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## SIZE OF ISSUE AND ASSET SIZE OF OBLIGOR

PRECEDING chapters have touched upon the characteristics and experience records of large and small issues, a "large" issue being defined as one whose offerings summed, over the life span of the issue, to \$5 million or more. As explained in Chapter 1, this rather arbitrary size distinction was used originally in selecting small issues for special study. An attempt was made when compiling the basic records to determine the detailed characteristics and experience records of all issues \$5 million and over in size, and of a representative 10 percent sample of issues under \$5 million.

The size of a bond issue may have either of two meanings: the sum total of all offerings over the life span of the issue, or the amount of the issue outstanding on a particular date. Attention will be focused in this chapter primarily on amount outstanding, but default rates and yields by amount of offerings will also be presented, in each case by means of a more detailed code of size than was used in earlier chapters. The characteristics and behavior of bond issues will be analyzed also with respect to the size of the issuing corporation (the asset size of obligor) both at offering and on specified dates when the issue was outstanding.

Following the general plan of other chapters, we shall first summarize the principal findings of the analysis, and then comment briefly upon the nature and limitations of the estimates. The next section treats of major changes that have occurred in the number and par-amount totals of issues in different size classes, and in their principal characteristics. The chapter closes with a comparison of average yields and loss rates obtained on offerings and outstandings in different size classes of issue and of obligor. An appendix measures and traces changes in the degree of inequality in various size distributions in an effort to determine whether there is any evidence of growing concentration in the bond market.

### SUMMARY OF FINDINGS

One of the most striking features of long-term corporate indebtedness is the extreme inequality that appears when outstanding

issues are distributed according to size. In 1900, for example, issues outstanding in amounts of under \$5 million accounted for fully 89 percent of the total number outstanding but for only 37 percent of the aggregate par amount. By 1944 the small issues still accounted for a large fraction—two-thirds—of the total number, and their share in the total par amount had shrunk to only 10 percent. In both years a comparatively few large issues accounted for a disproportionately large share of the aggregate outstanding debt. Thus in 1900 issues outstanding in amounts of \$50 million or more comprised less than 1 percent of the total by number but 14 percent by amount; in 1944 the same size group accounted for 3 percent of the number and 31 percent of the amount. Breakdowns of outstandings by the asset size of the issuing corporation reveal similar inequality. A few large issues and a few issues of large corporations have at all times accounted for a major share of the aggregate volume of long-term corporate funded debt.

The question naturally arises whether any shifts have occurred in the distributions of outstandings by size that were sufficiently persistent to suggest a change in the degree to which large issues have dominated the market. The answer is that although such shifts occurred at different times in the past they largely reversed themselves over the full period studied, so that the relative distributions of outstandings by size were roughly the same in 1944 as in 1900. By this we do not mean to imply that bond issues were of about the same size in 1944 as in 1900; for in fact the average size of outstanding issues nearly quadrupled over the period. What we do mean is that when outstandings are distributed by size, any given proportion of the total number of issues accounted for approximately the same proportion of the total par amount in 1944 as in 1900. The share of the larger issues increased between 1900 and 1904, held level till 1920, then decreased; and these divergent trends roughly canceled out by 1944. There is no evidence in our data that the emergence of large business corporations during the present century and the concomitant rise of large savings institutions have resulted in a relative displacement of small by large issues.

Corporate bond issues distributed in order of size, whether of issue or of obligor, exhibit patterns of behavior similar to those observed in the earlier chapters. On the whole, investors have treated large issues and issues of large obligors as high-grade in-

vestments, and small issues as low-grade investments; and our records show that more often than not those decisions were borne out by experience. On the average, the investment agencies, the legal lists, and the market have shown a preference for large issues and large obligors, despite the fact that a smaller proportion of large issues were senior liens. Large issues and those issued by large obligors enjoy a striking advantage over other issues. Because of the broad interest of the investing public in large issues, and the power and financial strength of large business corporations, investors have usually been willing to accept a lower promised yield on large issues than on small.

In part, the yield differential in favor of large issues was a liquidity premium (a price paid in the form of a lower promised return). A considerably higher proportion of the large issues of large obligors have been listed on organized securities exchanges than of other issues. The publicity given price quotations of listed bonds, along with the broader market resulting from trading on organized exchanges, resulted in firmer prices, more rapid executions of buy and sell orders, and narrower spreads between bid and asked quotations.

In addition, larger issues proved to be of somewhat higher quality than small, judged by default experience. The evidence of the default rates is in some instances conflicting and must be interpreted with caution. Nevertheless, the default rates—particularly those based on issues of the combined industries, on public utilities other than street railways, and on industrial issues—typically were higher for smaller size classes of issue and of issuer. The rails and street railways occasionally exhibited a similar pattern, but their default rates were less closely related to size.

Like the default rates, the yield experience on corporate bond issues in different size classes is similar to that observed in the earlier chapters on quality ratings. Promised yields on new bond offerings and on outstandings were usually lower for the large size classes than for the small, in part because of the greater liquidity of the large issues and in part because of the lower prospective risk of default. Generally speaking, and allowing for important exceptions to be brought out later in the chapter, realized returns were also lower for issues in the large size classes, indicating that investors either overestimated the risks inherent in small issues or were willing to forego the higher promised returns for the convenience of a broader and more active market. The loss rates, too,

typically fell with increasing size of issue and of obligor, capital gains occurring on the large issues and capital losses on the small; but again there were notable exceptions, particularly for railroad bonds. In most instances, therefore, the behavior of the size groups was similar to that observed in earlier chapters, with issues in the larger classifications behaving like high grades under the different rating systems. Like high grades generally, large issues and issues of large obligors usually had lower default rates than other issues, and also lower promised yields, realized yields, and loss rates.

#### NATURE AND LIMITATIONS OF THE ESTIMATES

Our statistical breakdowns of the number and par-amount totals of outstandings by issue size are based on estimates of the amounts involved on the particular observation dates in question. That is to say, the size of an issue in a given quadrennial year refers to the par amount outstanding on January 1 of the year indicated. On the other hand, when offerings are analyzed, size of issue refers to the total of the par amounts offered to and taken up by the investing public throughout the life span of the issue.

Data on size of issue in these two senses could be determined for every corporate bond issue included in our records. The breakdowns of the par-amount totals by these variables are therefore accurate for the large issues sample (issues whose offerings summed to \$5 million or more). There is, however, some question about the inclusiveness of the manual sources with respect to small issues, which bulk large in the total number of all issues but contribute little to the aggregate par amount. In consequence, data on the number of issues in different size classes are less reliable than the corresponding par-amount figures, but are believed to be sufficiently accurate for most purposes. The methods used in estimating the totals and the breakdowns have been described fully in other places and need not be reviewed here, except to note that the size of an outstanding issue is the net amount held by the domestic investing public, and that it excludes so far as possible amounts held by various governmental divisions and their agencies, by foreigners, and by issuing corporations and their subsidiaries.<sup>1</sup>

The data on size of obligor are neither so complete nor so re-

<sup>1</sup> Cf. Chapter 1 of this report; also *Volume of Financing*, Chapter 1 and Appendix B.

liable as on size of issue. Size of obligor refers to the total assets of the issuing corporation as presented in its balance sheet. Assets of the obligor and its subsidiaries but not of a top holding company are included in the figures. The principal sources of data were the financial manuals (Poor's and Moody's), supplemented when necessary by a search of the files of leading financial libraries in New York City. Poor's and Moody's manuals were checked against each other, and in the event of a disagreement the more conservative figure was taken. In so far as possible, published company statements were used in preference to those presented to federal and state authorities, on the assumption that company statements represent the best judgment of management and are given most weight by investors. Pro forma balance sheets reflecting future financing were not used, and receiver's and I.C.C. statements were used only when company statements could not be obtained.

For outstanding issues, the size of obligor was taken from balance sheets dated nearest to, and within six months of, January 1 of the observation years in question. In the vast majority of cases, the error in timing arising from this treatment is negligible, since asset totals usually change slowly. Moreover, most published balance sheets were for years ending December 31, although June and October were also popular closing months in the early part of the century.

Somewhat more liberty was taken when recording the size of obligor at offering. For that purpose, the total asset figure of the obligor as shown on the first balance sheet following the offering was used, provided it was dated not more than two years later than the offering. Again, since assets change slowly, that procedure should not be a major source of error.

The principal difficulty with the total asset figures is that assets are at best only rough measures of the power and financial strength of the issuing corporations. Moreover, reported asset values may differ considerably from what may be considered as "true" economic values, owing to differences in the timing of the purchase of assets, subsequent changes in price level, differences between corporations in depreciation procedures, etc. The decision to include the assets of corporate obligors and their subsidiaries but not of top holding companies was based on the legal theory that the assets of the holding company do not, unless specifically pledged, stand behind the obligations of the subsidiaries. This

procedure introduces a conservative bias, since in many instances the strength of the entire corporate system has been placed behind the obligations of its members. Because of the difficulty of determining the asset size of a corporate "system" (as distinct from that reported by an obligor and its subsidiaries), the procedure followed was the only practical one. Nevertheless, the asset size of the obligor may have been grossly underestimated in some cases, particularly in the railroad and public utility fields. As will appear in the next section, another important source of error was the difficulty of obtaining balance sheet data for many small corporations in the early years,<sup>2</sup> a problem that did not arise in collecting data on size of issue.

#### VOLUME AND CHARACTERISTICS OF ISSUES IN DIFFERENT SIZE CLASSES

General growth and price trends in our economy since the beginning of the century have produced important changes in the size distributions of corporate bond outstandings to be examined in the present section. As in other sections on detailed bond characteristics, the breakdowns by asset size of obligor were obtained by combining large issues with an adjusted 10 percent sample of small issues. The breakdowns by size of issue are, however, a special case. Since the lowest size-of-issue class that we shall use includes all small issues, whose totals are known precisely, universe distributions are available for size of issue.<sup>3</sup>

A word about terminology in the material to come may be helpful. In tables, the headings "large issues," "small issues" always carry the same meaning as before, referring to the sum of all offerings of an issue, large ones being those of \$5 million or more. But in the discussion "large issues" will usually mean only those

<sup>2</sup> The deficiency will ultimately be remedied in part by a special study of bond financing by small and medium-sized industrial corporations, which is now being undertaken by Elizabeth T. Simpson of the National Bureau of Economic Research. The data on size of obligor are weakest in the industrial field.

<sup>3</sup> That is, the number (or the par-amount total) of issues outstanding in an amount of less than \$5 million on a given observation date is equal to the total of outstandings of all "small" issues (those whose offerings throughout their lives summed to less than \$5 million) plus any "large" issues that may have dropped below the \$5 million mark because of partial extinguishment by sinking fund calls, etc. Data covering all small issues are presented in *Volume of Financing*, Tables A-6 and A-8; the distributions for all large issues completed the data required for universe distributions.

with \$20 million or more outstanding, as will be clear from the context.

*Number and Volume of Outstanding Issues  
Classified by Size of Issue*

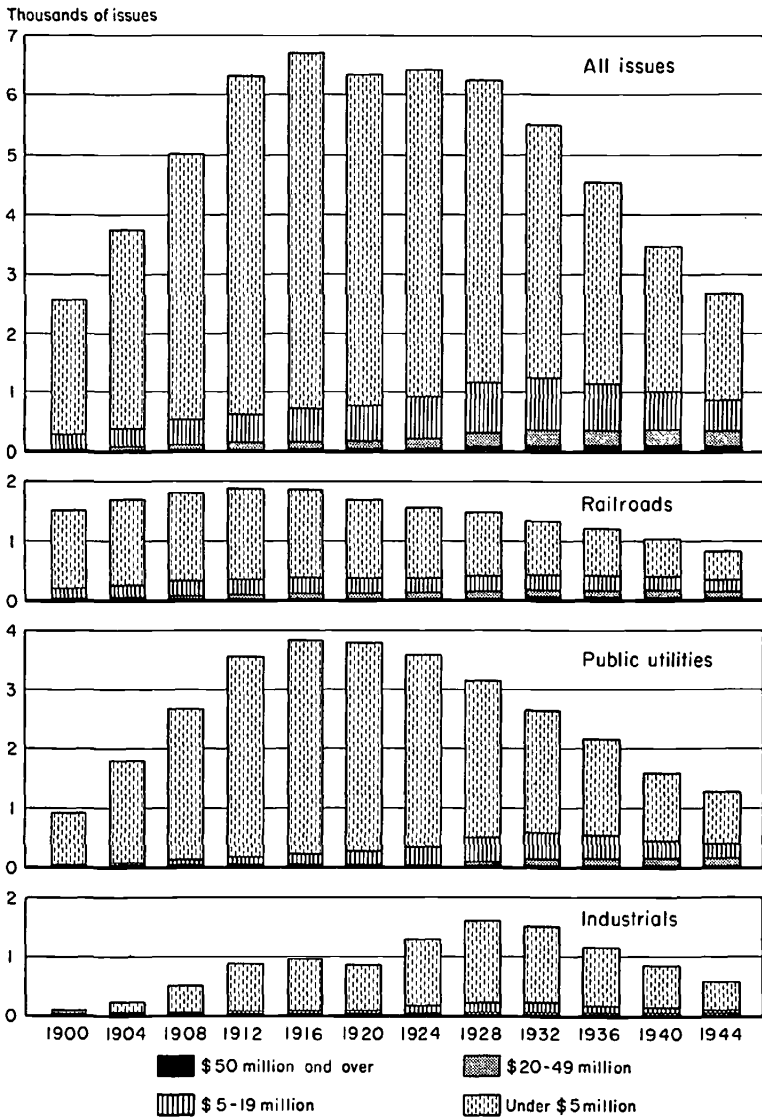
Data on number and par amount of straight corporate bond issues in different size classifications are presented in Charts 31 and 32. Comparison of these charts reveals a trend toward issues of larger size coupled with an extreme degree of inequality in the size distributions of outstandings. In 1900, 2,286 issues out of 2,566 outstanding, or nearly 90 percent, were under \$5 million in par amount, but their aggregate volume was only \$2.2 billion out of a total of \$5.9 billion, or 37 percent. (See Table 99 for the percentage distributions by number and par amount.) In the same year issues \$20 million and over in size accounted for less than 2 percent of all issues outstanding but represented about 28 percent of the total par amount. By 1920, small issues (under \$5 million) still accounted for about 90 percent by number, and large issues (\$20 million and over) for only 3 percent; but because of the flotation of a few very large issues in the intervening period, the share of the small issues in the par-amount total of outstandings had shrunk to 26 percent, and that of the large issues had increased to 44 percent. These trends accelerated after 1920, as both the absolute and relative number of small outstanding issues declined through 1943, while the number of large outstanding issues expanded rapidly until about 1932 and then suffered only a mild decline. By 1944 small issues despite their decline comprised over two-thirds of all issues outstanding, and issues \$20 million and over, only 13 percent. The small issues then accounted for only 10 percent of the par-amount total, however, and the large issues for 67 percent. It is thus clear that the representative size of issue rose markedly between 1900 and 1944 (the median size increasing from \$0.7 million to \$1.8 million), and that the par-amount totals have at all times been dominated by a relatively few large issues.<sup>4</sup>

The records also reveal that the small rails declined in importance fairly regularly over the period, their share in the par-

<sup>4</sup> Another way of showing the increase in size of issue is illustrated in *Volume of Financing*, Chart 5 (and the first column of Table 113, below). The plotted data represent the average size of straight bond issue, obtained by dividing the total par amount outstanding by the number of issues.



CHART 31—Number of Issues Outstanding Distributed by Outstanding Amount, 1900-1944



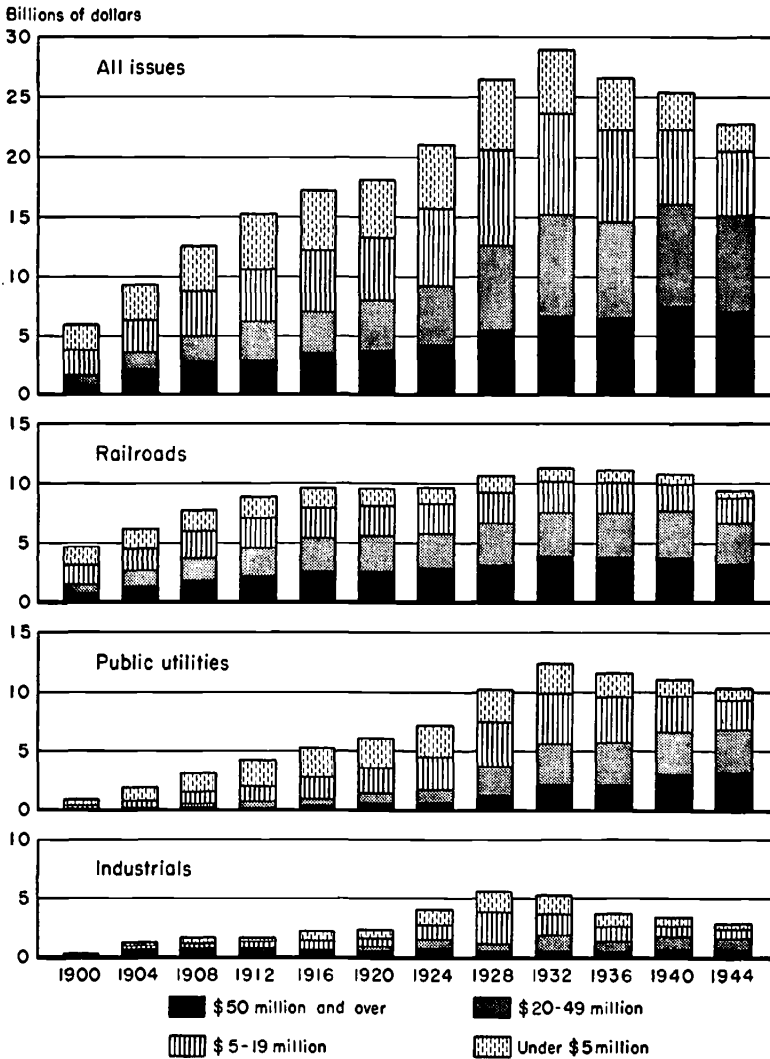
Universe totals for straight bonds, January figures, from "Statistical Measures," Table 23.

TABLE 99—Percentage Distributions of Number and Par Amount of Outstanding Issues by Amount Outstanding, 1900, 1920, and 1944

	NUMBER OF ISSUES BY ISSUE SIZE (IN MILLIONS)				PAR AMOUNT BY ISSUE SIZE (IN MILLIONS)				
	Under \$5		\$50 and over		Under \$5		\$50 and over		Total
	\$5-19	\$20-49	\$5-19	\$20-49	\$5-19	\$20-49	\$50 and over		
<i>All issues</i>									
1900	89.1%	9.3%	1.2%	0.4%	36.5%	35.8%	14.1%	13.6%	\$ 5,935.5
1920	87.9	9.2	2.2	0.7	26.3	29.7	22.8	21.2	18,085.1
1944	67.5	19.4	9.7	3.4	10.0	23.5	35.4	31.1	22,797.8
<i>Railroads</i>									
1900	85.4	12.1	1.8	0.7	32.1	35.5	16.4	16.0	4,663.5
1920	77.0	15.5	5.6	1.9	16.2	26.0	30.7	27.1	9,630.5
1944	57.4	24.3	13.1	5.2	7.3	21.9	36.3	34.5	9,488.2
<i>Public utilities</i>									
1900	95.6	4.1	0.3	0.0	56.5	36.0	7.5	0.0	946.9
1920	92.6	6.5	0.7	0.2	40.8	35.6	13.6	10.0	6,074.4
1944	68.2	19.4	9.4	3.0	10.2	24.3	35.0	30.5	10,369.8
<i>Industrials</i>									
1900	84.0	15.1	0.0	0.9	42.1	38.6	0.0	19.3	325.1
1920	88.9	8.9	1.5	0.7	30.3	29.6	14.5	25.6	2,380.2
1944	80.1	12.5	5.7	1.7	17.8	26.3	33.6	22.3	2,939.8

Based on Table 23 of *Statistical Measures*, covering the universe of straight corporate issues.

CHART 32—Par Amount of Outstanding Issues Distributed by Amount Outstanding, 1900-1944



Universe totals for straight bonds, January figures, from "Statistical Measures," Table 23.

amount total for all rails falling from 32 percent in 1900 to 7 percent in 1944. For the railroad industry the total volume of outstandings did not increase so rapidly as for other industry groups, but the median size rose almost continuously from \$1.1 million at the beginning of the century to \$3.7 million in 1944, as underlying divisional liens were refunded under various blanket mortgages. In the utility field also, issues with less than \$5 million outstanding declined in relative importance, particularly after 1920; in 1900 they comprised 57 percent of the par-amount total of utility outstandings; in 1920, 41 percent; and in 1944, only 10 percent. These declines were rather general throughout the utility field but were accentuated by the shift away from small street railway issues to larger issues of the telephone and electric light and power industries. The median size of utility outstandings changed little between 1900 and 1920, but increased rapidly thereafter (\$0.4 million in 1900, \$0.5 million in 1920, and \$1.7 million in 1944). The industrial group was atypical, the median size of outstandings falling from \$1.9 million in 1900 to \$0.7 million in 1916, then rising gradually to \$1.4 million in 1932, and falling again to \$0.8 million in 1944. The share of small issues (under \$5 million) in the total par amount of industrial outstandings did, it is true, decline rather regularly from 42 percent in 1900 to 18 percent in 1944; but the share of the very large issues (outstanding in amounts of \$50 million and over) showed hardly any change over the period. The apparent stability of the share of large industrial issues in the industrial totals is largely explained by the financing of the giant trusts through the bond market near the turn of the century. The issues of the giant trusts were gradually retired but were replaced by other large issues as the economy expanded.

*Characteristics of Issues in  
Different Issue-size Classes*

Data pertaining to the relationships among the size of outstanding issues and various other bond characteristics are presented in Table 100. The table covers issues outstanding at the beginning of 1944, classified by amount then outstanding into two groups on either side of a \$20 million boundary. Although the volume of issues in the various classes changed markedly over the period studied, the breakdowns for 1944, the latest available from our

TABLE 100—Proportions of Outstandings Characterized by High Quality, Large Obligor, Exchange Listing, etc. for Issues with Amounts under and over \$20 Million Outstanding, 1944

	LEGAL IN				Market Rating under 1% over	Assets of \$200 Million and over	Listed on New York Stock Exchange	Maturity over 30 Years	Senior Liens <sup>a</sup>	Debentures <sup>b</sup>
	Agency Rating 1-IV	Maine	Massachusetts	New York						
All issues	45.8%	24.3%	10.9%	22.7%	24.0%	27.2%	42.3%	9.3%	70.1%	17.7%
Railroads	40.7	28.5	11.2	37.9	17.3	48.6	76.1	18.8	78.3	3.0
Public utilities	50.7	28.5	14.7	18.3	30.0	14.3	16.8	5.2	77.4	12.9
Industrials	43.3	3.4		2.3	21.8	17.1	40.0	0.2	32.2	62.4
					Under \$20 Million					
All issues	67.1	49.1	33.1	43.8	43.1	74.9	77.5	18.0	65.4	22.0
Railroads	46.1	47.5	28.8	48.2	16.8	86.1	98.6	32.6	70.9	8.1
Public utilities	84.4	57.6	45.4	47.2	63.2	62.5	57.0	7.9	68.1	25.8
Industrials	81.0	20.6		12.2	67.7	79.8	76.1	0.0	32.2	62.8
					\$20 Million and over					

Based on Tables 24, 25, and 26 of *Statistical Measures*, and special supplementary tabulations: par-amount data, beginning of year, for all large (straight) corporate issues, and for 10 percent of small issues adjusted to universe totals.

<sup>a</sup> A "senior lien" is an issue secured by mortgage, collateral, or leasehold, provided the lien is not entirely junior to that of other issues.  
<sup>b</sup> A debenture is an issue not secured by lien.

records, typify the kinds of differences observable in earlier years.<sup>5</sup> In 1944 issues outstanding in amounts of \$20 million and over comprised 71 percent of the total par amount of rail issues, 66 percent of the public utility group, and 56 percent of the industrial, with the figure for the combined industries matching that for the middle group.

As preceding chapters have demonstrated, the various rating systems have usually favored large issues at the expense of small. In 1944, for example, 67 percent of aggregate outstandings of the combined industries in the \$20 million and over class was rated in the first four grades by the investment agencies, as against 46 percent for the under \$20 million class; and similar differences may be observed among legal bonds and issues rated as high grade by the market. It will be noted also that the differentials in favor of the large issues persist with great regularity within major industry groups, the only exception occurring in the rail group under the market rating. The reason for the exceptional behavior of the rails in 1944 is that many of the smaller divisional liens were then considered by investors to be of high quality. (The investment agencies tend to confirm the market's view in this matter, since the difference between the percentages of large and of small issues rated I-IV in 1944 was smallest for rails.) Because of the various statutory restrictions favoring large issues, the legal lists showed a clear-cut preference for them, both in the rail field and in the other industry groups as well.

The table also indicates that large issues usually enjoy special marketability privileges. Because of the greater public interest in them, relatively large proportions, in each industry group, of the par-amount total of issues outstanding in amounts of \$20 million or more were listed on the New York Stock Exchange. Other things equal, this implied a broader market for large issues, greater publicity for price quotations, and narrower spreads between bid and asked quotations.

Principally because of the influence of the rails on the combined industry totals, large issues had longer terms to maturity than small issues. Thus 18 percent of the par-amount total in the \$20 million and over class matured in more than thirty years, compared with only 9 percent for issues outstanding in smaller amounts. Except during the first decade of the century, rail issues

<sup>5</sup> Quadrennial comparisons back to 1900 for agency ratings, market ratings, and legal status may be made from data presented in *Statistical Measures*.

consistently exceeded other issues in both median and mean size, and the rails had longer terms to maturity.<sup>6</sup>

The differences in the percentages of large and of small outstandings (under \$20 million) that were senior liens, as well as in those that were debentures, are not pronounced; but except for industrials, the large issues show less senior liens and more debentures than small issues. Many small divisional rail liens and issues of operating utilities are secured by mortgage, so that among small rails and utilities senior liens formed a large proportion of outstandings and debentures a small part. In the industrial field, where debentures are most popular, there appears to have been little relationship between size of issue and type of security.

The most pronounced differences observable in Table 100 relate to issues of obligors with assets of \$200 million and over. In 1944, 75 percent of the par-amount total of large issues fell in that class, as compared with only 27 percent for issues with less than \$20 million outstanding. These differences reflect the fact that the size of an issue is limited by the asset size of the issuer. When issues are examined individually, however, the relationship between the size of an issue and of its obligor is not so close as these percentages might indicate (see the section dealing with such relationships, below).

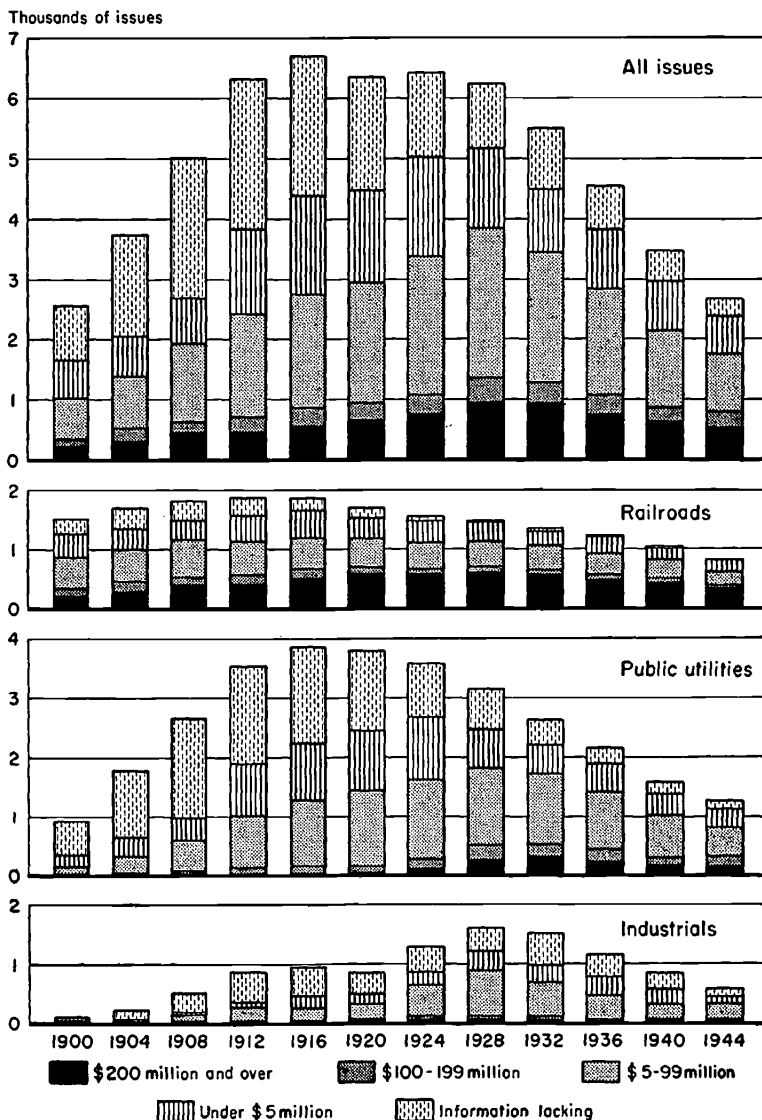
#### *Number and Volume of Outstanding Issues Classified by Asset Size of Obligor*

Breakdowns by size of obligor of the number and par amount of straight bond outstandings on quadrennial observation dates are presented in Charts 33 and 34, and percentage distributions for selected years are given in Table 101. Preceding pages have shown that the bond market has been dominated by the large issues over the past half century, in the sense that a relatively small number of the large issues have accounted for a disproportionately large share of the par-amount totals of outstandings. An analogous story is told in the distributions of issues by size of obligor: a small number of issues of large obligors have accounted for a large share of the total par amount outstanding.

Because of the difficulty of obtaining information on the asset size of obligor (note the information-lacking entries in the table and charts), the breakdowns must be interpreted with more cau-

<sup>6</sup> For a comparison of industry differences in terms to maturity, see *Volume of Financing*, pp. 75 ff.

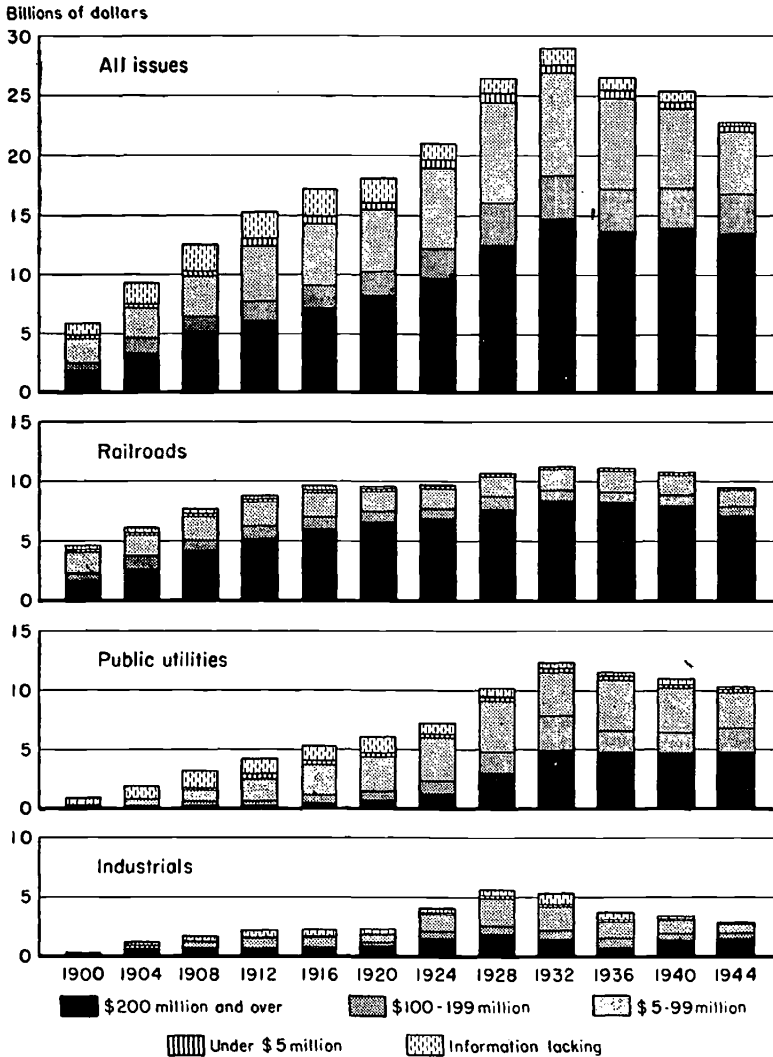
CHART 33—Number of Issues Outstanding Distributed by Asset Size of Obligor, 1900-1944



Universe estimates for straight bonds, January figures, from "Statistical Measures," Table 28.



CHART 34—Par Amount of Outstandings Distributed by Asset Size of Obligor, 1900-1944



Universe estimates for straight bonds, January figures, from "Statistical Measures," Table 28.

TABLE 101—Percentage Distributions of Number and Par Amount of Outstanding Issues by Asset Size of Obligor, 1900, 1920, and 1944

BEGINNING OF YEAR	ASSET SIZE (IN MILLIONS)					Total Number of Issues
	Under \$5	\$5-99	\$100-199	\$200 and over	Informa- tion Lacking	
	NUMBER OF ISSUES					
	<i>All Issues</i>					
1900	24.6%	26.4%	4.8%	8.8%	35.4%	2,566
1920	24.0	31.7	4.4	10.4	29.5	6,363
1944	24.3	35.5	9.6	19.9	10.7	2,679
	<i>Railroads</i>					
1900	26.9	33.9	7.7	14.7	16.8	1,534
1920	20.9	27.9	8.0	33.2	10.0	1,700
1944	23.6	27.1	7.2	40.7	1.4	814
	<i>Public Utilities</i>					
1900	22.4	14.6	0.2	0.0	62.8	926
1920	26.5	34.2	2.9	1.1	35.3	3,795
1944	26.4	37.8	13.0	11.9	10.9	1,273
	<i>Industrials</i>					
1900	11.3	19.8	1.9	0.9	66.1	106
1920	19.2	27.8	4.1	6.7	42.2	868
1944	21.1	41.8	5.6	8.4	23.1	592

tion than those based on size of issue. As the data show, balance sheet information on asset size was more readily obtainable after 1920 than before. Somewhat later, additional information became available under the full-disclosure provisions of the Securities Act of 1933, and through the activities of various state and federal regulatory bodies. Throughout the period studied, the Interstate Commerce Commission played a leading role in providing uniform accounting data for the railroads, as is indicated by the fact that the proportions of outstanding rail issues for which no information was available on asset size were appreciably below those of the other industries.

Examination of the information-lacking categories in Table 101 also reveals that for each industry group and for each year covered, the proportions based on par amounts were substantially below those based on numbers of issues, indicating that the number

TABLE 101  
(concluded)

BEGINNING OF YEAR	ASSET SIZE (IN MILLIONS)					Total Par Amount (millions)
	Under \$5	\$5-99	\$100-199	\$200 and over	Informa- tion Lacking	
PAR AMOUNT						
<i>All Issues</i>						
1900	4.7%	36.6%	12.0%	29.1%	17.6%	\$ 5,935.5
1920	3.4	28.5	11.5	45.5	11.1	18,085.1
1944	2.2	23.0	14.6	58.9	1.3	22,797.8
<i>Railroads</i>						
1900	4.4	37.9	14.7	35.7	7.3	4,663.5
1920	2.3	17.1	10.2	68.0	2.4	9,630.5
1944	1.8	14.8	8.0	75.2	0.2	9,488.2
<i>Public Utilities</i>						
1900	6.4	31.2	1.6	0.0	60.8	946.9
1920	5.9	47.3	12.9	11.6	22.3	6,074.4
1944	2.8	29.1	20.1	45.9	2.1	10,369.8
<i>Industrials</i>						
1900	4.1	33.4	3.8	19.3	39.4	325.1
1920	1.7	26.5	13.4	40.7	17.7	2,380.2
1944	1.5	27.8	16.1	52.1	2.5	2,939.8

Based on Table 28 of *Statistical Measures*, covering all large (straight) corporate issues and 10 percent of small issues adjusted to universe totals.

breakdowns are the less reliable of the two, and that less information was available for small issues than for large. The manuals usually provide more comprehensive information for the large corporations than for small and for subsidiaries of large systems, which, under our procedures, are treated as small corporations unless they are completely merged with the parent. It follows that most of the percentages for the size classes of Table 101 are lower than they would be if full information were available and that the deficiencies are greater for small issues than for large.

Evidence of the unequal distribution of total outstandings by asset size of obligor is provided by the fact that in 1900 approximately 41 percent of the total par amount and 14 percent of the total number of issues were accounted for by obligors in the \$100 million and over class, and that in 1944 the corresponding

figures had grown to 74 percent and 30 percent. (Because of gaps in the data, the figures for 1900 are approximate; but those for 1944 are believed reasonably accurate.) Conversely, small obligors were much more important than large obligors in the total number of outstanding issues, but much less important in terms of aggregate par amounts. In 1900, for example, from one-quarter to just over one-half of all issues had obligors in the under \$5 million class, but they accounted for only 5 to 14 percent of the aggregate par amount. (The higher figure in each case was obtained by assuming that all small issues for which the size of obligor could not be determined belonged in the under \$5 million class.) By 1944, the smaller obligors had become even less important in the bond market. Although they still accounted for from one-quarter to one-third of the total number of outstanding issues, their share in the par-amount total had shrunk to between 2.2 and 2.8 percent.

Both in terms of number and of par amount, the largest obligor class (corporations with assets of \$200 million and over) was relatively more important in the rail field than among utilities and industrials. In each industry group the larger companies have come to occupy a position of increasing importance in the bond market, a reflection of the phenomenal growth of asset values in the United States during the present century and the emergence of large business corporations.

#### *Characteristics of Issues in Different Asset-size Classes*

Data similar to those presented in Table 100 for size of issue are given in Table 102 for asset size of obligor. The table relates to outstandings at the beginning of 1944, and covers only issues for which asset size was known (99 percent of the par-amount total in that year).

The respective characteristics of issues of large and small obligors are roughly similar to the corresponding characteristics of large and small issues. In the utility and industrial fields, outstanding issues of corporations with assets of \$200 million and over consistently showed larger proportions of their total par amount rated as high grade by the agencies, the legal lists, and the market than did issues of other obligors. These differences carry through to the total for the combined industries, but in the case of market and agency ratings they are rather small. In the rail

TABLE 102—Proportions of Outstandings Characterized by High Quality, Large Size, Exchange Listing, etc. for Obligors with Assets under and over \$200 Million, 1944

	Agency Rating I-IV	LEGAL IN			Market Rating under 1% and over	Amount Outstanding \$20 Million and over	Listed on New York Stock Exchange	Maturity over 30 Years	Senior Liens <sup>a</sup>	Debentures <sup>b</sup>
		Maine	Massachusetts	New York						
<i>Under \$200 Million</i>										
All issues	58.8%	29.0%	14.0%	24.8%	36.7%	42.1%	43.4%	5.9%	79.9%	12.7%
Railroads	50.1	27.6	9.8	37.6	27.8	39.9	80.8	14.3	80.8	1.8
Public utilities	65.3	36.0	19.3	25.3	42.7	47.2	26.1	3.7	86.5	6.0
Industrials	47.8	3.1		0.6	27.9	24.9	47.5	0.0	38.1	58.6
<i>\$200 Million and over</i>										
All issues	61.9	49.7	34.2	45.6	37.6	84.5	82.1	21.6	59.1	26.3
Railroads	42.8	46.8	28.3	47.8	13.4	81.1	95.7	33.3	70.4	8.2
Public utilities	84.2	62.8	54.0	52.3	64.4	89.3	64.3	11.0	53.3	39.5
Industrials	81.8	22.3		14.5	66.8	85.5	74.1	0.2	24.9	69.1

Based on Tables 30, 31, and 32 of *Statistical Measures*, and special supplementary tabulations: par-amount data, beginning of year, for all large (straight) corporate issues, and for 10 percent of small issues adjusted to universe totals.

<sup>a</sup> A "senior lien" is an issue secured by mortgage, collateral, or leasehold, provided the lien is not entirely junior to that of other issues.

<sup>b</sup> A debenture is an issue not secured by lien.

field, the legal lists also favored issues of large obligors, the statutes insuring that preferential treatment be given them under the various asset-size tests. The market and the agencies, however, disagreed with the legal lists on this point, rating up a larger proportion, by volume, of issues of the smaller rail obligors. The explanation appears to be that in 1944 the agencies and the market were reflecting the depression experience of rail bonds. Issues of large rail obligors had gone into default in disproportionately large volume in the thirties and many were still outstanding in default in the early forties. The legal lists were based on rigid asset-size tests and were therefore less responsive to the recent history of the railroad industry. It should be remembered, however, that many, if not most, of the small railroads were closely affiliated with larger systems. The size of the obligor, as here delineated, is a less significant measure of the financial strength of the issuing corporation for railroads than for other corporations.

Because of the relationship between size of issue and asset size of obligor, in each industry group a larger proportion of the par-amount total for large obligors consisted of issues outstanding in amounts of \$20 million and over than for small obligors. Issues of large obligors also had longer terms to maturity (note, however, the industrials, where thirty-year maturities were practically nonexistent in 1944). In addition, a substantially larger proportion of the obligations of large obligors than of small enjoyed the advantage of stock exchange listing. Since the Exchange has traditionally favored the rails, placing only minor restrictions on size of issue and obligor, the differential is less pronounced for them. As to lien position, it was the smaller companies in each industry group whose outstandings had the higher proportion of senior liens (and lower proportion of debentures). But differences between the major industry groups in this respect were on the whole greater than differences between large and small corporations in the same industry.

#### *Relationship between Size of Issue and Asset Size of Obligor*

Both Tables 100 and 102 indicate that there is a direct positive correlation between issue size and the asset size of obligor. There were, however, many small issues of large obligors among outstandings in 1944; and, within the limits set by the size of obligor, many large issues of comparatively small obligors. The relation-

ship between issue size and asset size is not, in fact, a particularly close one.

Cross-classifications of the number of issues outstanding in 1944 by amount outstanding and asset size of obligor are presented in Table 103. The table shows that the size of issue, necessarily limited on the upper side by size of obligor, fans out increasingly below the upper limit as the size of obligor increases. The reason is that small obligors frequently do their bond financing at one time and in one lump sum. Large obligors, on the other hand, may borrow repeatedly, so that their issues range from the very small to the very large. Also, many large issues of large companies become small issues as they are retired by sinking funds or by partial calls. Finally, large corporations formed by consolidation or merger frequently assume the smaller obligations of the merged companies.

TABLE 103—Distribution of Number of Issues Outstanding in 1944 by Amount Outstanding and Asset Size of Obligor

ASSET SIZE OF OBLIGOR (MILLIONS)	AMOUNT OUTSTANDING (MILLIONS)						Total
	Under \$5	\$5-9	\$10-19	\$20-49	\$50-99	\$100 and over	
<i>All Industries</i>							
Under \$5	653	0	0	0	0	0	653
5-9	207	5	0	0	0	0	212
10-19	129	39	4	1 <sup>a</sup>	0	0	173
20-49	173	58	50	4	0	0	285
50-99	125	55	47	50	1	0	278
100-199	97	41	60	51	9	0	258
200-499	35	27	36	66	23	5	192
\$500 and over	105	38	52	85	39	13	332
TOTAL	1,524	263	249	257	72	18	2,383
<i>Railroads</i>							
Under \$5	192	0	0	0	0	0	192
5-9	12	3	0	0	0	0	15
10-19	42	7	3	1 <sup>a</sup>	0	0	53
20-49	25	12	10	2	0	0	49
50-99	52	26	13	11	1	0	103
100-199	20	12	15	9	3	0	59
200-499	35	18	18	24	6	2	103
\$500 and over	69	23	37	60	23	7	219
TOTAL	447	101	96	107	33	9	793

TABLE 103  
(concluded)

ASSET SIZE OF OBLIGOR (MILLIONS)	AMOUNT OUTSTANDING (MILLIONS)						Total
	<i>Under</i> \$5	\$5-9	\$10-19	\$20-49	\$50-99	\$100 <i>and over</i>	
<i>Public Utilities</i>							
Under \$5	336	0	0	0	0	0	336
5-9	86	1	0	0	0	0	87
10-19	35	29	1	0	0	0	65
20-49	118	35	39	2	0	0	194
50-99	55	21	25	34	0	0	135
100-199	73	24	29	34	6	0	166
200-499	0	6	5	28	13	3	55
\$500 and over	34	15	14	18	10	6	97
TOTAL	737	131	113	116	29	9	1,135
<i>Industrials</i>							
Under \$5	125	0	0	0	0	0	125
5-9	109	1	0	0	0	0	110
10-19	52	3	0	0	0	0	55
20-49	30	11	1	0	0	0	42
50-99	18	8	9	5	0	0	40
100-199	4	5	16	8	0	0	33
200-499	0	3	13	14	4	0	34
\$500 and over	2	0	1	7	6	0	16
TOTAL	340	31	40	34	10	0	455

From special tabulations of the National Bureau of Economic Research: number of issues data covering all large (straight) corporate issues, and 10 percent of small issues adjusted to universe totals.

<sup>a</sup> The outstanding amount in this case exceeded the corporation's total assets; i.e., there was a capital deficit.

Additional evidence bearing on the relationship between size of issue and obligor is presented in Table 104, which contains correlation coefficients for the two size measures based on the number of outstanding issues in the different industry groups in 1900, 1920, and 1944. Although the coefficients are all significant in the statistical sense, except for industrials they are quite low and show little evidence of trend.<sup>7</sup> The reason is the tendency already

<sup>7</sup> Scatter diagrams of the data suggest that the relationship between asset size and size of issue may be slightly curvilinear. The evidence on this point is difficult to interpret, however, since it reflects largely the exceptional behavior of a few issues in the adjusted 10 percent sample of small issues.



mentioned for some large obligors to raise funds more or less continuously with small issues and to assume the small issues of merged companies. The correlation coefficients also indicate that the situation was somewhat different in the industrial field than for rails and utilities. During the period studied, industrial enterprises relied infrequently on straight (i.e. single-maturity) obligations for capital funds; but when they did, their financing frequently took the form of a single lump-sum issue roughly proportional in amount to the asset size of the issuer.

TABLE 104—Correlation Coefficients for Asset Size of Obligor and Amount Outstanding, 1900, 1920, and 1944

	1900	1920	1944
All issues	+0.32	+0.40	+0.44
Railroads	+0.29	+0.34	+0.44
Public utilities	+0.47	+0.34	+0.39
Industrials	+0.88	+0.61	+0.73

From special tabulations of the National Bureau of Economic Research: number of issues data covering all large (straight) corporate issues and 10 percent of small issues adjusted to universe totals. All the above coefficients are statistically significant; that is, coefficients of this size or larger would be obtained by chance in less than 5 out of 100 trials if drawn from a population in which the variables were uncorrelated.

#### INVESTOR EXPERIENCE AND THE FACTOR OF SIZE

In view of what is now common knowledge as to the high mortality rates of small business concerns, we should expect the default rates of small corporations (and of small issues to the degree that issue size is correlated with size of issuing corporation) to be higher than those of large corporations. To the extent that the market is cognizant of this presumptive relationship, we should also expect the promised yields of corporate bonds to vary inversely with size. Finally, on the basis of the relationship between size and mortality of business firms, we should expect the realized yields on bond issues to vary inversely with size. For as we have found in earlier chapters, the bond market is conservative, placing a premium on the high-grade issues.

The purpose of this section is to examine those conjectures in the light of the historical record. Generally speaking, and in a

broad average sense, we shall find them to be correct. But we shall also find that easy generalizations in this field are as risky as in most others. It will appear that default differentials associated with size are usually small; moreover, the evidence is occasionally mixed.

#### *Default Experience*

Tables 105–108 present default rates based on par amounts for different sizes of issue and of obligor, the first two pertaining to offerings that subsequently went into default and the second two to default incidence among issues outstanding at the beginning of quadrennial periods. In Tables 105 and 106, size of issue refers to the sum of all offerings, or maximum amount outstanding in the hands of the public; and size of obligor, to asset size at date of offering. In Tables 107 and 108, the amount outstanding and size of obligor relate to the situation existing at the beginning of the respective quadrennial years.

TABLE 105—Proportions of Offerings 1900–1943 in Given Size-of-issue Classes That Went into Default before 1944

	<i>Under \$5 Million</i>	<i>\$5–19 Million</i>	<i>\$20–49 Million</i>	<i>\$50 Million and over</i>
All Regular Offerings	24.9%	19.0%	16.4%	16.3%
Railroads	20.6	26.2	33.1	24.5
Public utilities	20.9	12.5	8.1	11.2
Street railways	67.1	47.7	71.9	82.0
All others	13.2	9.1	4.3	5.2
Industrials	33.7	23.3	7.5	12.1

Based on par-amount data for regular offerings in the offerings experience sample, *Statistical Measures*, Tables 203 and 204, and special supplementary tabulations. Data for the under \$5 million class are from the 10 percent sample of small issues; other data from the sample of large issues. Size classification refers to the sum of all offerings of an issue.

From Table 105 it is clear that the percent of the par amount of offerings of the combined industries that subsequently went into default declines as we move up the size scale from issues under \$5 million par amount to issues of \$50 million and over. Total public utilities and industrials show roughly the same pattern, but railroads and street railways present the opposite picture. The

evidence of Table 106, based on size of obligor at offering, is very similar; the likeness of the two tables presumably arises from the positive correlation between the size of obligor and issue.

Although the quadrennial data of Tables 107 and 108 are notable principally for their irregularity, there is some evidence that the default rates are inversely related to the two size measures, especially in the periods of heavy default beginning with 1928. The average of the quadrennial default rates for the combined

TABLE 106—Proportions of Offerings 1900–1943 in Given Size-of-obligor Classes at Offering That Went into Default before 1944

	SIZE OF OBLIGOR					Informa- tion Lacking
	All Sizes of Obligors	Under \$5 Million	\$5–99 Million	\$100–199 Million	\$200 Million and over	
All Regular Offerings	19.1%	23.6%	18.8%	17.0%	16.4%	30.4%
Railroads	27.3	18.5	26.6	37.2	27.0	20.6
Public utilities	13.2	18.8	12.4	7.3	9.5	30.0
Street railways	65.2	64.5	60.8	60.5	73.4	69.5
All others	8.0	13.7	7.2	3.4	6.2	20.7
Industrials	19.6	38.0	25.3	17.2	3.4	34.3

Obtained by combining and weighting par-amount data for regular offerings of large and small issues in the offerings experience sample, *Statistical Measures*, Tables 206 and 207, and special supplementary tabulations. Size of obligor refers to total assets at date of offering.

industries over the periods studied is 8.1 percent for issues in the smallest issue-size class and drops to 6.2 percent and to 4.5 percent for the next two size classes, but rises to 5.1 percent for issues outstanding in amounts of \$50 million and over. The averages for rails and utilities also show some tendency to decline irregularly as size of issue increases. The decline was most regular for industrial bonds, the averages of the quadrennial rates falling from 12.1 percent to 9.0 percent to 4.4 percent to 3.1 percent, moving from left to right in the table.

In general, the quadrennial default rates for the different size-of-obligor classes (Table 108) corroborate the evidence obtained from size of issue. Although the mean default rate rises irregularly with obligor size for rails, it declines regularly as size increases for

TABLE 107—Quadrennial Default Rates for Outstandings Classified by Amount Outstanding at Beginning of Periods, 1900-1943

PERIOD	Under \$5		\$5-19		\$20-49		\$50 Million and over		Under \$5 Million	\$5-19 Million	\$20-49 Million	\$50 Million and over
	Million	Million	Million	Million	Million	Million	Million	Million				
	<i>All Issues</i>											
1900-1903	0.8%	3.4%	0.0%	0.0%	0.0%	0.8%	2.1%	0.0%	0.8%	2.1%	0.0%	0.0%
1904-1907	0.3	3.2	0.0	0.0	7.5	0.4	1.6	0.0	0.4	1.6	0.0	0.0
1908-1911	6.7	4.2	2.8	2.1	2.1	3.8	4.4	1.3	3.8	4.4	1.3	0.0
1912-1915	9.4	9.4	9.3	11.2	11.2	13.2	9.7	8.6	13.2	9.7	8.6	12.9
1916-1919	9.6	7.1	2.1	3.8	3.8	9.3	5.8	1.8	9.3	5.8	1.8	0.0
1920-1923	6.1	4.2	3.5	0.0	0.0	0.6	3.9	3.5	0.6	3.9	3.5	0.0
1924-1927	4.9	2.7	5.8	4.6	4.6	3.2	1.7	5.8	3.2	1.7	5.8	1.7
1928-1931	9.3	4.4	1.0	0.9	0.9	2.1	2.0	2.1	2.1	2.0	2.1	1.6
1932-1935	25.0	18.9	13.9	15.2	15.2	19.4	22.8	22.3	19.4	22.8	22.3	21.3
1936-1939	6.4	6.4	9.8	9.2	9.2	5.0	13.8	19.0	5.0	13.8	19.0	13.4
1940-1943	10.6	4.7	1.4	1.1	1.1	12.4	7.9	3.6	12.4	7.9	3.6	0.0
	<i>Public Utilities</i>											
1900-1903	0.7	5.1	0.0	0.0	0.0	0.0	15.9	0.0	0.0	15.9	0.0	0.0
1904-1907	0.4	5.4	0.0	0.0	0.0	0.0	10.0	0.0	0.0	10.0	0.0	22.7
1908-1911	5.9	4.3	15.8	18.0	18.0	19.7	2.7	0.0	19.7	2.7	0.0	0.0
1912-1915	5.0	6.6	6.6	26.5	26.5	13.2	13.7	24.6	13.2	13.7	24.6	0.0
1916-1919	11.7	11.0	4.2	33.1	33.1	4.3	1.7	0.0	4.3	1.7	0.0	0.0
1920-1923	10.2	4.3	4.8	0.0	0.0	4.5	5.2	0.0	4.5	5.2	0.0	0.0
1924-1927	2.5	2.4	7.5	8.5	8.5	11.9	5.2	3.1	11.9	5.2	3.1	11.7
1928-1931	9.2	2.9	0.0	0.0	0.0	15.3	11.4	0.0	15.3	11.4	0.0	0.0
1932-1935	17.6	12.9	6.6	8.8	8.8	43.8	28.6	9.6	43.8	28.6	9.6	0.0
1936-1939	7.4	3.2	1.7	5.3	5.3	5.8	4.2	10.7	5.8	4.2	10.7	0.0
1940-1943	7.6	4.2	0.0	2.4	2.4	14.9	0.6	0.0	14.9	0.6	0.0	0.0
	<i>Industrials</i>											

From special tabulations of the National Bureau of Economic Research: par-amount data for all large (straight) corporate issues in good standing at beginning of four-year periods, and for 10 percent of small issues adjusted quadrennially to universe totals.

the combined industries and for industrials, and declines somewhat less regularly for utilities. Moving from left to right in the table, the averages for the combined industries are 8.0 percent, 6.7 percent, 5.3 percent, and 4.7 percent.

The evidence of the broad averages is not conclusive, but additional information can be obtained by means of an analysis of variance. This device in effect abstracts from changes in the average level of default rates from one period to the next before testing for the homogeneity of the default rates among the different size groups of the tables.<sup>8</sup> Under the test, the default rates for the different issue-size classes were found to differ significantly

TABLE 108—Quadrennial Default Rates for Outstandings Classified by Asset Size of Obligor at Beginning of Periods, 1900-1943

PERIOD	<i>Under \$5 Million</i>	<i>\$5-99 Million</i>	<i>\$100-199 Million</i>	<i>\$200 Million and over</i>	<i>Information Lacking</i>
			<i>All Issues</i>		
1900-1903	3.1%	1.7%	0.0%	0.0%	4.1%
1904-1907	2.5	2.1	0.0	4.7	2.0
1908-1911	0.0	8.2	5.4	0.3	7.1
1912-1915	3.9	6.8	12.3	10.6	13.5
1916-1919	6.4	9.9	6.6	3.0	6.5
1920-1923	8.2	4.6	5.2	1.4	8.4
1924-1927	9.6	4.3	6.2	3.7	4.1
1928-1931	12.1	6.8	1.8	0.8	15.9
1932-1935	28.8	19.2	11.2	15.9	43.2
1936-1939	4.9	5.5	6.5	9.7	33.3
1940-1943	8.4	4.5	3.1	1.3	37.7
			<i>Railroads</i>		
1900-1903	4.1	2.1	0.0	0.0	0.0
1904-1907	2.6	1.2	0.0	0.0	2.0
1908-1911	0.0	8.1	0.0	0.4	3.0
1912-1915	9.6	9.2	14.7	10.2	19.0
1916-1919	0.0	7.7	5.3	2.4	2.7
1920-1923	0.0	3.8	9.3	0.8	2.0
1924-1927	1.1	2.3	0.0	3.8	0.0
1928-1931	12.4	2.2	4.2	1.3	0.0
1932-1935	0.0	18.5	16.3	23.3	47.8
1936-1939	0.0	11.2	18.4	15.2	0.0
1940-1943	0.0	7.2	10.5	2.3	58.0

<sup>8</sup> That is to say, the analysis of variance used here was a test for homogeneity of column means after holding row means constant.

TABLE 108  
(concluded)

PERIOD	<i>Under \$5 Million</i>	<i>\$5-99 Million</i>	<i>\$100-199 Million</i>	<i>\$200 Million and over</i>	<i>Information Lacking</i>
<i>Public Utilities</i>					
1900-1903	0.0%	0.0%	0.0%		3.7%
1904-1907	2.4	1.1	0.0	0.0%	2.6
1908-1911	0.0	7.1	19.3	0.0	6.6
1912-1915	1.0	4.3	9.3	26.5	7.3
1916-1919	11.4	13.8	10.1	15.6	8.6
1920-1923	13.1	4.5	2.5	7.9	10.3
1924-1927	7.5	2.4	12.1	0.0	4.0
1928-1931	6.2	5.3	0.0	0.0	14.7
1932-1935	22.5	13.8	9.8	7.6	28.5
1936-1939	3.5	3.2	2.7	3.7	31.3
1940-1943	11.2	2.7	1.4	0.5	54.4
<i>Industrials</i>					
1900-1903	0.0	0.0	0.0	0.0	16.1
1904-1907		10.2	0.0	22.4	0.0
1908-1911	0.0	11.0	0.0	0.0	12.4
1912-1915	0.0	7.3	0.0	7.1	23.5
1916-1919	1.7	2.8	0.0	0.0	4.6
1920-1923	9.2	6.9	0.0	0.0	5.2
1924-1927	38.0	10.8	3.6	6.2	5.0
1928-1931	24.2	12.8	2.5	0.0	18.5
1932-1935	63.5	33.5	8.6	1.8	51.9
1936-1939	14.6	6.4	3.1	0.0	42.0
1940-1943	13.6	7.7	0.0	0.0	2.0

From special tabulations of the National Bureau of Economic Research: par-amount data for all large (straight) issues in good standing at beginning of four-year periods, and for 10 percent of small issues adjusted quadrennially to universe totals.

only for the combined industries, but they were fairly near the threshold of statistical significance for industrials. Among asset-size classes, the differences in default rates were significant only for industrial bonds. We conclude that there was quite probably a significant relationship between default experience and issue and asset size in the industrial field, but not for the other groups. The high mortality rate of small industrial concerns suggests that asset size was more important for that group than size of issue.

Breakdowns of average market prices at default by size classes assigned at that time, along with values of receipts after default discounted at 3 percent and at 6 percent, may be obtained from

the underlying records but are not presented here since factors other than size appear to have been mainly responsible for the differences. For example, many defaulted railroad obligations were of comparatively small size but were secured by mortgages on strategic properties and were assumed by large obligors. Such issues frequently had high prices at date of default and a good subsequent payout record. Similar results occurred among public utility and industrial issues in cases where the amount outstanding had been reduced considerably before default. The effect was to make market prices at date of default and receipts after default move directly with size of obligor and inversely (but somewhat less regularly) with the amount outstanding. These patterns, however, were less regular than those observed in comparable breakdowns by the various quality ratings (cf. Tables 37, 49, 63, 87, and 96).

*Average Yields and Loss Rates  
(nondefaulted and defaulted issues combined)*

Somewhat more systematic size differentials appear in the yields and loss rates of bond issues during their full life span and over various assumed chronological periods of investment (Tables 109–112). The distributing variables in the tables are the same as those used in the group immediately preceding on default rates. Thus, size of issue in the offerings experience table (Table 109) refers to the total of all offerings of the issue, but in the periodic experience table (Table 110) it refers to the par amount outstanding at the beginning of the indicated periods. In the size-of-obligor tables, the distributing variables are the asset size of the issuer at date of offering (Table 111) and the asset size at the beginning of the chronological periods (Table 112).

Weighted average promised yields at offering were clearly lower the larger the issue, whether all offerings in the period 1900–1943 are considered, all regular offerings, or only the regular offerings in 1920–43. Investors were willing to sacrifice promised yields at offering for the greater liquidity or lower default risks presumed to be associated with the larger issues. Industry breakdowns of promised yields at offering (not shown in Table 109) reveal similar patterns for utilities and industrials; but in the case of rails, only for regular offerings since 1920. The realized yields from offering to extinguishment also declined for progressively higher size classes, although not so regularly as the promised yields. (Realized

TABLE 109—Life-span Yields and Loss Rates for Bonds Classified by Size of Issue: Regular versus Total Offerings, 1900–1943

	<i>Under \$5 Million</i>	<i>\$5–19 Million</i>	<i>\$20–49 Million</i>	<i>\$50 Million and over</i>
	<i>Promised Yield</i>			
Total Offerings	6.3%	5.7%	5.2%	4.9%
Regular offerings				
1900–1943	5.8	5.3	4.8	4.6
1920–1943	6.3	5.5	4.8	4.5
	<i>Realized Yield</i>			
Total Offerings	6.1	5.5	5.7	5.0
Regular Offerings				
1900–1943	5.3	5.3	5.0	4.6
1920–1943	5.6	5.5	5.3	4.7
	<i>Loss Rate</i>			
Total Offerings	0.2	0.2	–0.5	–0.1
Regular Offerings				
1900–1943	0.5	0.0	–0.2	0.0
1920–1943	0.7	0.0	–0.5	–0.2

Based on Tables 202 and 203 of *Statistical Measures*, covering issues in the offerings experience sample. Yields and loss rates are weighted averages with par amounts of included offerings as weights. For issues still outstanding on January 1, 1944 liquidation is assumed at prices prevailing in the first quarter of that year. Size classification refers to the sum of all offerings of an issue.

yields also declined irregularly as size increased in each industry group, except for total offerings of rails.) Presumably, investors either overestimated the risks inherent in the smaller issues (a typical phenomenon in the bond market; see Chapters 3 to 5) or were willing to forego the higher realized returns on them for the added convenience of a more active market in the larger issues. Still, default rates were higher on the smaller issues, and call rates lower, so that the loss rates also moved inversely with the size of issue (i.e. capital losses occurred on the small issues and capital gains on the large). Within industries, however, this pattern was fairly regular only for industrials.

The chronological data for issues in the different size classes rather generally support those conclusions. Weighted average promised yields for all issues outstanding in amounts of \$20 mil-



TABLE 110—Yields and Loss Rates over Four-year and Longer Periods of Investment on Issues with Amounts under and over \$20 Million Outstanding at Beginning of Periods, 1900-1943

PERIOD	LARGE ISSUES WITH AMOUNTS OUTSTANDING OF											
	UNDER \$20 MILLION					\$20 MILLION AND OVER						
	All Industries	Railroads	Public Utilities	Industrials	All Industries	Railroads	Public Utilities	Industrials	All Industries	Railroads	Public Utilities	Industrials
1900-1903	4.3%	4.2%	4.7%	5.4%	4.1%	4.1%	4.1%	5.4%	4.1%	4.1%	4.1%	4.7%
1904-1907	4.7	4.3	5.3	6.5	4.5	4.2	4.6	6.5	4.5	4.2	4.6	5.8
1908-1911	5.3	4.8	5.8	7.3	4.9	4.7	6.2	7.3	4.9	4.7	6.2	5.3
1912-1915	4.9	4.5	5.2	5.8	4.6	4.4	5.4	5.8	4.6	4.4	5.4	4.7
1916-1919	5.3	5.0	5.6	5.6	4.8	4.8	5.5	5.6	4.8	4.8	5.5	4.7
1920-1923	7.3	6.9	8.1	6.7	6.6	6.5	8.0	6.7	6.6	6.5	8.0	5.7
1924-1927	6.2	5.8	6.3	6.8	5.8	5.7	6.2	6.8	5.8	5.7	6.2	5.9
1928-1931	5.2	4.6	5.3	5.9	4.8	4.5	5.0	5.9	4.8	4.5	5.0	5.2
1932-1935	9.9	9.2	9.1	13.3	8.4	8.1	7.5	13.3	8.4	8.1	7.5	12.1
1936-1939	5.1	4.8	5.3	5.1	4.7	4.6	4.8	5.1	4.7	4.6	4.8	5.2
1940-1943	5.9	7.3	5.1	5.3	5.4	7.3	4.2	5.3	5.4	7.3	4.2	3.5
1900-1907	4.4	4.2	4.8	5.4	4.1	4.1	4.1	5.4	4.1	4.1	4.1	4.7
1908-1915	4.4	4.3	4.8	5.3	4.1	4.1	4.1	5.3	4.1	4.1	4.1	4.7
1916-1919	5.3	4.8	5.8	7.6	4.9	4.7	6.2	7.6	4.9	4.7	6.2	5.3
1920-1927	7.0	6.9	7.4	6.4	6.5	6.4	7.4	6.4	6.5	6.4	7.4	5.7
1928-1931	7.0	6.9	7.4	6.3	6.4	6.3	7.4	6.3	6.4	6.3	7.4	5.7
1932-1939	6.9	6.9	7.3	6.2	6.2	6.1	7.4	6.2	6.2	6.1	7.4	5.3
1940-1943	6.1	5.8	6.2	6.3	5.6	5.4	6.2	6.3	5.6	5.4	6.2	5.6
1900-1907	5.1	4.7	5.2	5.7	4.8	4.5	5.0	5.7	4.8	4.5	5.0	5.2
1908-1915	9.4	8.8	8.5	13.1	7.6	7.9	6.9	13.1	7.6	7.9	6.9	8.7

TABLE 110  
(continued)

PERIOD	LARGE ISSUES WITH AMOUNTS OUTSTANDING OF									
	UNDER \$20 MILLION					\$20 MILLION AND OVER				
	All Industries	Railroads	Public Utilities	Industries	Industrials	All Industries	Railroads	Public Utilities	Industrials	Industrials
1900-1903	4.1%	4.1%	3.9%	4.7%	4.1%	4.1%	4.0%	3.2%	7.4%	
1904-1907	3.2	2.8	3.6	5.1	4.1	4.1	3.1	0.2	8.9	
1908-1911	6.6	5.7	7.7	9.4	6.3	6.3	5.6	9.7	7.9	
1912-1915	3.1	2.0	4.1	5.1	2.4	2.4	1.8	3.8	4.9	
1916-1919	0.7	0.5	0.2	3.4	-0.1	-0.1	0.0	-2.7	2.3	
1920-1923	9.2	8.9	10.4	6.8	8.6	8.5	8.5	10.3	6.8	
1924-1927	8.4	8.8	8.7	7.1	8.5	8.5	8.7	8.9	7.5	
1928-1931	-1.1	-2.9	0.5	-2.4	-0.7	-0.7	-2.8	1.5	1.8	
1932-1935	12.6	10.2	12.3	17.4	11.2	11.2	10.2	11.3	14.3	
1936-1939	3.0	-1.2	4.5	4.7	0.5	0.5	-2.9	3.8	1.9	
1940-1943	7.9	11.6	6.1	6.9	7.8	7.8	12.2	4.6	3.5	
1900-1907	3.7	3.6	3.5	4.7	3.5	3.5	3.4	2.7	5.8	
1908-1919	3.6	3.6	3.5	5.2	3.1	3.1	3.1	2.6	4.4	
1920-1927	4.9	4.1	6.1	7.3	4.7	4.7	3.9	6.9	6.9	
1928-1931	8.9	9.0	9.4	7.4	8.5	8.5	8.6	9.7	6.7	
1932-1935	6.4	5.8	7.4	5.6	5.9	5.9	5.5	7.7	6.0	
1936-1939	6.3	5.3	7.7	6.3	5.7	5.7	5.1	7.8	6.2	
1940-1943	5.7	3.7	6.9	6.9	4.8	4.8	3.7	6.7	6.5	
1900-1907	3.4	1.0	4.7	4.0	3.0	3.0	1.1	5.0	5.4	
1908-1919	8.9	4.0	9.7	14.0	6.5	6.5	3.7	8.8	11.5	

TABLE 110  
(concluded)

PERIOD	LARGE ISSUES WITH AMOUNTS OUTSTANDING OF						Loss Rate	
	UNDER \$20 MILLION			\$20 MILLION AND OVER				
	All Industries	Railroads	Public Utilities	All Industries	Railroads	Public Utilities		
1900-1903	0.2%	0.1%	0.8%	0.7%	0.0%	0.1%	0.9%	-2.7%
1904-1907	1.5	1.5	1.7	1.4	0.4	1.1	4.4	-3.1
1908-1911	-1.3	-0.9	-1.9	-2.1	-1.4	-0.9	-3.5	-2.6
1912-1915	1.8	2.5	1.1	0.7	2.2	2.6	1.6	-0.2
1916-1919	4.6	4.5	5.4	2.2	4.9	4.8	8.2	2.4
1920-1923	-1.9	-2.0	-2.3	-0.1	-2.0	-2.0	-2.3	-1.1
1924-1927	-2.2	-3.0	-2.4	-0.3	-2.7	-3.0	-2.7	-1.6
1928-1931	6.3	7.5	4.8	8.3	5.5	7.3	3.5	3.4
1932-1935	-2.7	-1.0	-3.2	-4.1	-2.8	-2.1	-3.8	-2.2
1936-1939	2.1	6.0	0.8	0.4	4.2	7.5	1.0	3.3
1940-1943	-2.0	-4.3	-1.0	-1.6	-2.4	-4.9	-0.4	0.0
1900-1907	0.7	0.6	1.3	0.7	0.6	0.7	1.4	-1.1
1900-1919	0.8	0.7	1.3	0.1	1.0	1.0	1.5	0.3
1908-1915	0.4	0.7	-0.3	0.3	0.2	0.8	-0.7	-1.6
1920-1927	-1.9	-2.1	-2.0	-1.0	-2.0	-2.2	-2.3	-1.0
1920-1931	0.6	1.1	0.0	0.7	0.5	0.8	-0.3	-0.3
1920-1939	0.6	1.6	-0.4	-0.1	0.5	1.0	-0.4	-0.9
1924-1939	0.4	2.1	-0.7	-0.6	0.8	1.7	-0.5	-0.9
1928-1939	1.7	3.7	0.5	1.7	1.8	3.4	0.0	-0.2
1932-1939	0.5	4.8	-1.2	-0.9	1.1	4.2	-1.9	-2.8

Based on Table 177 of *Statistical Measures*, covering large issues in the periodic experience sample. Yields and loss rates are weighted averages with par amounts of outstandings at the beginning of the relevant period as weights. Corresponding figures for small issues, each of which had less than \$5 million outstanding, are given in Table 23 of this report.

TABLE 111—Life-span Yields and Loss Rates for Bonds Classified by Asset Size of Obligor at Offering: Regular versus Total Offerings, 1900–1943

	SIZE OF OBLIGOR					
	<i>All Sizes of Obligors</i>	<i>Under \$5 Million</i>	<i>\$5–99 Million</i>	<i>\$100–199 Million</i>	<i>\$200 Million and over</i>	<i>Information Lacking</i>
	<i>Promised Yield</i>					
Total Offerings	5.5%	6.6%	5.6%	5.0%	5.4%	6.1%
Regular Offerings						
1900–1943	5.1	5.7	5.3	4.9	4.7	5.7
1920–1943	5.1	6.1	5.4	4.9	4.7	6.5
	<i>Realized Yield</i>					
Total Offerings	5.5	6.6	5.7	5.8	5.3	5.0
Regular Offerings						
1900–1943	5.1	5.1	5.4	5.4	4.7	4.6
1920–1943	5.2	5.1	5.6	5.4	4.9	4.1
	<i>Loss Rate</i>					
Total Offerings	0.0	0.0	-0.1	-0.8	0.1	1.1
Regular Offerings						
1900–1943	0.0	0.6	-0.1	-0.5	0.0	1.1
1920–1943	-0.1	1.0	-0.2	-0.5	-0.2	2.4

Based on Tables 205 and 206 of *Statistical Measures*, covering issues in the offerings experience sample. For issues still outstanding on January 1, 1944 liquidation is assumed at prices prevailing in the first quarter of that year. Yields and loss rates were weighted by the par amounts of included offerings and averaged separately for large and small issues. The two size groups were then combined, the par amounts in Tables 88 and 89 of *Statistical Measures* being used as weights for total offerings. For regular offerings the proportions in each of the two groups (Table 206) compared to total offerings (Table 205) were applied to the par-amount figures of Tables 88 and 89 to obtain the weights. Because of differences in method of computation the column for offerings of all obligors differs slightly from the universe estimates in Table 10 of this book.

lion and over were lower than the corresponding averages for issues of under \$20 million at the beginning of each of the eleven four-year investment periods and all nine of the longer periods (a statistically significant result).<sup>9</sup> For the combined industries the

<sup>9</sup> Since the yields for the four-year periods are independent in the statistical sense, a sign test may be applied to the differences. The all-industry figures are significant at the 5 percent confidence level. Within major industry groups, the promised yields were lower for the large issues than for small issues in 30 out of 33 comparisons, a highly significant result.

realized yields were also lower on the large issues than on the small over seven of the eleven four-year periods and over all of the longer periods. While this is not a statistically significant result, it becomes significant when the realized yields over the four-year periods are compared within major industry groups.<sup>10</sup> The evidence is quite mixed for the loss rates. For issues of the combined industries they were lower for the large issues than for the small in eight of the eleven four-year periods, but in only five of the nine longer periods. Neither this result nor that based on loss rates within major industry groups is statistically significant.

Closely comparable results are obtained by comparing yields on the small issues sample as given in Table 23 with the yields for large issues, particularly those with \$20 million and over outstanding from Table 110. Almost uniformly, promised yields were lower for the large issues than for the small; more frequently than not, the realized yields and loss rates were also lower.

We conclude that the small issues were usually undervalued at offering, and more frequently than not were undervalued in the secondary market for old issues as well. Default and loss rates were usually higher on the small issues than on the large; but realized yields on the small issues were also usually higher.

The yield and loss experience on corporate bond offerings classified by asset size of obligor (Table 111) is on the whole similar to that observed in the classifications by size of issue. Because of the correlation of issue size and size of obligor, Table 111 presents pooled or universe estimates constructed from the samples for large and small issues, rather than the separate estimates shown in other tables of this type. The pooled estimates indicate that promised and realized yields were usually lower on issues of large business corporations than of small, and the loss rates were irregular. Because of uncertainty as to the appropriateness of the weighting employed in constructing the table, pooled estimates of this type may be misleading unless confirmed by the underlying sample data. The yield patterns for the samples were mutually consistent in this case: for both small and large issues, promised and realized yields declined for progressively higher size classes of obligor, and the loss rates behaved irregularly.

<sup>10</sup> Such comparisons indicate twenty-one cases in which the average realized yield of the large issues was lower than that of the small, ten cases in which it was higher, and two ties, a result that is significant whether the ties are omitted or divided equally between the other two classes.

TABLE 112—Yields and Loss Rates over Four-year and Longer Periods of Investment on Issues of Obligors with Assets under and over \$200 Million at Beginning of Periods, 1900-1943

PERIOD	UNDER \$200 MILLION				\$200 MILLION AND OVER			
	All Industries		Public Utilities		All Industries		Public Utilities	
	Industries	Railroads	Industries	Public Utilities	Industries	Railroads	Public Utilities	Industries
1900-1903	4.3%	4.3%	4.9%	4.3%	Promised Yield	4.0%		4.7% <sup>a</sup>
1904-1907	4.5	4.3	6.1	4.7	4.9	4.2		5.8
1908-1911	5.4	4.8	7.3	5.9	4.8	4.7		5.1
1912-1915	5.0	4.6	5.7	5.3	4.5	4.4		4.5
1916-1919	5.5	5.3	5.8	5.6	4.7	4.7		4.6
1920-1923	7.4	6.8	7.4	7.8	6.5	6.5		5.5
1924-1927	6.4	6.0	7.1	6.3	5.8	5.7		5.7
1928-1931	5.4	4.9	6.2	5.3	4.7	4.5		5.1
1932-1935	10.9	8.8	17.1	9.1	8.0	8.1		8.6
1936-1939	5.3	4.7	6.0	5.3	4.6	4.6		4.1
1940-1943	6.0	6.4	6.3	4.8	6.1	7.5		3.1
1900-1907	4.4	4.3	4.9	4.3	4.1	4.0		4.7 <sup>a</sup>
1908-1915	5.4	4.8	7.5	5.9	4.7	4.6		4.7 <sup>a</sup>
1920-1927	7.1	6.7	7.4	7.4	6.4	6.4		5.5
1928-1931	7.1	6.7	7.3	7.4	6.3	6.3		5.5
1932-1939	6.8	6.7	6.4	7.0	6.2	6.1		5.4
1940-1943	6.2	5.8	6.8	6.2	5.5	5.4		5.4
1928-1939	5.3	4.8	5.9	5.2	4.7	4.5		4.9
1932-1939	9.9	8.3	14.8	8.4	7.5	7.9		6.9

TABLE 112  
(continued)

PERIOD	UNDER \$200 MILLION			\$200 MILLION AND OVER		
	All Industries	Railroads	Public Utilities	All Industries	Railroads	Public Utilities
	Realized Yield					
1900-1903	4.3%	4.5%	3.7%	3.8%	3.7%	7.4% <sup>a</sup>
1904-1907	3.0	2.9	2.8	4.1	3.0	8.8
1908-1911	6.3	5.3	6.9	9.6	5.7	7.5
1912-1915	2.6	1.6	3.4	4.0	2.2	4.5
1916-1919	0.8	0.5	0.2	4.1	0.2	2.0
1920-1923	9.3	8.8	10.0	8.4	8.5	10.2
1924-1927	8.2	8.5	8.4	7.2	8.7	9.4
1928-1931	-1.3	-3.0	0.7	-3.5	-2.5	1.8
1932-1935	13.6	10.8	12.6	18.3	9.9	11.2
1936-1939	3.2	-0.5	4.6	4.1	-3.0	3.7
1940-1943	7.6	9.4	5.6	8.5	12.7	5.0
1900-1907	3.8	3.9	3.3	3.8	3.3	5.8 <sup>a</sup>
1908-1915	3.5	3.5	3.1	4.4	3.3	4.4 <sup>a</sup>
1916-1919	4.5	3.5	5.3	7.6	4.2	7.9 <sup>a</sup>
1920-1927	8.8	8.7	9.1	8.3	8.6	9.6
1928-1931	6.9	5.9	7.7	6.7	5.5	7.4
1932-1935	6.6	5.7	7.6	5.4	5.1	8.1
1936-1939	5.7	4.2	6.9	4.9	3.6	7.5
1940-1943	4.0	2.0	5.0	3.9	0.8	5.0
1900-1907	9.9	5.7	9.9	13.9	3.4	8.9
1908-1915	3.5	3.5	3.1	4.4	3.3	5.8 <sup>a</sup>
1916-1919	4.5	3.5	5.3	7.6	4.2	4.4 <sup>a</sup>
1920-1927	8.8	8.7	9.1	8.3	8.6	6.6
1928-1931	6.9	5.9	7.7	6.7	5.5	6.9
1932-1935	6.6	5.7	7.6	5.4	5.1	5.9
1936-1939	5.7	4.2	6.9	4.9	3.6	6.3
1940-1943	4.0	2.0	5.0	3.9	0.8	6.5
1900-1907	9.9	5.7	9.9	13.9	3.4	5.4
1908-1915	3.5	3.5	3.1	4.4	3.3	5.4
1916-1919	4.5	3.5	5.3	7.6	4.2	11.8
1920-1927	8.8	8.7	9.1	8.3	8.6	8.9
1928-1931	6.9	5.9	7.7	6.7	5.5	8.9
1932-1935	6.6	5.7	7.6	5.4	5.1	6.3
1936-1939	5.7	4.2	6.9	4.9	3.6	6.5
1940-1943	4.0	2.0	5.0	3.9	0.8	5.4
1900-1907	9.9	5.7	9.9	13.9	3.4	8.9

TABLE 112  
(concluded)

PERIOD	UNDER \$200 MILLION				\$200 MILLION AND OVER			
	All Industries		Public Utilities		All Industries		Public Utilities	
	Industries	Railroads	Public Utilities	Industries	Industries	Railroads	Public Utilities	Industries
1900-1903	0.0%	-0.2%	0.6%	1.1%	0.2%	0.3%		-2.7% <sup>a</sup>
1904-1907	1.5	1.4	1.9	2.0	0.3	1.2		-3.0
1908-1911	-0.9	-0.5	-1.0	-2.3	-1.5	-1.0		-2.4
1912-1915	2.4	3.0	1.9	1.7	1.9	2.2		0.0
1916-1919	4.7	4.8	5.4	1.7	4.5	4.5		2.6
1920-1923	-1.9	-2.0	-2.2	-1.0	-2.0	-2.0		-1.4
1924-1927	-1.8	-2.5	-2.1	-0.1	-2.8	-3.0		-1.6
1928-1931	6.7	7.9	4.6	9.7	5.4	7.0		2.1
1932-1935	-2.7	-2.0	-3.5	-1.2	-2.7	-1.8		-4.8
1936-1939	2.1	5.2	0.7	1.9	5.0	7.6		0.9
1940-1943	-1.6	-3.0	-0.8	-2.2	-3.1	-5.2		0.5
1900-1907	0.6	0.4	1.0	1.1	0.7	0.7		-1.1 <sup>a</sup>
1908-1911	0.8	0.8	1.4	0.5	0.8	0.8		0.3 <sup>a</sup>
1912-1915	0.9	1.3	0.6	-0.1	0.0	0.4		-1.5
1916-1919	-1.7	-2.0	-1.7	-0.9	-2.1	-2.2		-1.4
1920-1923	0.2	0.8	-0.3	0.6	0.6	0.8		-0.4
1924-1927	0.2	1.0	-0.6	1.0	0.7	1.0		-0.9
1928-1931	0.5	1.6	-0.7	1.9	0.9	1.8		-1.1
1932-1935	1.3	2.8	0.2	2.0	2.2	3.7		-0.5
1936-1939	0.0	2.6	-1.5	0.9	1.4	4.5		-2.0

Based on Table 178 of *Statistical Measures*, and special supplementary tabulations, covering issues in the periodic experience sample. Weighted average yields and loss rates were first obtained for large and small issues for each major industry and obligor size group. The yields for large and small issues were then combined within industry, with appropriate weighting.

<sup>a</sup> Based on less than five issues.



Further evidence to the same effect is provided by the yields and loss rates of Table 112, covering assumed chronological investment periods. Again, these are pooled estimates obtained by combining the sample data for large and small issues, and should be interpreted with caution. For the combined industries, promised yields for large corporations were below those for small corporations at the beginning of nine of the eleven quadrennial periods (plus one tie) and at the beginning of all nine of the longer periods. (The results for the four-year periods are independent and are statistically significant.) The same pattern prevailed within the major industry groups: promised yields of large corporations were lower than for small in all eleven four-year periods for industrials, in ten periods for railroads, and in seven out of ten periods for public utilities. It also prevailed in all long periods for industrials and rails but in only two out of seven long periods for utilities. The underlying sample data show roughly similar patterns both for large and for small issues.

Realized yields obtained over the longer chronological periods were also typically lower on issues of large corporations than of small; but for the four-year periods the differences were small and not statistically significant. Specifically, for the combined industries the realized yields on issues of small obligors were higher than on those of large obligors in eight of the nine longer periods, but in only five of the eleven four-year periods (plus two ties). Again, roughly the same pattern occurred in the underlying sample data for large and small issues. Within major industry groups, the quadrennial realized yields on issues of large and small obligors were very similar. Over most of the longer periods, realized yields were higher for the small than for the large rail obligors, lower for small than for large public utilities, and irregular for industrials. The explanation is the tendency for default rates among rails to be higher, but among public utilities and industrials, lower, the larger the obligor.

Realized yields over the four-year periods were about the same for issues of small obligors as for large, but promised yields were generally higher. In most cases, the quadrennial loss rates were therefore higher for the smaller obligors, both for all industries combined, and for each of the major industry groups. Over the longer chronological periods, however, the reverse was true for the railroads and for the combined industries. The explanation is the poor default record during the Great Depression of several

of the large rail obligors, and the better than average record of a number of the smaller divisional lines. Loss rates on obligations of small public utility and industrial corporations usually exceeded those of large corporations over long as well as short periods owing to the tendency for default rates in those groups to decline with increasing asset size of obligor.

In conclusion, it appears that promised yields on corporate bonds varied over the chronological periods studied roughly in inverse order to the size of the issuing corporation. Except for rails, default rates were higher for the smaller obligors, so that loss rates were also higher while realized yields were about the same. Promised yields at offering and life-span yields realized varied in inverse order to the size of the issuing corporation, but in this case the loss rates were irregular. Similar patterns were observed in the yields and loss rates of corporate bonds classified by size of issue.

## NOTE ON BOND MARKET CONCENTRATION

Preceding sections of the chapter have pointed out that the degree of concentration in the bond market is extremely high. By concentration is meant the degree to which the par-amount total of outstandings is accounted for by a relatively small number of the largest issues or issues of the largest obligors. A question that naturally presents itself is whether the degree of bond market concentration is growing, or whether there is a tendency toward greater equality of obligor- and issue-size. A statistical inquiry into the question may be of interest, since it has been argued, in the absence of evidence to the contrary, that the growth of large financial intermediaries and business corporations has resulted in channeling an increasing proportion of the total capital funds of the economy into large issues and issues of large business corporations at the expense of others.

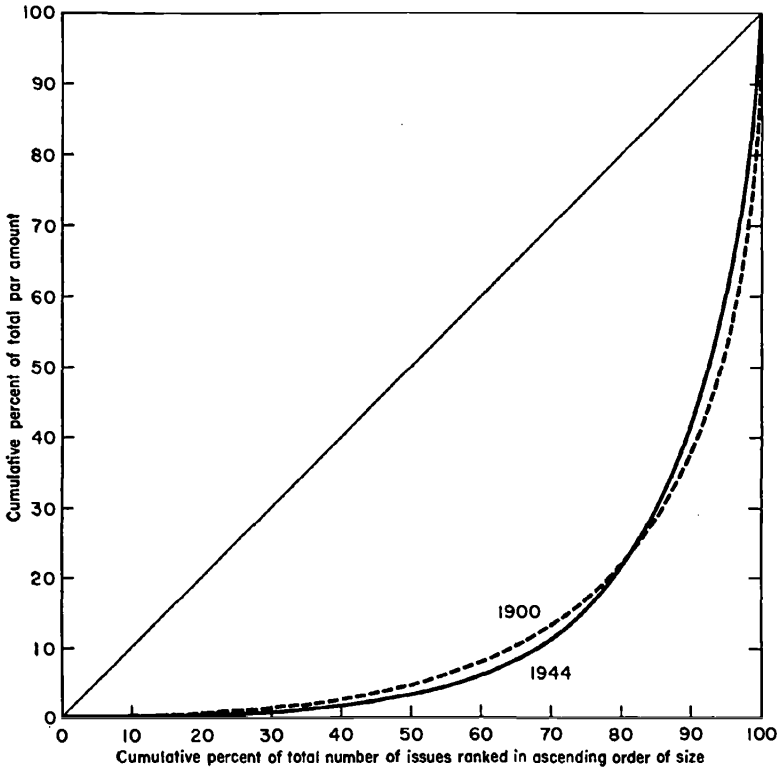
Accurate measurement of the degree of relative concentration in the bond market presupposes almost complete information on the distributions of outstandings by size. Because sufficient information is not available for most years on the asset size of obligor, most of our analysis is based on size of issue. Since the two size measures are interrelated, accurate measurement of the degree of concentration based on size of issue provides some information on the degree of concentration as related to size of obligor. In the second section of this note, concentration measurement by size of borrower is examined directly to the extent that the data permit, and the evidence is found to agree well with that based on size of issue.

As was indicated earlier in the chapter, the absolute asset size of corporations and the absolute size of their outstanding issues have reflected the general growth and price trends of the economy, both moving upward with prices and values over the period studied. In consequence, corporate obligors and debt issues above any given absolute size level have become increasingly important in the total of outstandings, while those below any given level have become progressively less important. It does not, of course, follow from such evidence that the degree of concentration has increased in the bond market, or that issues in the smaller size classes are more difficult to float now than heretofore. The data thus far presented simply indicate that the size of business corporations generally, and their financial requirements, have expanded with the economy.

### CONCENTRATION AND SIZE OF ISSUE

A straightforward method of testing for changes in the degree of relative concentration in the bond market is available in the techniques developed for comparing changes in distributions of personal incomes by size. These techniques in effect adjust for equiproportional shifts in issue size over time, thus enabling the analyst to exclude changes common to all issues. The point is illustrated in Chart 35, which shows Lorenz curves, or curves of inequality, for all outstanding issues in the two years

CHART 35—Lorenz Curves of Size of Outstanding Issues, 1900 and 1944



Universe estimates for straight bonds, January figures, from Table 116.

1900 and 1944. The curves were obtained by arraying issues in order of par amount, outstanding, cumulating the numbers and the par amounts, and expressing the two cumulants as percentages of the respective number and par-amount totals of outstandings. The curve for 1900 shows, for example, that the smallest 50 percent of the issues accounted for only 5 percent of the total par amount, the largest 50 percent for 95 percent, and so on.

Lorenz curves like those given in the chart were constructed quadrennially from the underlying distributions of outstandings for each of the three major industry groups and for all industry groups combined; and the upper 5 percent, 10 percent, 25 percent, and 50 percent points, as read from the curves, are presented in Table 113. (More comprehensive tabulations are provided in Table 116 at the end of the note.) The percentage points reveal the extreme inequality that existed in the size distributions of outstandings throughout the period studied.

An important technical point for our purposes is that a Lorenz curve, and any set of percentage points read from it, is invariant under general growth and price trends that affect the size of all issues equally. An all-around doubling or trebling of the size of each issue will result in a doubling or trebling of the total par amount of outstanding but will leave the percentage points unchanged (i.e., the largest 5 percent, 10 percent, etc. of the issues will account for the same proportions of the par-amount total as before the transformation). Similarly, a doubling or trebling of the total number of outstanding issues, if the new issues are distributed among size groups as in the original distribution, will leave the Lorenz curve unchanged. Because changes of these two types are the only ones under which the Lorenz curve is invariant, the curve provides an accurate measure of changes in inequality in the relative size distributions of outstandings.<sup>11</sup>

In addition to the percentage points obtained from the Lorenz curves,

<sup>11</sup> Since the Lorenz curve is obtained by plotting the proportion of the total number of observations below a given size  $x$  against the proportion of the total volume (par amount, etc.) accounted for by those observations, it depends solely upon the relative frequency distribution of the data. Thus an increase (decrease) in the size of sample, if the observations are distributed as in the original sample, leaves the Lorenz curve unchanged.

The proposition that a Lorenz curve is invariant under a simple multiplicative transformation on  $x$  but not under any other transformation follows directly from its definition. The proportion of the total number of observations falling below a given size  $y$  equals the proportion falling below a given size  $x$ , for every  $y = \lambda x$ . Since the proportion of the total volume accounted for by observations of size less than  $y$  is equivalent to the product of the proportion of the total number below  $y$  and the ratio of the mean size of observations below  $y$  to the grand mean of the  $y$ 's, this proportion is necessarily the same as the proportion of the total volume accounted for by observations below  $x$ , for every  $y = \lambda x$ . Hence the Lorenz curve is invariant under the transformation  $y = \lambda x$ .

For any other transformation on  $x$ , say  $y = \phi(x)$ , the ratio of the mean value below  $y$  to the grand mean of the  $y$ 's must differ from the corresponding ratio based on  $x$ , for at least one value of  $y$ . Hence,  $y = \lambda x$  is the only transformation on  $x$  that leaves the Lorenz curve unchanged.

Any statistical measure of size inequality, such as the coefficient of concentration (see page 517, the last paragraph), that is constructed solely from the Lorenz curve is by this proposition invariant under a linear magnification of scale. Also, for a wide class of distribution functions, the moments define the distribution uniquely and hence the Lorenz curve. Conversely, the Lorenz curve defines the moments of the distribution up to a power of the scale. Since the  $r$ th moments of a distribution are homogeneous functions of degree  $r$  in the scale factor  $\lambda$ , the  $r$ th roots of the moments are homogeneous of degree one. It follows that for a wide class of distribution functions, any statistical measure of inequality that is defined as the ratio of the  $r$ th roots of two moments is defined by the Lorenz curve as well, and is invariant under a linear magnification of scale. In particular, the coefficient of variation, which is the ratio of the square root of the second moment about the mean to the first moment, possesses this property. It should be noted in passing that although equality of Lorenz curves implies equality of coefficients of variation, the converse does not follow (cf. footnote 12).

TABLE 113—Means and Standard Deviations of Size Distributions of Outstandings and Selected Measures of Concentration, Quadrennially 1900-1944

YEAR <sup>a</sup>	Mean (millions)	Standard Deviation (millions)	Coefficient of Variation	Coefficient of Concentration	PERCENT OF TOTAL PAR AMOUNT ACCOUNTED FOR BY INDICATED PERCENTAGE OF NUMBER OF ISSUES				
					Largest 5 Percent	Largest 10 Percent	Largest 25 Percent	Largest 50 Percent	Largest 95 Percent
<i>All Issues</i>									
1900	\$2.3	\$6.4	2.8	0.74	47%	62%	83%	95%	
1904	2.5	9.0	3.6	0.77	55	69	85	95	
1908	2.5	8.7	3.5	0.77	55	68	85	95	
1912	2.4	8.3	3.5	0.77	55	69	86	95	
1916	2.6	8.5	3.3	0.78	55	69	86	96	
1920	2.8	9.1	3.3	0.78	55	69	87	96	
1924	3.3	9.3	2.8	0.77	51	66	85	96	
1928	4.2	10.5	2.5	0.75	47	63	84	95	
1932	5.3	12.0	2.3	0.74	45	62	83	95	
1936	5.8	12.7	2.2	0.74	43	61	84	95	
1940	7.3	15.3	2.1	0.75	41	61	85	96	
1944	8.5	17.2	2.0	0.74	39	58	85	97	
<i>Railroads</i>									
1900	3.0	7.8	2.6	0.72	46	60	81	94	
1904	3.6	10.3	2.9	0.75	49	64	83	95	
1908	4.2	11.4	2.7	0.75	49	64	84	95	
1912	4.7	12.3	2.6	0.77	50	66	85	96	
1916	5.1	13.0	2.5	0.75	47	64	85	95	
1920	5.7	13.8	2.4	0.75	45	63	85	95	
1924	6.2	14.2	2.3	0.74	43	61	84	95	
1928	7.1	15.1	2.1	0.72	39	58	82	95	
1932	8.4	17.0	2.0	0.72	38	57	83	95	
1936	9.1	17.5	1.9	0.72	36	55	82	96	
1940	10.5	18.8	1.8	0.71	33	52	81	96	
1944	11.7	19.8	1.7	0.71	34	52	80	96	

TABLE 113  
(continued)

YEAR <sup>a</sup>	Mean (millions)	Standard Deviation (millions)	Coefficient of Variation	Coefficient of Concentration	PERCENT OF TOTAL PAR AMOUNT ACCOUNTED FOR BY INDICATED PERCENTAGES OF NUMBER OF ISSUES				
					Largest 5 Percent	Largest 10 Percent	Largest 25 Percent	Largest 50 Percent	Largest 95 Percent
1900	\$1.0	\$2.4	2.4	0.75	48%	64%	84%	95%	
1904	1.1	2.7	2.5	0.70	47	60	79	92	
1908	1.2	3.8	3.2	0.71	47	60	79	93	
1912	1.2	3.5	3.9	0.71	47	62	80	93	
1916	1.4	4.2	3.0	0.74	49	63	83	94	
1920	1.6	5.1	3.2	0.75	51	65	84	95	
1924	2.0	5.7	2.9	0.75	47	63	84	95	
1928	3.2	7.9	2.5	0.74	45	61	84	95	
1932	4.7	10.4	2.2	0.74	44	60	83	95	
1936	5.4	11.3	2.1	0.74	43	60	83	96	
1940	7.0	14.8	2.1	0.74	42	60	84	96	
1944	8.1	17.5	2.2	0.75	41	59	85	97	
				<i>Public Utilities</i>					

TABLE 113  
(concluded)

YEAR <sup>a</sup>	Mean (millions)	Standard Deviation (millions)	Coefficient of Variation	Coefficient of Concentration	PERCENT OF TOTAL AMOUNT ACCOUNTED FOR BY INDICATED PERCENTAGES OF NUMBER OF ISSUES								
					Largest 5 Percent	Largest 10 Percent	Largest 25 Percent	Largest 50 Percent	Largest 70 Percent	Largest 88 Percent	Largest 95 Percent	Largest 99 Percent	
					<i>Industrials</i>								
1900	\$3.1	\$6.5	2.1	0.60	35%	49%	70%	88%					
1904	5.1	20.3	4.0	0.80	67	75	88	95					
1908	3.2	13.3	4.2	0.76	57	67	83	95					
1912	2.5	10.3	4.1	0.73	53	64	81	93					
1916	2.4	9.3	3.9	0.75	53	66	83	94					
1920	2.7	9.9	3.7	0.75	53	66	83	95					
1924	3.2	9.2	2.9	0.73	49	63	81	94					
1928	3.5	9.1	2.6	0.71	47	61	80	92					
1932	3.5	8.1	2.3	0.70	44	59	79	92					
1936	3.2	7.4	2.3	0.71	44	60	80	93					
1940	4.0	9.8	2.5	0.78	50	68	87	96					
1944	5.0	11.1	2.2	0.77	44	64	87	97					

Based on straight corporate issues: means, on universe figures from *Volume of Financing*, Tables A-2 and A-7; standard deviations computed from above means, on ungrouped data for all large issues and 10 percent of small issues adjusted to universe totals; coefficients of concentration and percentages in the four right-hand columns, on Table 116.

The various measures of concentration, etc. are described in the accompanying text and in standard statistical treatises.

<sup>a</sup> Size distributions refer to beginning of year.



Table 113 presents several other statistics descriptive of the characteristics of the size distributions of outstandings and the degree of relative inequality. The first column contains the sample means (average size of issue), which, as the table indicates, rose steadily for all issues from \$2.3 million at the beginning of the century to \$8.5 million in 1944. The second column presents the standard deviations of the size distributions, which measure the average spread or scatter about the sample means. (The standard deviation is the square root of the average of squared deviations about the mean.) Like the means, they also rose rather steadily over the period studied, from \$6.4 million to 1900 to \$17.2 million in 1944. Because equiproportional changes in issue size result in equiproportional changes in the mean and standard deviation (e.g. a doubling of the size of each issue would result in a doubling of both statistics), ratios of the standard deviation to the mean (the coefficients of variation presented in the third column of Table 113) are invariant under such a change, and provide a rough measure of size inequality.<sup>12</sup> Since the standard deviation is zero when all issues are of equal size, the coefficient of variation vanishes under conditions of perfect equality. For distributions with equal means, it rises as issues become less equal in size (i.e. as the scatter about the mean increases). Similarly, for size distributions with equal standard deviations the one with the greatest mean size of issue will be the most evenly distributed.<sup>13</sup> The coefficient of variation thus provides one measure of the degree of relative size inequality.

Although the standard deviation of the size distributions of outstandings for the combined industries rose from \$6.4 million in 1900 to \$17.2 million in 1944 and the mean size of issue from \$2.3 million to \$8.5 million, the standard deviation rose less rapidly than the mean (an increase of 169 percent in the former versus 270 percent in the latter) so that the coefficient of variation fell from 2.8 to 2.0. To the extent that the coefficient of variation reflects changes in the underlying size distributions, it indicates a decline in the degree of relative concentration in the bond market as measured by the size of outstanding bond issues.

As a check on the coefficients of variation, so-called coefficients of concentration (Gini's coefficients) are presented in the fourth column of Table 113. The coefficient of concentration is the ratio of the area between the line of perfect size equality (the line having an upward slope of 45° in Chart 35) and the Lorenz curve to the total area under the line of perfect size equality. Since the coefficient of concentration is based on the entire Lorenz curve, it is usually held to be a more comprehensive measure of size equality than the coefficient of variation. The coefficient

<sup>12</sup> A rough measure, because distributions having different Lorenz curves may have the same coefficient of variation. As the preceding footnote has indicated, equality of coefficients of variation is a necessary but not a sufficient condition for the Lorenz curves to be equal.

<sup>13</sup> As equal amounts are added to the size of each issue the relative differences among them become smaller, so that the distributions become less unequal. That is to say, the common element in size becomes progressively more important, and the differences progressively less important, the greater the amount added to each issue.

of concentration ranges between zero, for perfect equality, and unity, for perfect inequality.<sup>14</sup>

Coefficients of concentration for corporate bond outstandings for the combined industries ranged between 0.74 and 0.78, indicating a high degree of inequality (how high may be inferred from the fact that coefficients of concentration for income distributions in typical American cities seldom exceeded 0.50 in 1933).<sup>15</sup> Nevertheless, the coefficient was exactly the same in 1944 as in 1900, so that there is no evidence on the basis of this statistic of an increase in size inequality.

Chart 35 (see also Table 116) indicates that the Lorenz curves for 1900 and 1944 cut one another at a point corresponding to 82 percent of the total number of issues, the 1944 curve being lower to the left and higher to the right of that point. In other words, the lower 82 percent of the issues (in an array from smallest to largest) accounted for exactly the same percent of the par-amount total of outstandings in 1944 as in 1900; but the lesser percentages, for example, the lower 50 percent, accounted for a smaller share of total outstandings in 1944 than in 1900 (and the upper 50 percent accounted for a larger share of the total). Above the 82 percent point, the opposite was true; e.g., the lower 95 percent of the issues accounted for a larger proportion of the par-amount total in 1944 than in 1900, while the upper 5 percent accounted for a smaller proportion. Evidently, the areas between the two curves are equal and offsetting, since the coefficients of concentration are identical; however, the small and the very large issues were relatively less important in 1944 than in 1900, while issues of moderate size were relatively more important. In one sense, therefore, there was a decline in size inequality in the forty-four-year span owing to the growth of medium-size issues. The absence of any systematic evidence of increasing size inequality is remarkable in view of the rapid growth over the period studied in the average size of borrowers and lenders, and accordingly in the size of new issues.

Although the relative size distributions of outstandings underwent

<sup>14</sup> The area under the line of perfect size equality is the area of the lower of the two triangles into which the 45° line divides the square framework of Chart 35. Let the base of this triangle equal unity and the area between the 45° line and the Lorenz curve equal  $A$ . Then the area of the triangle is  $\frac{1}{2}$  and the coefficient of concentration is  $2A$ . The latter ranges from zero for perfect equality ( $A = 0$ ) to unity for perfect inequality ( $A = \frac{1}{2}$ ).

Areas under the Lorenz curves were computed by means of Simpson's rule applied to the data at 5 percent intervals of the argument as given in Table 116 [cf. E. F. Whittaker and G. Robinson's *The Calculus of Observations* (London and Glasgow, 1940), p. 157]. The method was checked for selected years by more elaborate methods of numerical integration and also by the use of an Improved Willis Planimeter, and was found to be reasonably accurate. The derived coefficients of concentration in Table 113 are believed to be correct to the two decimal places shown.

<sup>15</sup> See Horst Mendershausen's *Changes in Income Distribution during the Great Depression* (National Bureau of Economic Research, 1946), Table 7. The coefficients of variation for the same distributions ranged narrowly around 1.0 (*ibid.*, Table 6).

little change over the full period from 1900 to 1944, Table 113 reveals that important swings occurred within the period. Thus the coefficients of variation and of concentration for issues of all industries combined, as well as the upper 5 and 10 percent points of the distributions, moved sharply upward between 1900 and 1904, indicating increasing inequality in the bond market. After 1904 they changed little through 1920, and then declined gradually. It is noteworthy that it was precisely during the latter period that the financial intermediaries enjoyed their most rapid growth.

Analysis of the industry breakdowns shows that the swings were far from uniform in the major industry groups, although in each case there is some evidence of an upward drift in most of the inequality measures after 1900, followed at irregular intervals by a decline. The initial movement upward was most pronounced for industrials. The sharp rise in industrial inequality between 1900 and 1904 was brought about by the formation of the giant trusts, several of which were financed largely by bond issues. A few of the very largest of these issues were so important in the industrial bond totals that the share of the upper 5 percent group jumped from 35 percent, in 1900, to 67 percent in 1904. Later, the large industrial issues were gradually extinguished while an increasing number of business concerns entered the bond market with small and medium-size issues. As a result, the share of the largest 5 percent of the industrials gradually shrank until it reached 44 percent in 1944.

One of the factors contributing to the rise and subsequent decline of inequality in the size distributions of the combined industries was the divergence (measured relative to the grand mean) of the average size of issue of the different industry groups up to about 1920, and their gradual convergence thereafter (see the first column of Table 113). In absolute terms, the rail and utility averages increased rather regularly over the entire period from 1900 to 1944, although the rate of increase for utilities was slow at first and then rapid. The industrial averages shot up very rapidly between 1900 and 1904, then fell and rose again more gradually, just about reaching their 1904 peak again by 1944.

If all issues were of equal size within their respective industry groups, the distribution for the combined industries would, of course, still exhibit some inequality because of differences among the industry means. Coefficients of mean variation for the means may be calculated in exactly the same way as for the individual issues to measure the contribution of the differences among industry means to the total inequality.<sup>16</sup> These

<sup>16</sup> If the industry means were all equal to one another (zero "mean" coefficient of variation), the coefficient of variation for the combined industries would equal a weighted average of the coefficients of variation computed within industry groups. Conversely, if the issues were of equal size within industry groups (zero coefficients of variation for each) then the coefficient of variation for the combined industries would equal the mean coefficient of variation obtained by weighting the respective mean deviations by the number of issues included. These propositions follow from the fact that the total variance (square of the standard deviation) breaks down into two components: the pooled variance of the size of individual issues about their indus-

coefficients were 0.41 in 1900, 0.52 in 1920, and 0.33 in 1944. Thus some part of the growth in inequality in the distributions of total outstandings between 1900 and 1920 was caused by the relative divergence of the industry means over that period, while the convergence of the means after 1920 contributed to the growing equality.

One of the surprises of Table 113 is that the rails were usually more homogeneous, after allowance for their larger average size, than issues in the other industry groups. Thus the coefficient of variation for rails was lower than the corresponding coefficient for utilities in ten out of the twelve comparisons that may be made from the data in Table 113, and was lower than the coefficient for industrials in eleven comparisons. Conversely, the industrials were less homogeneous, relative to their average size, than issues of other industries. Not only did the industrial coefficient of variation exceed the rail coefficient in eleven out of twelve comparisons; it also exceeded the utility coefficient in nine comparisons, fell short of it in one comparison, and the two were tied twice.

The coefficient of variation for the combined industries was usually above that for rails and for utilities but lower than that for industrials. The rail coefficient was lower than the corresponding all-industry coefficient in all twelve comparisons, and the utility coefficient was lower in seven comparisons and higher in only three. The industrial coefficient exceeded the all-industry coefficient in ten out of twelve comparisons.

Distributions of bond offerings by size are more difficult to interpret than distributions of outstandings because of the smaller numbers and wider annual fluctuations involved. Analysis of a limited amount of offerings data gives results that seem to fit those obtained for outstandings. For example, groupings of bond offerings of the combined industries by four-year periods, 1900-1903, 1904-07, and so on, show that the mean size of offering was fairly constant up to 1920, but rose rapidly thereafter. (The mean size ranged between a low of \$1.3 million, in 1908-11, and a high of \$1.8 million in 1900-1903 and 1916-19, and then rose irregularly to \$6.6 million in 1940-43.) The standard deviation of the size distributions of bond offerings declined between 1900 and 1912, and then rose fairly regularly through the final four-year period studied (\$8.4 million in 1900-1903, \$3.9 million in 1908-11, and \$17.0 million in 1940-43). As a result, the coefficient of variation was high in 1900-1907 (between 4.3 and 4.7), moderately high in 1912-23 (between 3.6 and 3.9), and low in other periods (between 2.5 and 3.0). The general pattern was therefore one of declining concentration in the size distributions of bond offerings as measured by coefficients of variation.

Comparisons of upper percentage points of Lorenz curves based on the aggregate volumes of bond offerings in the two periods 1900-1919 and 1920-43 show that the curves crossed at about the 90 percent point, the largest 10 percent of the offerings accounting for approximately two-thirds of the aggregate par amount in both periods. To the right of that point, the curve for 1900-1919 was below that for 1920-43, indicating

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try means, and the pooled variance of the industry means about the grand mean.

that the largest offerings were more important in the early period than in the later; and to the left of that point, the converse. For example, the largest 5 percent of offerings accounted for 53 percent of the par-amount total in 1900-1919 and for 49 percent in 1920-43, while the largest 25 percent accounted for 81 percent and 84 percent respectively. From the standpoint of equality, trends in the size distributions of offerings and outstandings were therefore similar. In both cases there was a decline in the importance of the very large size classes and a decline in the coefficient of variation.

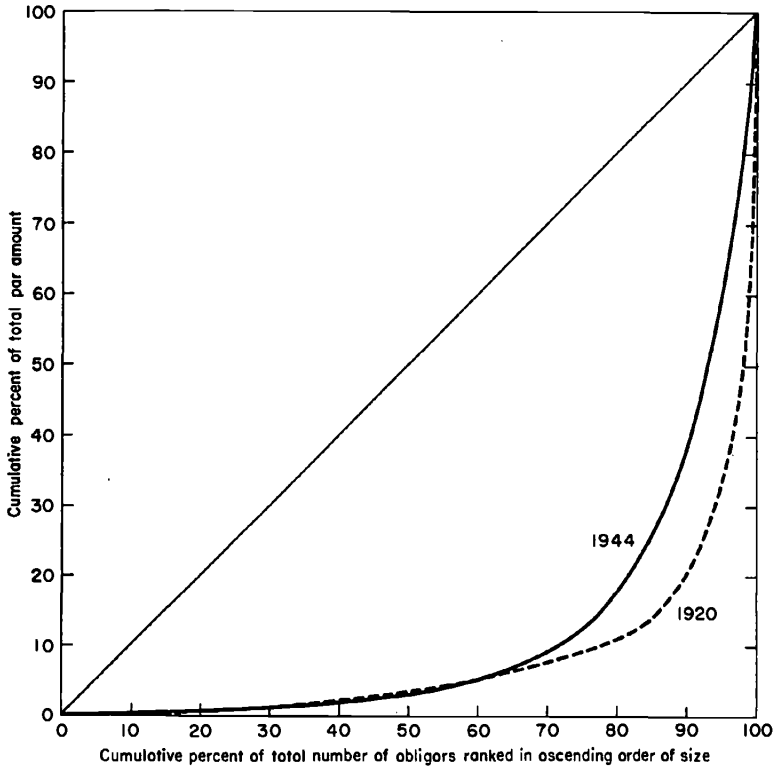
#### CONCENTRATION AND SIZE OF OBLIGOR

Despite gaps in our basic records on size of obligor, it was possible to piece together a fairly accurate picture of the distribution of outstandings by this variable for the two years 1920 and 1944. In the original records of the Corporate Bond Project, items were classified as "information lacking" unless precise information was available (see Table 101 for percentages of the numbers and amounts so coded), but such high precision is not required when, as in this report, the data are coded and tabulated by classes. Through an independent search of the manual sources for 1920 and 1944 it was possible to obtain sufficient informa-

TABLE 114—Percent of Total Par Amount of Outstandings Accounted for by Given Percentages of Number of Obligor Ranked by Asset Size, 1920 and 1944

BEGINNING OF YEAR	<i>Largest 5 Percent</i>	<i>Largest 10 Percent</i>	<i>Largest 25 Percent</i>	<i>Largest 50 Percent</i>
1920				
All industries	68%	80%	90%	96%
Railroads	66	84	94	98
Public utilities	57	76	87	95
Industrials	56	69	84	95
1944				
All industries	38	62	88	97
Railroads	55	73	90	98
Public utilities	26	50	84	96
Industrials	46	62	87	96

Read from Chart 36 and curves of inequality for the major industries based on grouped data in Table 28 of *Statistical Measures* and on special supplementary tabulations of the corresponding number of obligors by asset size. The par-amount data cover all large (straight) corporate issues and 10 percent of small issues adjusted to universe totals. An obligor was counted once if one of its outstanding issues was in the large issues sample and ten times if all of its issues were in the small issues sample. This procedure assumes that only 10 percent of the obligors of small issues are included in the sample. A test based on railroad data for 1900 showed that 11.2 percent were included in that year.

**CHART 36—Curves of Inequality Based on Asset Size of Obligor, 1920 and 1944**

Based on the grouped data of "Statistical Measures," Table 28, and special supplementary tabulations of the corresponding number of obligors by asset size. The par-amount data cover all large (straight) corporate issues and 10 percent of small issues adjusted to universe totals. An obligor was counted once if one of its outstanding issues was in the large issues sample, and ten times if all of its issues were in the small issues sample.

tion to code most of the issues by size of obligor. Curves of inequality were then constructed, with the results plotted in Chart 36 and summarized in Table 114. The curves are similar to the Lorenz curves presented in Chart 35, except that they show on the horizontal axis the percent of the total number of obligors having asset size less than a given amount, and on the vertical axis, the corresponding percents of the par-amount total of straight bond outstandings accounted for by those obligors.<sup>17</sup>

<sup>17</sup> Conceptually, the curves differ from Lorenz curves since the size measure used in ranking obligors differs from that used to measure the importance of

The data reveal that there was a perceptible decline between 1920 and 1944 in the proportion of outstandings accounted for by the largest obligors. For the combined industries, the largest 5 percent of the obligors accounted for 68 percent of the total volume of outstandings in the former year and for 38 percent in the latter. Similarly, the largest 10 percent accounted for 80 percent of the par amount total in 1920 and for only 62 percent in 1944. At the 50 percent point, however, the degree of inequality remained about the same, the largest half of the obligors accounting for 96 percent of outstandings in 1920 and 97 percent in 1944.

A similar decline in inequality occurred within each of the major industries, being most pronounced for public utilities. Among utilities there were relatively more very large corporations in 1944 than in 1920, so that the largest 5 percent in 1944 was comprised entirely of corporations with assets above \$500 million, whereas in 1920 the largest 5 percent contained mainly companies with assets between \$50 million and \$100 million. On the other hand, straight bond financing was a less important source of capital for large utilities in 1944 than in 1920, the ratio of funded debt to total assets declining sharply for the largest obligor group. As a result, the largest 5 percent of utility obligors accounted for a much smaller proportion of straight bond outstandings in 1944 than in 1920. Similar developments occurred in the railroad and industrial fields as well, but to a lesser extent. Although the asset size of the largest 5 percent of the corporations in those industries increased between 1920 and 1944, the ratios of straight bond outstandings to total assets of the largest companies dropped sharply, so that the share of the largest 5 percent in total outstandings also declined, but less markedly than for utilities.

In general, the data confirm the findings of the preceding section on size of issue. Bond market concentration declined between 1920 and 1944, measured both by the share of large issues in total outstandings and by the share of large obligors. Partly because of the correlation of issue size and size of obligor, both showed about the same decline in inequality for the combined industries and for each of the major industry groups.

Supplementary data on concentration as it relates to size of obligor are presented in Table 115 in the form of shares of the par-amount totals of outstandings accounted for by the largest three, four, and eight obligors in 1900, 1920, and 1944. Measures of this type based on absolute numbers of corporations can occasionally be calculated when information needed to compute the corresponding relative measures based on total numbers is not available; they throw light on the latter when the number of corporations in the universe is fairly steady over the period

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issues in the bond market. Theoretically, part of the inequality curve could lie above the 45° line of perfect size equality if the variation in asset size of obligor was small, and if the ratio of straight funded debt to total assets dropped sharply at some point as asset size of obligor increased (both conditions contrary to fact). This could never happen for the true Lorenz curve.

TABLE 115—Percent of Total Par Amount of Outstandings Accounted for by Largest Obligors, 1900, 1920, and 1944

BEGINNING OF YEAR	<i>Largest Three Obligors</i>	<i>Largest Four Obligors</i>	<i>Largest Eight Obligors</i>
1900			
All industries	7.6%	8.6%	15.1%
Railroads	9.7	11.0	19.3
Public utilities	4.9	8.3	17.4
Industrials	23.0	26.1	35.4
1920			
All industries	8.9	10.5	18.7
Railroads	14.6	16.9	32.3
Public utilities	8.5	12.4	15.8
Industrials	25.3	29.0	35.3
1944			
All industries	6.4	7.6	13.0
Railroads	14.3	16.2	29.0
Public utilities	11.5	11.8	17.0
Industrials	12.0	15.4	24.5

Based on special tabulations of the National Bureau of Economic Research.

studied.<sup>18</sup> As the table indicates, there was a rise in the degree of concentration in the bond market between 1900 and 1920 as measured by the proportion of outstandings accounted for by the very large corporations. Since the total number of obligors increased rapidly over that period, the largest corporations constituted a declining proportion of the universe of long-term corporate borrowers. Hence we may infer that both the relative and absolute degree of concentration increased in the

<sup>18</sup> The share of the market (volume of production, employment, etc.) accounted for by a given number of the largest corporations is frequently used in empirical studies of business concentration because of the presumptive relationship between the number and size of the participants and the degree of monopoly power. See, for example, Gideon Rosenbluth's "Measures of Concentration" in *Business Concentration and Price Policy* (Princeton University Press for the National Bureau of Economic Research, 1955), pp. 57-99, for an interesting comparison of such measures. In the bond market the number of participants is large, the obligations traded are close substitutes (with due allowance for risk, liquidity, cost of investigation, etc.), and the extent of the market is wide, so that it is usually considered a highly competitive market. The interesting question in this area is whether small issues and issues of small obligors have been displaced by large issues and large obligors, and for that purpose measures of concentration based on relative numbers not only appear more appropriate but are easier to interpret than measures based on absolute numbers, because of wide swings over the period studied in the number of issues and obligors.



bond market between 1900 and 1920, a conclusion analogous to that observed in the preceding section on size of issue. The figures also indicate a decline between 1920 and 1944 in the share of the largest corporate obligors in the par-amount total of outstandings for the combined industries and industrials, and a fairly steady share for rails and public utilities. Since the number of obligors contracted sharply in each group between 1920 and 1944, it may be inferred that there was a general decline in relative concentration, a conclusion supported by Table 114.

TABLE 116—Percents of Total Par Amounts of Outstandings Corresponding to Percentages of Total Number of Issues Ranked in Ascending Order of Outstanding Amount, Quadrennially 1900-1944

PERCENT OF TOTAL NUMBER OF ISSUES <sup>a</sup>	PERCENT OF TOTAL PAR AMOUNT <sup>b</sup>											
	1900	1904	1908	1912	1916	1920	1924	1928	1932	1936	1940	1944
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
5.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.0	0.2	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
15.0	0.4	0.5	0.5	0.4	0.4	0.3	0.3	0.4	0.4	0.3	0.2	0.2
20.0	0.6	0.8	0.8	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.4	0.4
25.0	1.0	1.2	1.2	1.1	0.9	0.9	0.9	1.0	1.1	0.9	0.7	0.7
30.0	1.4	1.6	1.6	1.6	1.3	1.3	1.3	1.5	1.5	1.4	1.0	1.0
35.0	2.0	2.2	2.2	2.2	1.8	1.8	1.8	2.1	2.2	1.9	1.5	1.4
40.0	2.7	2.9	2.9	2.8	2.4	2.4	2.5	2.8	2.9	2.6	2.1	1.9
45.0	3.7	3.7	3.7	3.7	3.1	3.1	3.2	3.8	3.9	3.4	2.9	2.5
50.0	4.8	4.7	4.7	4.7	4.1	4.0	4.2	4.9	5.1	4.5	3.9	3.4
55.0	6.2	5.9	5.9	6.0	5.2	5.2	5.6	6.3	6.5	5.8	5.1	4.5
60.0	8.2	7.5	7.4	7.5	6.6	6.6	7.1	8.0	8.2	7.4	6.6	6.1
65.0	10.4	9.5	9.4	9.3	8.4	8.3	9.1	10.1	10.3	9.5	8.7	8.4
70.0	13.3	11.7	11.7	11.6	10.6	10.8	11.6	12.8	13.0	12.5	11.4	11.4
75.0	17.1	14.6	14.7	14.4	13.6	13.4	14.8	16.4	16.6	16.2	15.1	15.4
80.0	22.1	18.2	18.6	18.2	17.2	17.6	18.9	20.8	21.3	21.3	20.3	21.3
85.0	28.7	23.3	23.9	23.3	23.2	22.5	24.9	27.3	28.0	28.3	27.8	29.7
90.0	38.1	31.3	31.7	31.3	30.9	30.7	33.6	36.8	38.1	38.9	39.2	42.0
95.0	52.7	44.8	45.3	45.1	45.2	45.2	48.5	52.8	55.0	56.9	58.7	60.5
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
TOTAL NUMBER OF ISSUES	2,566	3,743	5,017	6,324	6,709	6,363	6,437	6,250	5,504	4,554	3,476	2,679
TOTAL PAR AMOUNT (IN BILLIONS)	\$5.9	\$9.3	\$12.6	\$15.3	\$17.2	\$18.1	\$21.0	\$26.5	\$29.0	\$26.5	\$25.4	\$22.8

*All Industries Combined*

TABLE 116  
(continued)

PERCENT OF TOTAL NUMBER OF ISSUES <sup>a</sup>	PERCENT OF TOTAL PAR AMOUNT <sup>b</sup>											1944		
	1900	1904	1908	1912	1916	1920	1924	1928	1932	1936	1940			
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
5.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
10.0	0.2	0.2	0.2	0.1	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
15.0	0.4	0.4	0.4	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.2
20.0	0.7	0.7	0.6	0.5	0.5	0.5	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.4
25.0	1.2	1.0	0.9	0.8	0.8	0.8	1.0	1.0	1.0	0.8	0.8	0.8	0.7	0.7
30.0	1.8	1.5	1.3	1.1	1.3	1.3	1.5	1.5	1.4	1.3	1.3	1.2	1.0	1.0
35.0	2.5	2.1	1.9	1.6	1.9	1.9	2.1	2.1	2.1	1.8	1.8	1.8	1.6	1.6
40.0	3.3	2.8	2.6	2.2	2.6	2.6	2.8	2.9	2.9	2.5	2.5	2.5	2.3	2.3
45.0	4.4	3.9	3.5	3.1	3.5	3.4	3.7	4.0	3.8	3.4	3.4	3.4	3.2	3.2
50.0	5.9	5.2	4.6	4.1	4.5	4.5	4.8	5.2	4.9	4.4	4.4	4.4	4.3	4.3
55.0	7.5	6.5	5.9	5.3	5.8	5.7	6.2	6.7	6.2	5.8	5.8	5.9	6.0	6.0
60.0	9.5	8.4	7.5	6.9	7.5	7.3	7.9	8.5	7.9	7.7	7.7	8.1	8.1	8.1
65.0	12.1	10.5	9.7	8.8	9.5	9.4	10.0	10.9	10.2	10.3	10.3	10.9	10.9	10.9
70.0	15.2	13.2	12.4	11.3	12.1	11.9	12.8	13.7	13.3	13.6	13.6	14.4	14.6	14.6
75.0	19.3	16.6	15.8	14.6	15.5	15.4	16.4	17.6	17.4	18.0	18.0	19.3	19.6	19.6
80.0	24.4	21.3	20.4	19.1	20.0	20.0	21.4	22.8	23.0	24.1	25.7	26.3	26.3	26.3
85.0	31.2	27.3	26.8	25.0	26.4	26.7	28.3	30.4	30.9	32.1	34.6	35.3	35.3	35.3
90.0	40.1	35.9	36.0	34.4	35.9	36.7	38.9	41.7	43.0	44.5	47.6	47.7	47.7	47.7
95.0	54.4	50.7	51.3	50.4	52.9	54.8	57.4	60.6	61.9	63.6	66.5	66.5	65.9	65.9
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
TOTAL NUMBER OF ISSUES	1,534	1,706	1,815	1,880	1,878	1,700	1,564	1,494	1,347	1,231	1,031	814	814	814
TOTAL PAR AMOUNT (IN BILLIONS)	\$4.7	\$6.1	\$7.7	\$8.8	\$9.7	\$9.6	\$9.7	\$10.6	\$11.3	\$11.1	\$10.8	\$9.5	\$9.5	\$9.5

Railroads

TABLE 116  
(continued)

PERCENT OF TOTAL NUMBER OF ISSUES <sup>a</sup>	PERCENT OF TOTAL PAR AMOUNT <sup>a</sup>											
	1900	1904	1908	1912	1916	1920	1924	1928	1932	1936	1940	1944
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
5.0	0.1	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.0	0.3	0.7	0.6	0.3	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1
15.0	0.5	1.2	1.0	0.7	0.5	0.5	0.4	0.4	0.3	0.3	0.2	0.3
20.0	0.9	1.6	1.4	1.1	0.9	0.8	0.7	0.6	0.5	0.5	0.5	0.4
25.0	1.4	2.3	2.1	1.6	1.2	1.2	1.1	0.9	0.9	0.9	0.8	0.7
30.0	1.9	3.2	2.9	2.4	1.8	1.8	1.6	1.4	1.4	1.3	1.2	1.1
35.0	2.5	4.2	3.7	3.4	2.5	2.4	2.2	2.0	2.0	1.9	1.7	1.5
40.0	3.3	5.3	4.8	4.5	3.3	3.3	3.0	2.7	2.7	2.5	2.4	2.0
45.0	4.2	6.7	6.1	5.7	4.4	4.2	3.9	3.6	3.5	3.4	3.3	2.7
50.0	5.3	8.1	7.5	7.2	5.6	5.4	5.0	4.6	4.7	4.4	4.4	3.5
55.0	6.6	9.8	9.2	9.1	7.0	6.8	6.4	5.9	6.1	5.7	5.7	4.6
60.0	8.2	12.0	11.3	11.2	8.8	8.5	8.0	7.6	8.0	7.4	7.4	6.1
65.0	10.4	14.5	13.7	13.6	11.0	10.5	10.2	9.8	10.2	9.6	9.8	8.2
70.0	12.8	17.5	16.6	16.5	13.6	13.0	13.0	12.6	13.1	12.9	12.6	11.2
75.0	16.0	21.2	20.5	20.0	17.0	16.3	16.3	16.3	17.2	16.9	16.4	15.1
80.0	20.4	26.0	25.2	24.4	21.7	20.6	21.0	21.5	22.2	22.1	21.4	20.9
85.0	26.5	32.0	31.4	30.2	28.0	26.4	27.6	28.4	29.3	29.3	28.7	29.1
90.0	36.0	39.9	39.8	38.4	37.5	34.8	37.2	38.5	39.6	40.0	39.8	41.2
95.0	52.0	53.3	52.6	52.7	51.5	48.8	52.8	54.5	56.1	57.4	58.3	59.2
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
TOTAL NUMBER OF ISSUES	926	1,791	2,674	3,558	3,862	3,795	3,583	3,150	2,641	2,168	1,589	1,273
TOTAL PAR AMOUNT (IN BILLIONS)	\$0.9	\$1.9	\$3.2	\$4.3	\$5.3	\$6.1	\$7.2	\$10.2	\$12.4	\$11.6	\$11.1	\$10.4

Public Utilities

TABLE 116  
(concluded)

PERCENT OF TOTAL NUMBER OF ISSUES <sup>a</sup>	PERCENT OF TOTAL PAR AMOUNT <sup>a</sup>											
	1900	1904	1908	1912	1916	1920	1924	1928	1932	1936	1940	1944
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
5.0	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1
10.0	0.5	0.3	0.2	0.3	0.3	0.2	0.1	0.4	0.5	0.3	0.2	0.2
15.0	1.3	0.6	0.5	0.7	0.6	0.5	0.4	0.8	0.9	0.6	0.3	0.3
20.0	2.2	1.1	0.8	1.2	1.2	0.8	0.8	1.3	1.4	0.9	0.5	0.5
25.0	3.4	1.5	1.2	1.7	1.5	1.3	1.3	1.9	2.1	1.6	0.8	0.8
30.0	4.9	2.0	1.8	2.4	2.1	1.8	1.9	2.7	2.8	2.2	1.1	1.2
35.0	6.5	2.6	2.5	3.2	2.8	2.4	2.6	3.7	3.9	3.1	1.6	1.6
40.0	8.1	3.4	3.3	4.2	3.6	3.2	3.5	4.8	5.0	4.2	2.1	2.0
45.0	9.8	4.2	4.3	5.5	4.6	4.1	4.7	6.2	6.4	5.5	2.9	2.6
50.0	12.0	5.2	5.5	6.9	5.7	5.5	6.2	7.6	7.9	6.9	3.8	3.3
55.0	14.6	6.2	7.0	8.6	7.1	7.1	7.9	9.3	9.8	8.4	4.9	4.2
60.0	17.7	7.2	8.6	10.5	8.8	8.9	10.1	11.3	11.9	10.7	6.3	5.3
65.0	20.9	8.5	10.8	12.7	10.8	10.9	12.7	13.7	14.3	12.9	8.0	6.8
70.0	25.0	10.0	13.6	15.6	13.2	13.6	15.8	16.6	17.2	15.8	10.3	9.4
75.0	29.7	12.2	16.8	19.0	16.5	17.0	19.2	20.3	20.7	19.6	13.3	12.9
80.0	35.5	14.8	21.1	23.2	20.9	21.2	23.2	24.4	25.6	24.6	17.4	17.4
85.0	42.5	19.1	26.0	28.2	26.5	26.2	29.0	30.9	31.7	31.0	23.2	24.2
90.0	51.4	24.7	32.6	35.6	33.9	33.7	37.4	39.1	40.6	40.1	32.1	36.3
95.0	65.1	33.1	43.0	46.9	47.4	46.9	51.5	53.2	56.1	56.3	49.8	55.6
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
TOTAL NUMBER OF ISSUES	106	246	528	886	969	868	1,290	1,606	1,516	1,155	856	592
TOTAL PAR AMOUNT (IN BILLIONS)	\$0.3	\$1.3	\$1.7	\$2.2	\$2.3	\$2.4	\$4.1	\$5.6	\$5.3	\$3.8	\$3.5	\$2.9

Based on ungrouped data for straight corporate issues arrayed by outstanding amount for the large and small issues samples. Since the latter is a 10 percent sample, each issue was conceived of as representing 10 small issues and counted 10 times.

<sup>a</sup> Size distributions refer to beginning of year.

