offerings and extinguishments to obtain new-money offerings and repayments. As Chart 17 shows, new-money offerings exhibit mild negative conformity with the business cycle and thus with

bond repayments. Hence the influence of new-money offerings on net changes in outstandings is usually reinforced by opposite movements in repayments. Over most cycle stages the net changes move directly with new-money offerings and inversely with repayments. A single exception occurs between stages I and III, when new-money offerings rise but the net changes fall because of the rise in repayments.

Later in the chapter we shall find that the cyclical behavior of new-money offerings, repayments, and refundings suggests an explanation for the cyclical relationships between the various bond series and the cost of money. New-money offerings and refundings usually rise and fall together with bond prices (the inverse of bond yields), while repayments rise and fall with general business activity and the volume of stock financing.

#### RELATIONSHIP BETWEEN BOND AND STOCK FINANCING DURING BUSINESS CYCLES

The net volume of bond financing, it has been shown, is inverted with respect to business cycles and is usually below the cycle base in expansion stages and above the cycle base in contraction. Since, as will appear in Chapter 6, the net change in outstandings is approximately equal to the net cash flow from sale and repayment of corporate bonds, the implication is that corporations usually obtain less funds through the bond market during business expansions than during contractions, and on occasion actually lose funds during expansion through the repayment of long-term debt. Other evidence indicates that many corporations lose cash during expansion stages through their ordinary business operations, since cash outflow into inventories and trade credit frequently exceeds cash inflow from earnings. During business contractions, the reverse is true: corporations raise more funds on balance through the bond market at the very time that they are gaining cash on balance from operations.<sup>13</sup>

A consideration of these two sets of conclusions raises important questions relating to the financing of corporate enterprise over the business cycle. Theory might lead us to expect the net volume

<sup>13</sup> This statement is based on an unpublished analysis of the flow of funds from financial and nonfinancial sources of 84 large manufacturing corporations prepared at the National Bureau of Economic Research by Wilson F. Payne.



of corporate bond financing to be heavier in good times than in bad, which is of course the opposite of what we now know to be the case. Where then do corporations obtain funds to meet the expanding requirements of trade? And why do corporations borrow more heavily in recession, when other cash flows are rather automatically favorable to them?

The explanation is to be found in the fact that bond financing is only one of many sources of external funds for corporate use. Additional funds may be procured through the stock market, the mortgage market, trade channels, commercial banks, etc.<sup>14</sup> These various capital markets compete with one another in supplying funds for the replenishing of cash accounts, the expansion of other asset accounts, and the repayment of claims traded in one market by funds obtained in another.

For a full description of the cycle stages at which the various markets for capital funds are tapped, we should need series similar to those now available for corporate bonds, showing the net change in—or net cash flow from—each of the several types of instruments outstanding. Materials of that kind are not available for most financial markets on a monthly basis, at least for any extended period of time, although approximate estimates are available for the equity market.<sup>15</sup> For corporations large enough to finance themselves through the securities markets, the stock market is the traditional competitor of the bond market as a principal source of long-term funds. To the extent that the two markets actually are competing, the volume of stock financing should complement the volume of bond financing over business cycles—rising in expansion phases as bond financing falls, and falling in contraction phases as bond financing rises.

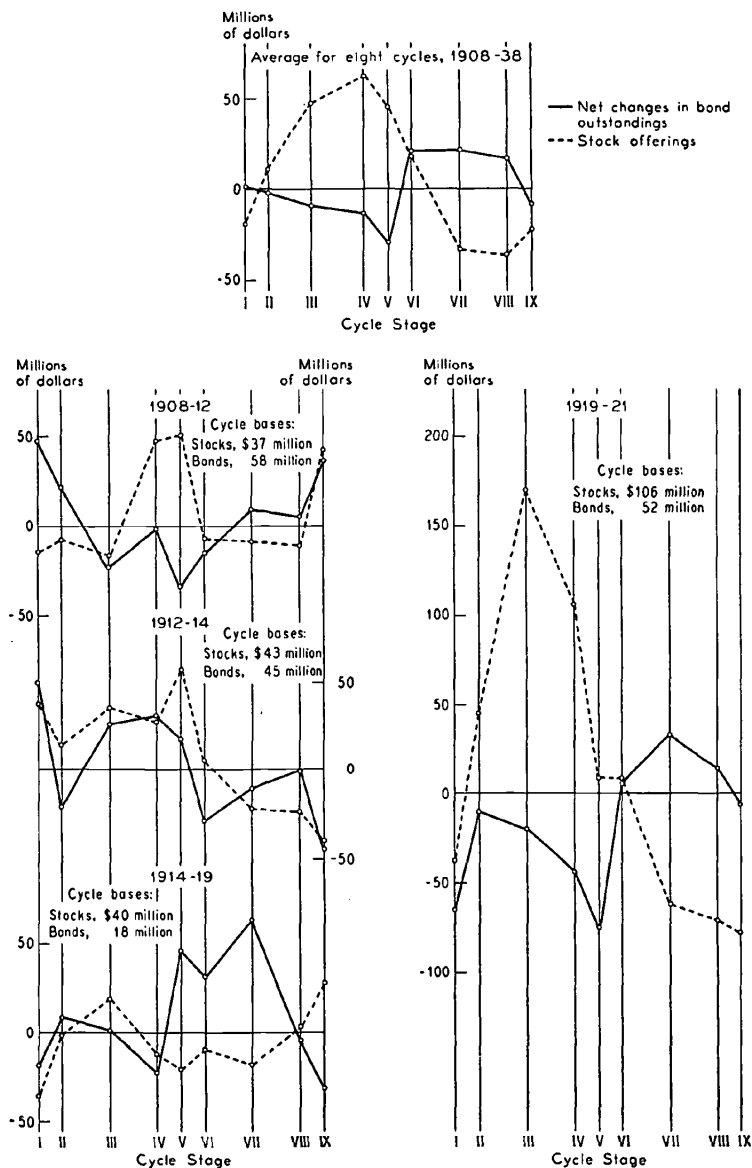
#### *Average Reference-cycle Patterns*

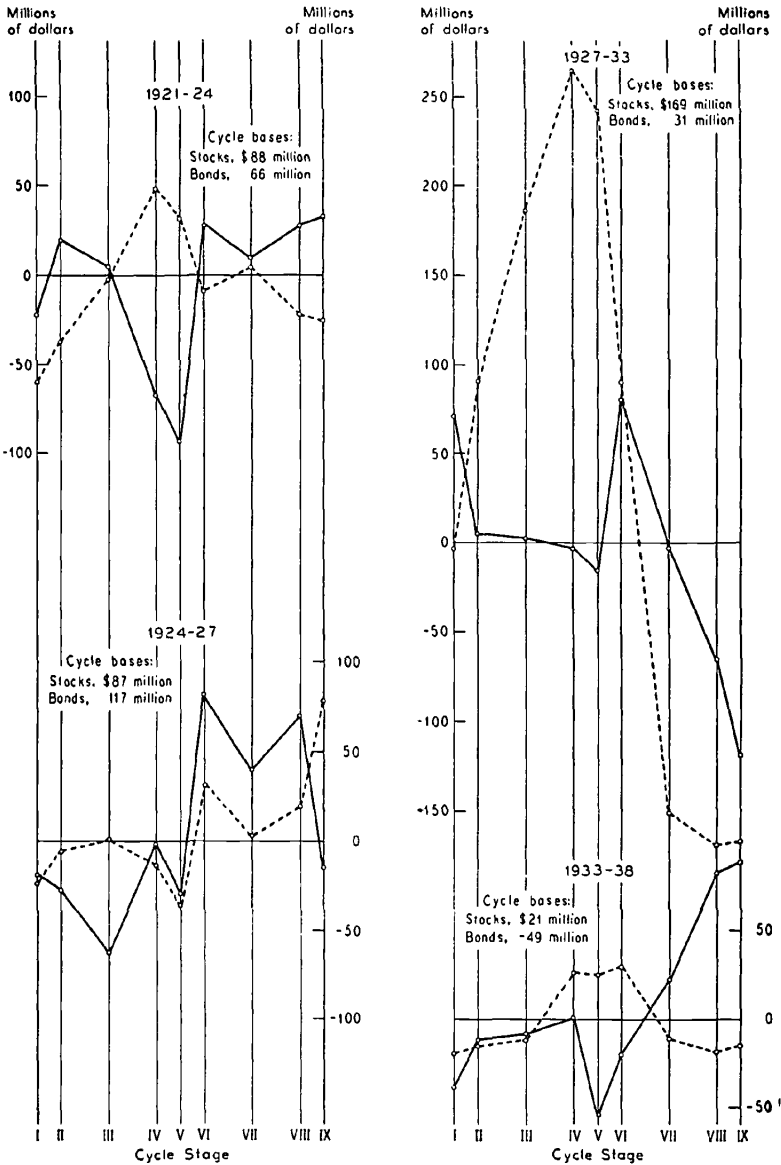
Confirming evidence of such a relationship is presented in Chart 18, which compares the individual reference-cycle patterns for

<sup>14</sup> The reader may question why retained earnings are not included here as a separate source of funds. The answer is that, although they are an important source of funds, they are already taken account of in funds received from ordinary operations.

<sup>15</sup> Another approach is through the use of corporate balance sheets and reconciling income statements. Unfortunately, such material is available only for small samples and is usually on an annual basis.

CHART 18—Monthly Reference-cycle Patterns for Stock Offerings and Net Changes in Corporate Bond Outstandings, 1908-38





Based on monthly data: for bonds, from Table A-14 (straight bonds); for stock offerings (including those for refunding purposes), United States, Canadian, and foreign, from *Journal of Commerce*. Both series are expressed in terms of cycle deviations.

stock offerings (after elimination of the seasonal) with those for net changes in bond outstandings for each of the eight cycles during 1908-38, and for the average of the eight cycles.<sup>16</sup> For comparability with the bond series, the data on stock offerings are expressed as cycle deviations (millions of dollars); equal changes on the chart represent equal changes in dollar volume. The stock-offerings series, compiled by the *Journal of Commerce* (monthly, 1906-40), includes new and refunding issues of common and preferred stock offered in the United States by domestic and Canadian and other foreign corporations. For purposes of comparison with the bond data, we should prefer a stock series that is net of extinguishments and excludes foreign issues; but a monthly series of that type is not available. The volume of stock retired from the market, however, has usually been quite small, except during the late twenties when the new stock offerings of many public utility holding companies were used to acquire ("extinguish") the stock of various operating companies. Likewise, the volume of Canadian and foreign stock issues floated in this country has been relatively unimportant. The *Journal of Commerce* series should therefore be a reasonably satisfactory approximation to the net change in stock outstandings over most of the period studied.<sup>17</sup> Our net-change series for bonds includes issues offered to retire stock or to procure funds for stock acquisition. The *Journal of Commerce* series is complementary in the sense that it includes the volume of stock offered to retire bonds.

The average reference-cycle patterns covering the eight cycles 1908-38, which are shown at the top of Chart 18, fully confirm expectations as to the inverse relationship between bond and stock financing over business cycles: stock offerings are high on the average in expansion stages, when the net volume of new bond financing is low, and are low on the average in contraction stages, when the net volume of bond financing is high. Moreover,

<sup>16</sup> The seasonal pattern of stock offerings is not unlike that of bond offerings and the net changes in bond outstandings; see footnote 4 above.

<sup>17</sup> Annual approximations to the net cash flow from sale of corporate stock issues (cash proceeds from sales less cash payments at extinguishment) have recently been prepared by Raymond W. Goldsmith. These are usually higher than the offerings series of the *Journal of Commerce*, particularly in the late twenties. However, the two series almost always move in the same direction from one year to the next.

in four of the eight cycles covered by the chart, corporations actually retired funded debt on balance during one or more stages of business expansion (the net change turned negative). The inference is that the proportion of total funds procured via the capital markets shifts in favor of stocks during business expansions and in favor of bonds during business contractions.<sup>18</sup> The structure of the average reference-cycle patterns of stocks and bonds also suggests that stock offerings reach a peak about one cycle stage before bonds, but that the series roughly coincide at troughs. The movements of the series over individual cycles are compared in the following section.

### *Stage-to-stage Movements within Reference Cycles*

Despite pronounced erratic movements in the series, the general shapes of the individual reference-cycle patterns in Chart 18 lend additional support to the conclusion that bond and stock financing usually move in opposite directions over business cycles. This raises a question as to whether a significant inverse relationship between the two series can be detected over shorter periods, as, for example, in the stage-to-stage movements discernible over the contraction phase of the cycle 1914-19 and over the full cycle 1921-24. If we assume for the moment that such a short-run relationship can be detected between the series, a further question is raised as to the rapidity of the response of one type of financing to the other. Does the net volume of bond financing move concurrently with stock offerings from stage to stage within cycles? Or does the volume either of stock or of bond financing respond with a lag?

Purely practical considerations are involved in these questions. If corporate executives decide to use one type of financial instrument rather than another, some time is required to arrange for

<sup>18</sup> It is tempting to conjecture further that in expansion stages of the cycle the proceeds of stock offerings are used for replenishment of depleted cash accounts and for the purchase or construction of fixed plant and equipment, as well as for the repayment of corporate bonds; and that in contraction stages the proceeds obtained from bond offerings are used to retire short-term debt and to complete capital programs initiated during preceding expansions. Although much of significance hangs on these inferences, they are not easily supported by data currently available. Payne's study referred to in footnote 13 above, should, when published, throw new light on these matters.

the new type of financing and to draw up the investment instruments. Moreover, if the proceeds of a stock offering are to be used to retire bonds, a waiting period is usually involved before the bonds can legally be extinguished. On a priori grounds, the effect of these investment processes on the timing of the movements of the series is not entirely clear. But as the discussion of Chart 15 has indicated, stock offerings typically lead the inverted net change in bond financing. (Stocks led bonds at eleven out of sixteen corresponding turns, lagged four times, and were coincident once.) The inverse relationship between the series, then, ought to improve if the net change were predated by one or more cycle stages.

One way of testing whether or not the stage-to-stage movements in bond and stock financing are inverted and whether or not there is a lag is to compare the direction of movement of the cycle relatives from one cycle stage to the next. For example, Chart 18 shows that between cycle stages I and II the net change in bond outstandings moved in the opposite direction from stock offerings in three cycles and in the same direction in the remaining five cycles. The numbers of similar and dissimilar movements of the two series between successive pairs of cycle stages are recorded in Table 17 and are summarized in columns 9-11 for all expansion stages, for all contraction stages, and for the eight full cycles. The upper tier of the table pertains to comparisons over the same cycle stages. The lower tier relates to comparisons obtained by predating the net-change series by one cycle stage to allow for a brief lag in the bond series. (For example, the direction of change of stock offerings between stages I and II is compared in the lower tier of the table with the direction of change of the bond series between stages II and III.)

When the concurrent directions of movement of the bond net-change and stock-offerings series are compared over all expansion stages, over all contraction stages, and over the cycle considered as a whole, the observed values are found to be too close to those expected on the basis of chance alone for the results to be significant. With the bond series predated by one cycle stage, however, the two series are found to move in opposite directions over expansion stages in 23 out of 32 comparisons, and in the same direction in only 9 comparisons, a result significantly different

TABLE 17—Number of Times Stock and Bond Financing Moved from Stage to Stage in Same or Opposite Direction: Concurrent and Predated Comparisons, Eight Reference Cycles 1908-38

	EXPANSION STAGES				CONTRACTION STAGES				TOTAL EXPANSION	TOTAL CONTRACTION	TOTAL
	I-II (1)	II-III (2)	III-IV (3)	IV-V (4)	V-VI (5)	VI-VII (6)	VII-VIII (7)	VIII-IX (8)	Cols. 1-4 (9)	Cols. 5-8 (10)	Cols. 1-8 (11)
Same direction	5	3	4	5	3	2	4	4	17	13	30
Opposite direction	3	5	4	3	5	6	4	4	15	19	34
Total	8	8	8	8	8	8	8	8	32	32	64
<i>Stock offerings vs. concurrent net changes in bonds</i>											
Same direction	1	3	3	2	4	5	3	3	9 <sup>a</sup>	15	24 <sup>a</sup>
Opposite direction	7	5	5	6	4	3	5	4	23 <sup>a</sup>	16	39 <sup>a</sup>
Total	8	8	8	8	8	8	8	7	32	31	63
<i>Stock offerings vs. net change in bonds predicated one cycle stage</i>											

Based on monthly data: net changes in bond outstandings from Table A-14; stock offerings (including those for refunding purposes), United States, Canadian, and foreign from *Journal of Commerce*.

<sup>a</sup> Significant at the 5 percent level. See footnote 19.

from that to be expected if chance factors alone were at play.<sup>19</sup> Since extinguishments rise during business expansions, one explanation for the lag in the net change in outstandings may be the time involved in calling bonds or in otherwise arranging for their extinguishment. In comparisons of the predated net changes with stock offerings over reference contractions, when there are apparently no such practical considerations to account for a lag, the observed number of similar and dissimilar movements is too close to the hypothetical value to permit a conclusion. But for the cycle considered as a whole we still find a significant lag (Table 17, column 11).<sup>20</sup>

Other comparisons, based on phase-to-phase movements of the reference-cycle relatives (i.e. the longer periods running from reference peaks to troughs and from reference troughs to peaks), were tested both on a concurrent basis and with the bond series predated to allow for a one-stage lag. They support the conclusions derived from Table 17. The predated comparisons showed

<sup>19</sup> A deviation is indicated as significant in Table 17 when it is larger than the result expected under the hypothesis that similar and dissimilar movements are equally likely and serially independent. For the purposes of the corporate bond investigation a deviation is considered significant if it (or a larger deviation) would occur by chance in less than 5 cases in 100. (A few borderline cases are indicated with their appropriate significance levels.) The upper (right-hand) tail of the binomial distribution with equal probabilities of success or failure was used for purposes of testing. In testing the significance of movements over the full cycle, the results for expansion and contraction stages were added and treated as a single sample.

<sup>20</sup> In addition to the results shown in Table 17, two other types of stage-to-stage comparison were made, one on the assumption that stock offerings led net changes in bond outstandings by two cycle stages and the other on the assumption that net changes led stock offerings by one cycle stage. The tests did not yield statistically significant results.

The length of a one-stage lag varies with the duration of expansion and contraction phases of the reference cycle from one and one-half months to sixteen and one-half months, with an average duration of five and one-half months. In order to test whether the results indicated above are influenced by unusually short or long stages in certain cycles, the expansion and contraction sections of Table 17 were recomputed, eliminating expansion stages December 1914 through August 1918, April 1919 through January 1920, and March 1933 through May 1937, and contraction stages August 1918 through April 1919 and June 1929 through March 1933. Despite the small number of observations remaining after the adjustments were made, the significance of the results was unaffected.



seven movements out of eight in opposite directions over expansion phases (a statistically significant result) and five movements out of eight in opposite directions over business contractions (statistically nonsignificant). The concurrent comparisons were similar: six opposite movements out of eight over business expansions and five out of eight over business contractions. Rank correlation coefficients of average monthly rates of change over the two phases confirm those results: the coefficients are uniformly negative but are higher for expansion than for contraction phases.<sup>21</sup>

The general conclusion from the various comparisons of reference-cycle patterns for the volume of financing in the two markets is that the net volume of bond financing usually moves inversely with stock offerings from one phase of the business cycle to the next. Moreover, stage-to-stage movements are frequently inverted when the bond series is lagged by about one cycle stage. In both concurrent and predated comparisons the inverse relationship was found to be closer during business expansion than during contraction, possibly because of the time required to extinguish outstanding bonds. Needless to say, these conclusions do not hold for every cycle studied; within individual cycles the systematic inversion of the two series was frequently obliterated by erratic movements.

#### SECURITY PRICES AND THE VOLUME OF FINANCING

The decisions made by corporate executives regarding the type of financial instrument to employ in raising external funds are based on many considerations: the financial structure of the corporation, national and local taxes, the prevailing set of financial practices

<sup>21</sup> The rank correlation coefficients for the concurrent comparisons were  $-0.81$  for expansions,  $-0.40$  for contractions, and  $-0.60$  for the full cycle, and for the corresponding predated comparisons,  $-0.67$ ,  $-0.64$ , and  $-0.66$ . It has been shown by M. G. Kendall, Sheila F. H. Kendall, and B. Babington Smith in "The Distribution of Spearman's Coefficient of Rank Correlation in a Universe in Which All Rankings Occur an Equal Number of Times" (*Biometrika*, Vol. xxx, 1939, pp. 251-73) that the coefficient of rank correlation is significant at the 5 percent level for samples based on eight observations if it exceeds 0.74 in absolute value, and for samples based on sixteen observations if it exceeds 0.50. Hence the only significant coefficients are those for concurrent expansions and for the full cycles (both concurrent and predated). However, both pairs of expansion and contraction coefficients are fairly high and are undoubtedly significant when considered jointly.

and customs, the stability and level of corporate earnings, the relative costs of financing through the bond and stock markets as measured by market yields or prices, and so on.<sup>22</sup> Over the long run many of the elements shaping financial decisions are subject to substantial change, so that we should not expect to obtain simple long-run relationships between them and the volume of stock or of bond financing. But since the National Bureau method of cyclical analysis frees the data of secular or intercycle trends, the reference-cycle patterns under observation are undisturbed by long-run drifts in those elements. And within the shorter spans covered by business cycles most of the elements appear to be relatively stable, at least as compared with market yields and prices. It is therefore through comparing the movements of the volume of stock and bond financing within cycles with the corresponding movements of stock and bond prices that we shall attempt an analysis—necessarily tentative and exploratory—of the causes of the cyclical shift between the two markets.

Promised yields on new bond offerings usually compare very closely with the yields on high-grade bonds outstanding in the market, so that an index of high-grade bond yields may be used as a measure of the cost of bond financing. Since future coupon payments are fixed by the bond contract, bond yields vary inversely with bond prices. Accordingly, bond prices (obtained by inverting the yields of high-grade bonds) may be used as an index of the “ease” of bond financing. The cost of stock financing from the point of view of the corporation is, in principle, determined essentially in the same way as the cost of bond financing: that is, by comparing the expected value of the stream of future dividend payments with the price at which the corporation can float new stock on the market.<sup>23</sup> Although future

<sup>22</sup> The theoretical relationships among these and other elements shaping the decisions made by individual firms as to the form of their financing have recently been investigated by David Durand in “Costs of Debt and Equity Funds for Business: Trends and Problems of Measurement,” *Conference on Research in Business Finance* (National Bureau of Economic Research, 1952). In Durand’s sense, investment “cost” is defined to include other elements besides bond and stock yields. In general, however, the findings to be reported here are in agreement with Durand’s theoretical conclusions.

<sup>23</sup> In comparing the cost of one form of financing with another, allowance must be made for the fact that earnings paid out as dividends are subject to the federal corporate income tax, while earnings paid out as interest are

dividends on stock are usually much less certain than coupon payments on bonds, changes in the current dividend yield (i.e. in the ratio of the current dividend rate per share to price per share) provide a rough measure of the changing cost of stock financing. For corporations with a fixed dividend policy, that measure is indeed a good approximation, at least over periods as short as a business cycle, so that the attractiveness of stock financing may be considered as varying directly with the market price of the stock. For other corporations the current dividend yield is a poorer approximation. Yet for the corporate sector as a whole there is fairly strong evidence that dividend payments fluctuate less than stock prices during business cycles, and that the attractiveness of stock financing varies directly with the market price of the stock.<sup>24</sup> Thus, as with bonds, an index of stock prices is used as a rough measure of the "ease" of stock financing within business cycles. Finally, the ratio of stock to bond prices is used to indicate roughly the ease of stock as compared with bond financing.

not. Therefore higher taxes encourage bond and discourage stock financing. During the period covered by our cyclical analysis (1900-1938), however, corporate tax rates were comparatively low and stable; and the small changes that occurred did not appreciably affect the relative attractiveness of bond and stock financing, particularly within the short periods spanned by business cycles. On the other hand, the high rates of recent years have acted as a powerful incentive to finance with bonds rather than with stock (cf. pages 10 and 178f).

<sup>24</sup> Stock offerings and stock prices typically expand over cycle stages VIII-IV, while dividend yields move inversely, typically expanding over cycle stages IV-VII or IV-VIII. All series exhibit pronounced conformity with one another and with the business cycle. The indexes of conformity with business cycles follow:

SERIES	INDEX		
	<i>Expansion</i>	<i>Contraction</i>	<i>Full cycle</i>
Stock price index (Cowles Commission, 1900-1938)	+80	+60	+79
Dividend yields (Cowles Commission, 1900-1938)	-80	-60	-79
Stock offerings ( <i>Journal of Commerce</i> , 1908-38)	+100	+56	+75

It is significant that the net volume of bond financing typically expands and contracts over the same cycle stages as the dividend yields on stock (i.e. IV-VII).

Chart 19 presents the average reference-cycle patterns for stock and bond prices and the corresponding patterns for the volume of stock and bond financing.<sup>25</sup> The prices are expressed in terms of cycle relatives (percentages of the cycle base), and the volume series in terms of cycle deviations (millions of dollars). The pattern for the price ratios was obtained by dividing the average reference-cycle relatives for stock prices by the corresponding relatives for bond prices.

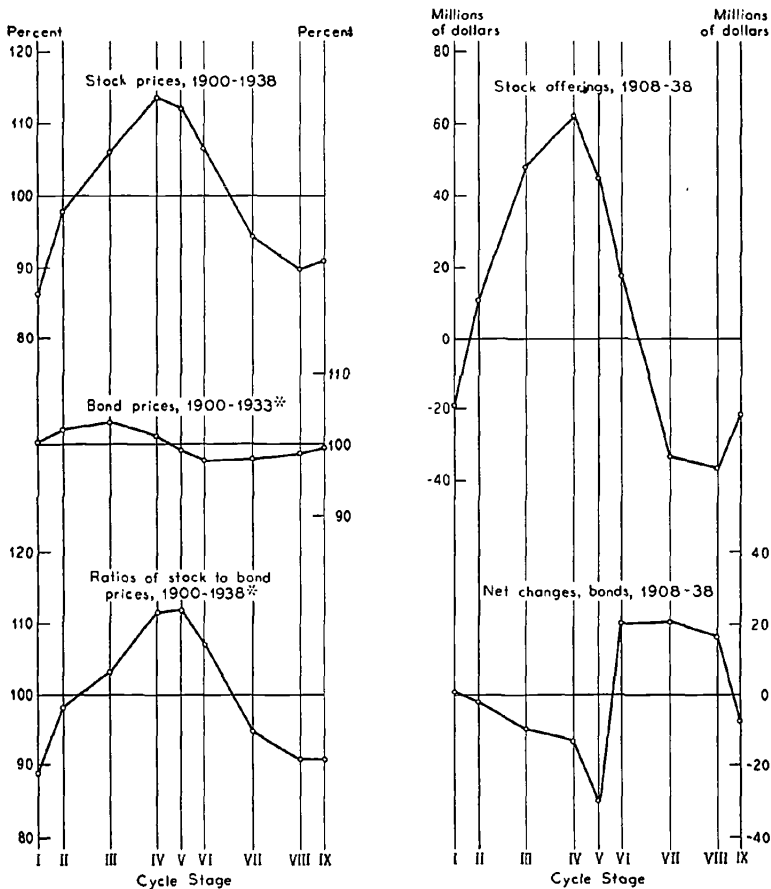
As Chart 19 shows, turning points in stock prices lag behind turning points in bond prices. In addition, the amplitude of the cyclical swing in stock prices is much greater than in bond prices. Therefore, the stage-to-stage movements in the ratio of stock to bond prices are dominated by changes in stock prices. An important exception occurs near the peak. Although bond prices reach their peak at stage *iii* and stock prices at stage *iv*, the ratio does not do so until stage *v*.

From the volume side of Chart 19 it appears that the cyclical swing in stock offerings is also greater than that in the net volume of bond financing, although the discrepancy is not so large here as it is in the case of prices. Stock offerings move closely with stock prices, both reaching peaks at stage *iv*. The net volume of bond financing appears to be roughly inverted with respect to the two stock series but moves downward with them from

<sup>25</sup> The bond-price pattern was obtained by inverting the pattern of bond yields (Standard and Poor's Corporation, sixty high-grade United States corporate and municipal bonds). This process of inverting yield patterns to obtain price patterns was first tested by comparing the average reference-cycle patterns of bond prices and of inverted bond yields computed for an identical group of bonds (F. R. Macaulay's indexes of American railroad bond prices and yields adjusted for economic drift). The difference between the two patterns was negligible.

The Standard and Poor's yield series, which had already been analyzed by the National Bureau's division of business cycle studies before this investigation was undertaken, is an unweighted average of four series covering railroad, public utility, industrial, and municipal bonds. Comparison with the series used in Chapter 3, which was constructed by using outstandings as weights and which excludes municipal bonds, indicates a systematic downward drift in the sixty-bond series between 1913 and 1920 and between 1934 and 1938. However, the spread between the two series is small in all years; and much of the downward drift in the sixty-bond series is automatically eliminated in the process of calculating the reference-cycle patterns.

CHART 19—Average Monthly Reference-cycle Patterns for Selected Stock and Bond Price and Volume Series



Based on monthly data. Stock prices, for all common stocks, are from Alfred Cowles 3rd and Associates' Common-Stock Indexes (Bloomington, Indiana, 1939); bond prices from inverted index of yields of high-grade corporate and municipal bonds, Standard and Poor's Corporation; stock offerings (including those for refunding purposes), United States, Canadian, and foreign, from Journal of Commerce; net changes, bonds, from Table A-14, for straight bonds. Prices and price ratios are expressed in terms of cycle relatives (percents), and stock offerings and net changes, bonds, in terms of cycle deviations (millions of dollars).

\* Owing to unusual market conditions in the late thirties, the bond price pattern excludes data beyond 1933, and the average standings at stages VIII and IX cover only 1900-1927, adjusted to the average standing at stage VII. Since stock prices are dominant in the ratio of stock to bond prices, the full-period data were used for that series.

stages iv to v while the ratio of stock to bond prices rises. The bond series, however, makes up for this timing difference by rising very rapidly from stages v to vi (an average increase of \$49.8 million in the net change for bond outstandings as against a decline of \$27.5 million in stock offerings).

Except for the differences mentioned, all of the average patterns in Chart 19 are roughly similar in structure. On the average, when stock prices move upward relatively to bond prices, the volume of bond financing moves downward relatively to stock financing; and conversely, when the ratio of stock to bond prices moves downward, bond financing in relation to stock financing moves upward. The average patterns are thus in agreement with the theory that the relative volume of financing through the bond and stock markets is governed by the differential costs in the two markets. Further, since the amplitude of cyclical fluctuation is generally greater in stock prices than in bond prices, Chart 19 suggests that bond prices alone (or bond yields alone) play a comparatively minor role in determining the relative volumes of stock and bond financing.

Several other pieces of evidence indicate that the cyclical behavior of the net volume of bond financing cannot be explained on the basis of any simple theory as to its responsiveness to bond yields, or without reference to the influence of the stock market. Since the average pattern of bond prices stands below the cycle base during reference contractions while the pattern of the net changes stands above, it is clear that corporations borrow on balance more heavily through the bond market when bond yields are high than when bond yields are low. Moreover, as Chart 19 shows, during some parts of the cycle bond prices and the net changes in outstandings move in the same direction and during other parts in the opposite direction. A comparison of the matching turning points of the bond-price and net-change series as given on Chart 15 reveals that the timing relationships of the two series may be viewed in either of two ways: that the net change consistently leads the corresponding turns in bond prices by fairly long intervals (13 leads, one coincidence, and one lag in 15 comparisons); or that the net change lags behind the opposite turns in bond prices, also by fairly long intervals (13 lags in 13 comparisons). Under either view, the timing relationships cannot be adequately ex-

plained by any simple theory as to the responsiveness of bond financing to bond yields. Under the first view, the turning points in bond financing occur before the corresponding turns in bond prices, so that the "response" is in the reverse *order* from what would be expected if an advance (decline) in yields brought about a decline (advance) in financing; and under the second view the turning points in net changes lag the opposite turns in bond prices, so that the response is in the opposite *direction* to that indicated by the theory.

A clue to an understanding of the peculiar timing relationship between bond prices and the net change in bond outstandings is provided by the average rank patterns already shown in Chart 17. The average pattern for gross new-money offerings—the positive component of the net change—is roughly similar to that of bond prices: new-money offerings have a peak at stage III and a trough at stage V; bond prices have a peak at stage III and a trough at stage VI or VII. On the other hand, the average pattern for bond repayments—the negative component of the net change—has its peak at stage V and trough at stage I (or IX). Hence the cyclical timing of the net change is the result of the distinctive timing of its two components, one more or less synchronous with bond prices, the other with business cycles and stock prices. Repayments appear to dominate the timing behavior of the net changes, so that the net-change series has its peak at stage I and trough at stage V and thus leads the corresponding turns (or lags the opposite turns) in the bond-price series.

These relationships can also be traced through the monthly data on total offerings and extinguishments. Chart 16 suggests that the average reference pattern for extinguishments for all industries, taken invertedly, has a larger influence on the average reference pattern for net changes than does the average reference pattern for offerings. In particular, the decline in extinguishments in the early stages of contraction is almost entirely responsible for the rise in the net changes. Similarly, Table 16 shows that the typical expansion stages for extinguishments, taken invertedly (i.e. V-VIII), resemble the expansion stages for the net changes (V-IX or IV-VII) more closely than do the expansion stages for total offerings (VI-II), while total offerings in expansion stages are nearly synchronous with bond prices

(VI-III or VII-III).<sup>28</sup> Since both total offerings and extinguishments contain refundings, the behavior of the difference between them (the net change) must be attributed to the different behavior of new-money offerings and repayments.

Chart 17 also provides an explanation for the fact that the patterns for total offerings and extinguishments both resemble the average pattern for bond prices more closely than does the average pattern for the net changes. Part of the explanation is that the pattern for new-money offerings is similar to that of bond prices. In addition, the pattern for refundings, a component of both total offerings and extinguishments but not of the net change, is roughly similar to that of bond prices. This is confirmed by the analysis of Chapter 3, where it was found that refundings moved closely with bond prices, particularly after 1920.

A rough check on the timing relationships can be made by comparing annual movements in the various bond series with annual movements in security prices, as is done in Table 18 by means of "indexes of correspondence in direction of change." The indexes were obtained by counting the respective number of years that a volume series and a price series moved in the same direction or moved oppositely, subtracting the latter number from the former, and dividing by the total number of changes. Thus, an index of +50 for total offerings for the period 1900-1920 indicates that total offerings moved in the same direction as bond prices over 15 of the 20 years.

Table 18 shows that total offerings and its two components, new-money offerings and refundings, usually moved with bond prices. Repayments appear to be unrelated to bond prices but fairly closely related to stock prices, while total extinguishments are associated both with bond and stock prices, though more closely with the latter. The behavior of repayments is, of course, what would be expected if funds for the repayment of bonds were procured through the stock market or from other sources closely associated with general business conditions. The net changes show some tendency to move directly with bond prices (a tendency more pronounced during the period of expanding

<sup>28</sup> The relationships do not appear with equal fidelity among the three industry subgroups. In the case of railroad bonds, offerings appear to have a dominant influence on the cyclical behavior of the net changes.



debt up to 1932 than afterward), and to move inversely with stock prices.

From all the evidence, though it is hardly conclusive, the most reasonable conjecture is that during business expansions when the stock market is buoyant, corporations generally prefer to

TABLE 18—Indexes of Correspondence in Direction of Change for Selected Corporate Bond Series and Stock and Bond Prices, 1900-1943

PERIOD	New-money offerings	Refundings	Repayments	Total offerings	Total extinguishments	Net change
<i>With bond prices</i>						
1900-20	+20	+10	0	+50	+20	+20
1920-32	+33	+67	-67	+67	+17	+33
1932-43	+45	+45	+27	+27	+9	-27
1900-43	+30	+35	-12	+49	+16	+12
<i>With stock prices</i>						
1900-20	+30	+20	+30	+20	+50	-10
1920-32	0	-33	+33	0	+17	0
1932-43	-27	+45	-9	+27	+45	-27
1900-43	+7	+12	+21	+16	+40	-12

The bond series are annual data, Table A-12. Index of all common stock prices from Alfred Cowles 3rd and Associates, *Common-Stock Indexes* (Bloomington, Indiana, 1939); bond prices from inverted index of yields of high-grade corporate and municipal bonds, Standard and Poor's Corporation.

finance in that market and to borrow less or to repay funded debt—even though bond prices may be high. And during business contractions when the stock market is depressed, corporations generally resort to the bond market—even though bond prices may be low.

#### STRUCTURAL CHANGES IN BOND AND STOCK FINANCING

Thus far we have described the average patterns and typical relationships of various capital-market series during 1900-1938. While the relationships appear typical of the period, the behavior of the series was far from uniform throughout. Have important structural changes, then, occurred within the period? A priori, such changes might well be expected from such sig-

nificant developments as the establishment of the Federal Reserve System, the freeing of bank reserves, the reversal of the rising trend in interest rates in the twenties, the growth in federal debt, the increasing importance of savings institutions in the capital markets, and so on. Such changes may well have altered the cyclical behavior of the bond market and its relationship with other sources of capital.

The search for structural change is complicated by the lumpy and highly erratic nature of the bond data. It is seldom possible to determine, when comparing any two cycle patterns, whether the observed differences are structural or simply the result of a multitude of factors that we subsume under the name of chance. Therefore an examination of the patterns of successive cycles was made, to determine whether any changes occurred that were sufficiently marked and sustained to suggest a break with the past. From that analysis the year 1919 emerged as a possible cut-off point, several of the series describing one typical pattern in the five cycles 1900-1919 and another typical pattern in the five cycles 1919-38.

The behavior of the various bond and stock series in those two periods, so far as it can be summarized in average patterns, is presented in Charts 20 and 21, the first showing average annual rank patterns, and the second, average monthly reference-cycle patterns for those series for which monthly data are available. The poor agreement between several of the corresponding monthly and annual patterns (note particularly bond net changes 1900-1919 and bond offerings and extinguishments 1919-38) emphasizes the erratic nature of the data and the need for extreme caution in concluding whether significant structural changes have occurred.

From a check of Charts 20 and 21 against the underlying individual patterns for each period the following conclusions appear fairly firm:

- (1) Bond extinguishments, the bond repayments and refundings of which they are comprised, stock offerings, and stock and bond prices, give little evidence of significant change in pattern between the two periods 1900-1919 and 1919-38. Bond prices, however, experienced a sharp and more or less continuous rise after 1931.

- (2) New-money bond offerings seem to show a significant

change in pattern between the two periods. In annual data, before 1919 they typically rose over stages I-III and fell over stages III-V; but after 1919 they did the reverse. In contractions, however, new-money rose in both periods. This change in the behavior of new-money carried through to the net change in outstandings and to a lesser extent to total bond offerings. Broadly speaking, the inverted character was preserved in the three series, but there were significant changes in timing and amplitude.

(3) The change in the pattern of new-money offerings was apparently not caused by bond prices, whose pattern was quite similar in the two periods, except for trend, and for a tendency toward shorter lags and closer integration with short-term interest rates after 1914.<sup>27</sup> Bond refundings corroborate that conclusion; they are dominated by the interest rate (see Table 18) and show no change in pattern.

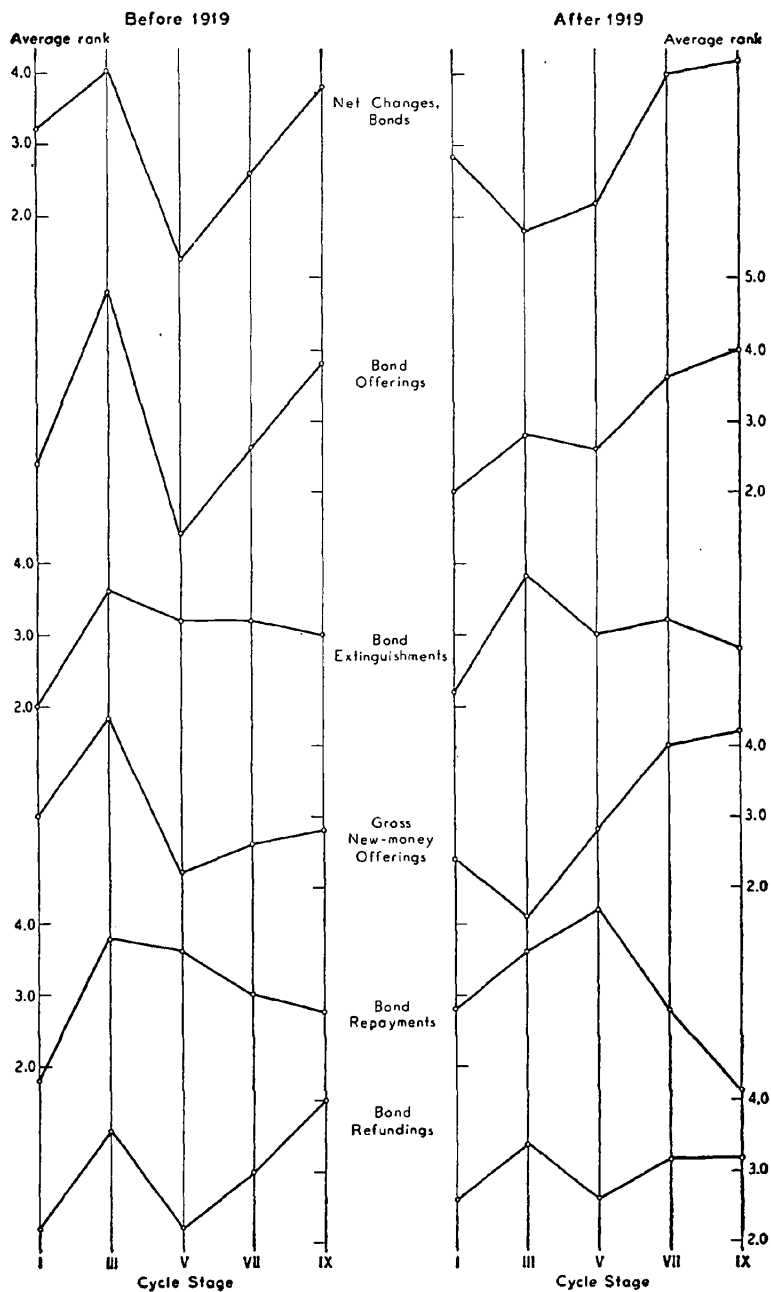
(4) Nor is there evidence that the change in the pattern of new-money bond offerings was caused by stock prices and offerings, each of which shows broadly similar behavior in the two periods. The stock variables are presumably more closely related to bond repayments and extinguishments, in which series also no structural change is apparent.

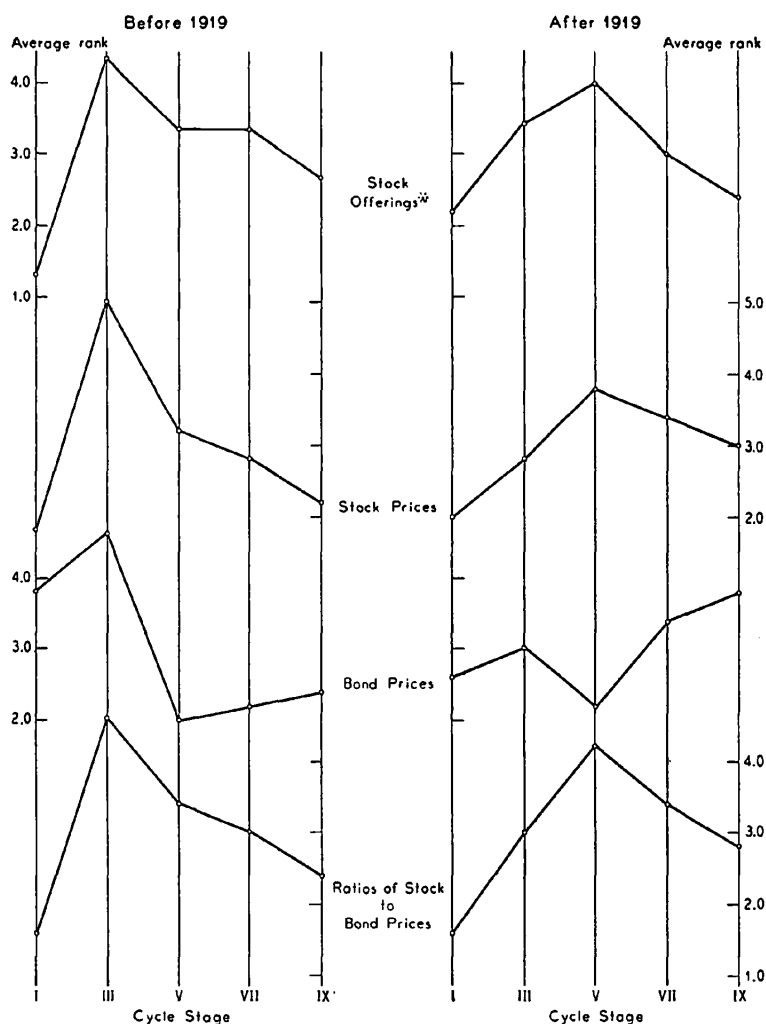
(5) The net changes in outstandings were influenced more by extinguishments and less by offerings in 1919-38 than in 1900-1919 (see both the annual and monthly patterns): a change in pattern inherent in the fact that bonded debt was growing less rapidly in the later period than in the earlier one and extinguishments were rising in relation to offerings. Necessarily, then, since refundings are included in both total offerings and extinguishments, the net changes were influenced after 1919 more by repayments and less by new-money offerings than in the earlier period of rapidly expanding debt. The latter change is difficult to discern in the average annual rank patterns but comes out clearly from detailed examination of the individual patterns.

(6) Because of the greater influence of repayments on the net changes in outstandings in the later period, and because of the influence of stock prices and offerings on repayments, one would

<sup>27</sup> It may be noted that short-term interest rates show a pronounced reduction in cyclical amplitude after the institution of the Federal Reserve System. There seems to have been virtually no such change in long-term rates. Cf. Burns and Mitchell, *op.cit.*, pp. 407-08.

CHART 20—Average Annual Rank Patterns for Selected Capital Market Series during Cycles in General Business Activity, before and after 1919

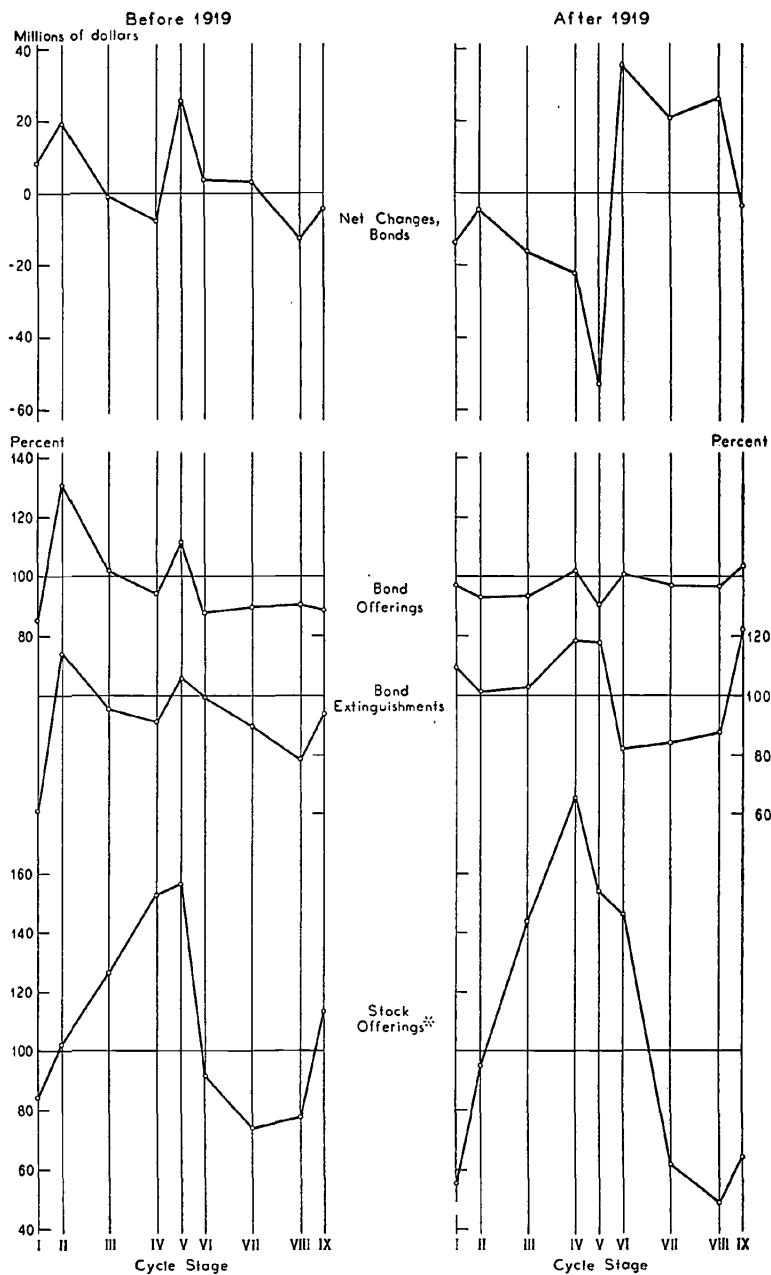


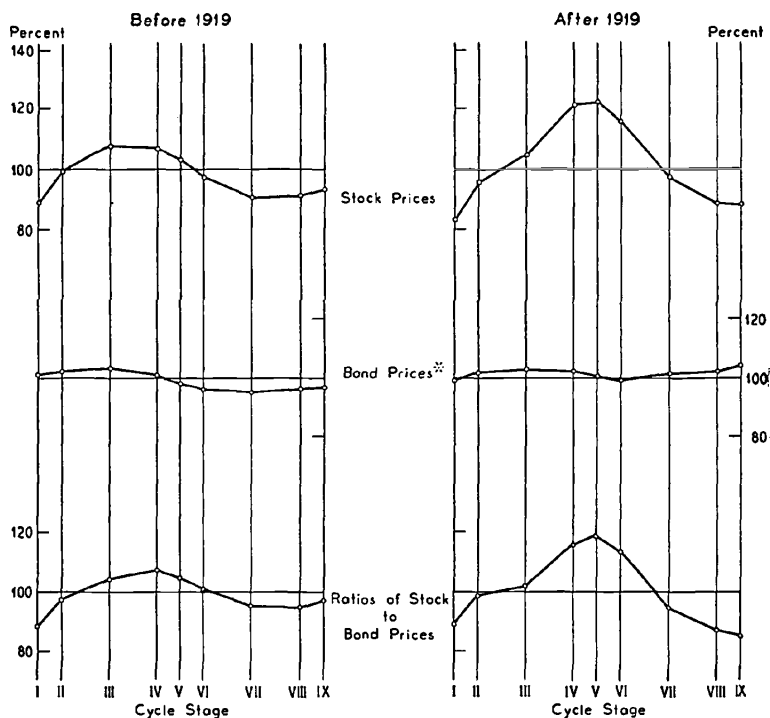


Based on annual data. Stock prices, for all common stocks, are from Alfred Cowles 3rd and Associates' Common-Stock Indexes (Bloomington, Indiana, 1939); bond prices from inverted index of yields of high-grade corporate and municipal bonds, Standard and Poor's Corporation; stock offerings (including those for refunding purposes), United States, Canadian, and foreign, from Journal of Commerce; other series from Table A-12, for straight bonds.

\* Each pattern except that for stock offerings before 1919 covers five full cycles, 1900-1919 or 1919-38. The stock offerings pattern before 1919 covers only three cycles 1908-19.

CHART 21—Average Monthly Reference-cycle Patterns for  
Selected Capital Market Series, before and after 1919





Based on monthly data. Stock prices, for all common stocks, are from Alfred Cowles 3rd and Associates' Common-Stock Indexes (Bloomington, Indiana, 1939); bond prices from inverted index of yields of high-grade corporate and municipal bonds, Standard and Poor's Corporation; stock offerings (including those for refunding purposes), United States, Canadian, and foreign, from *Journal of Commerce*; other series for straight bonds from Tables A-14 to A-16. All series are expressed in terms of cycle relatives (percents) except net changes, bonds, which are expressed in terms of cycle deviations (millions of dollars).

\* Each pattern except those for stock offerings before 1919 and bond prices after 1919 covers five full cycles, 1900-1919 or 1919-38. The stock offerings series begins in 1906 so that the averages at stages I-III cover three cycles only, 1908-19, adjusted to the average standing at stage IV. In view of unusual market conditions in the late thirties, the average standings at stages I to VII of the bond price pattern after 1919 cover only the first four cycles, and the average standings at stages VIII and IX cover only three cycles, 1919-27, adjusted to the average standing at stage VII. Since stock prices are dominant in the ratios of stock to bond prices, the full-period data were used for that series.

expect the pattern of net changes, when inverted, to be more like that of stock prices and offerings in the later than in the earlier period. This inference, while fairly reasonable on the basis of the cycle patterns, must be considered as conjectural, since we have not been able to establish it conclusively by observation of directions of change in annual data (cf. Table 18).

It should be emphasized that our analysis of structural change is preliminary and that there is need for further study in several directions. First there is the possibility of effecting a better reconciliation between the monthly and annual patterns shown in Charts 20 and 21. One way of tackling this problem might be by some process of smoothing to reduce or eliminate the erratic factor in the monthly data. A second possibility is to extend the cyclical analysis to cover in greater detail the behavior of individual industries and thus to explain changes in the all-industry patterns. Still another possibility is to study the problem of structural change more from the point of view of the suppliers of funds than from that of the corporate borrowers. It would be of interest to explore the data on loans and investments of commercial banks in this connection.

Finally, one would wish to extend the cyclical analysis beyond 1938. The fragmentary data available after that time permit us to draw, at present, only the most tentative conclusions as to the occurrence of structural change. During the wartime cycle 1938-46 the net changes in outstandings behaved rather typically, falling during business expansion and rising during business contraction. But in the next cycle, 1946-49, they behaved atypically, rising to a level never before attained at the crest of a business expansion. Moreover, bond financing has run far above stock financing since the war, both in expansion and in contraction.

Various economic developments have disturbed the relationships between bond and stock financing in recent years, and raise serious questions as to the applicability of these relationships to the economy of the future. Rising commodity prices have induced corporations to borrow large sums through the bond market to meet higher costs of constructing plant and equipment, and at the same time have decreased the burden of past debt financing. The relatively high level of bond as compared with stock prices in recent years and the deductibility of interest



charges under the corporate income tax have also encouraged debt and discouraged equity financing. Concurrently, the growing volume of funds flowing through savings institutions (insurance companies, savings banks, etc.) has increased the supply of funds available for corporate bond investment. It is still too early to appraise these changes fully, and to judge whether they have permanently altered prewar relationships between bond and stock financing. Changes in price levels, in taxation, and in financial institutions and practices have affected the relationships between debt and equity financing in the past and will presumably affect them in the future.