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AGGREGATE EXPERIENCE

BECAUSE of their inclusiveness, measures of aggregate experience, such as over-all default rates, realized yields, and loss rates, reflect the diverse fortunes of all bond issues held by the investing public —those that fared badly and those that fared well. They cover street railway and rail bonds, electric utilities and industrials; issues rated high grade by the investment rating agencies and those rated low; issues eligible for savings bank and trust fund investment and issues ineligible for such investment. Since the aggregate measures reflect the behavior of all issues under a wide variety of circumstances, they are free of the selective effects of investor judgment as to quality, industry, and timing, as well as of the regulatory rules and statutes governing the disposition of institutional funds. They therefore serve as useful yardsticks against which particular programs and portfolios may be ap- praised, and provide an essential background for the more de- tailed analyses of subsequent chapters.

Immediately after the summary of findings, we consider the ag- gregate returns obtained on bonds purchased at offering and held to extinguishment, and secular and cyclical drifts in default and loss rates of bonds offered in different periods. The next section analyzes the returns obtained from defaulted issues, on the as- sumption that they were sold on the date of default, or alterna- tively, that they were purchased on that date and held over periods of different lengths in the future. The chapter closes with an ex- amination of the yield and loss experience of bonds held over selected chronological periods. The principal breakdowns relate to major industry and size components, but some material is pre- sented on the behavior of issues of the minor industry divisions.

SUMMARY OF FINDINGS

During the full period 1900–1943, $71.5 billion par amount of straight corporate bond issues were offered to and purchased by the domestic investing public. Of that total, slightly over 10 per- cent was paid in full at maturity and slightly under 20 percent went into default. The remainder was either extinguished by call or was still outstanding at the close of the period studied (January

1, 1944). Realized yields on bonds purchased at offering and held to extinguishment necessarily equaled the promised yields at offering for the one-tenth paid at maturity, so that losses were zero for that group. On the other hand, capital losses occurred on the one-fifth that went into default, but these were just equaled by capital gains that were realized on the called issues or had accrued on those still outstanding on January 1, 1944. The weighted average promised yield on total offerings was 5.6 percent, and so was the realized yield from offering to extinguishment (Table 10). Thus if all of the bond issues in the study are conceived of as pooled into a single portfolio held from offering to extinguishment or 1944, the portfolio would have suffered no loss in current dollars. This is a truly remarkable finding in view of the fact that the record spans a period of forty-four years that includes a great war and a great depression.

Marked discrepancies occurred, however, between the experience records of issues differing in period of origin and of extinguishment. Generally speaking, during periods of rising interest rates a relatively large proportion of issues were paid in full at maturity while relatively few were called. Realized yields rose with money rates in such periods, but call premiums were insufficient to offset default losses, so that capital losses occurred. Contrariwise, in periods of falling interest rates few issues were paid in full at maturity but many were called. Even though default losses were substantial, call premiums more than offset them, and substantial capital gains occurred.

Analysis of the over-all performance of corporate bonds by minor industry group reveals the role played by the percent called and the percent defaulted in the determination of levels of loss rates and of realized rates of return. On the other hand, the yield ultimately realized was found to be virtually independent of the yield promised at offering, and the loss rate was influenced by the promised yield to only a minor extent. To put the matter differently, over 90 percent of the variation in loss rates from one minor industry group to another can be "explained" (in the statistical sense) by differences in realized yields and only 10 percent by differences in promised yields. It follows that industry variations in loss rates are dominated by realized yields; and since the realized yields are substantially dependent upon the call and default experience of the issues within industry groups, the loss rates are similarly determined. Accurate estimation of loss rates would

therefore seem to pivot largely upon the accuracy with which one is able to forecast future interest rate changes (i.e. call premiums) and the business cycle (i.e. defaults).

Our records fail to reveal a close relationship between the default and loss experience of corporate bonds in minor industry groupings and the corresponding rates of long-term industrial growth. They do, however, provide some evidence in support of the belief that issues floated toward the end of major bull market swings have poorer records than those offered soon after deep depressions.

One of the most striking and at the same time most systematic findings reported in the chapter pertains to the behavior of issues in the default experience record. The experience of such issues in each of the major industry-size groups indicates that realized yields from offering to default were consistently below those from offering to extinguishment. Moreover, capital losses were general on bonds sold at default, whereas capital gains were equally general on bonds purchased at default and held to extinguishment. Thus, in the light of subsequent events, the policy followed by many regulatory authorities of encouraging financial intermediaries, such as savings banks and life insurance companies, to sell bonds promptly at default or to write them down to market proved more costly (or embarrassing) to the institutions involved than a more liberal policy would have been. Losses were greatest on the defaults of the thirties, but they occurred on earlier defaults as well.

The experience record, when analyzed for assumed four-year periods of investment and selected combinations of them, on the whole confirms what was observed for bonds held from offering to extinguishment. Over the longer chronological periods the realized rate of return was significantly affected by the default and call experience prevailing within the period. Over shorter periods, however, investor experience was governed by the particular set of market prices that happened to rule at the beginning and at the end of the period. We conclude that the successful short-term trader must forecast correctly short-term changes in capital values. For the long-term investor the principal problem is that of predicting default experience and major swings in basic yields. Later chapters will investigate the extent to which these crucial variables are related to various measures of bond quality.

LIFE-SPAN PERFORMANCE OF CORPORATE BONDS: THE COMPREHENSIVE RECORD

Our most global measures of investor experience on bonds purchased at offering and held to extinguishment are presented in Table 10, which shows average yields and loss rates for bonds in major groups. The averages were obtained by weighting the yields and loss rates for the individual offerings by the corresponding par amounts. Separate estimates are presented for regular and irregular offerings (see the third paragraph below), and the regular offerings are further classified into those that defaulted and those that were extinguished by contractual methods or were still in good standing at the end of the period studied (January 1, 1944). The first two sections of the table pertain to the large and small issues in the offerings experience sample, and the remaining sections to universe estimates obtained by adjusting the sample values for discrepancies among the sample and universe distributions of offerings by default status and method of extinguishment.

The weighted average promised yield to maturity on all large issues in the experience sample was 5.3 percent, as compared with a realized yield from offering to extinguishment of 5.4 percent. The difference, 5.3 percent less 5.4 percent, or −0.1 percent, indicates that investors actually received a higher rate of yield than was promised on such issues, in spite of the heavy default losses on corporate bonds in the thirties. In effect, a portfolio comprised of a representative sample of large straight corporate bonds offered during the period 1900–1943 showed capital gains through call premiums and market appreciation of issues still outstanding at the end of the period in excess of all losses on defaulted bonds, the net amount of the gain averaging 0.1 percent per annum (ten yield basis points) on the par amount of the offerings.

Equally large capital gains accrued on the 95 percent of all large offerings that were regular offerings, but the promised and realized yields on them, although quite attractive by recent standards, were somewhat lower than on the total. The breakdown of the par amount of regular offerings into the 13 percent paid at maturity, 37 percent called, 16 percent defaulted, and 29 percent still outstanding on January 1, 1944, reveals why net capital gains were obtained over the period. Realized yields necessarily equaled promised yields for bonds paid in full at maturity, so that losses were zero for that group. Losses of 3.5 percent per annum under

TABLE 10—Life-span Yields and Loss Rates on Offerings 1900–1943, by Default Status and Method of Extinguishment

| | REGULAR OFFERINGS | | | | | | | |
	All Offerings	Total	Paid in Full at Maturity	Called[a]	Outstanding Jan. 1, 1944 with No Prior Default[b]	Defaulted[c]	Irregular Offerings[a]	Total Par Amount (millions)
				Large Issues Sample				
Distribution of par amount	100.0%	95.0%	12.7%	36.8%	29.1%	16.4%	5.0%	$55,181.0
Promised yield	5.3	4.9	5.1	5.3	4.1	5.4	12.2	
Realized yield	5.4	5.0	5.1	6.5	4.7	1.9	13.1	
Loss rate	−0.1	−0.1	0.0	−1.2	−0.6	3.5	−0.9	
				Small Issues Sample				
Distribution of par amount	100.0	92.6	21.6	42.4	5.6	23.0	7.4	$1,006.2
Promised yield	6.3	5.8	5.4	6.1	4.4	6.1	12.5	
Realized yield	6.1	5.3	5.4	7.6	4.7	1.3	16.1	
Loss rate	0.2	0.5	0.0	−1.5	−0.3	4.8	−3.6	
			Large Issues Adjusted to Universe Totals					
Distribution of par amount	100.0	94.3	10.8	37.2	30.7	15.6	5.7	$56,619.2
Promised yield	5.3	4.9						
Realized yield	5.5	5.0						
Loss rate	−0.2	−0.1						

TABLE 10
(concluded)

	REGULAR OFFERINGS							Total Par Amount (millions)
All Offerings	*Total*	*Paid in Full at Maturity*	*Called*[a]	*Outstanding Jan. 1, 1944 with No Prior Default*[b]	*Defaulted*[c]	*Irregular Offerings*[d]		
Small Issues Adjusted to Universe Totals								
Distribution of par amount	100.0%	89.8%	16.0%	37.2%	8.0%	28.6%	10.2%	$14,924.7
Promised yield	6.5	5.8						
Realized yield	6.1	4.9						
Loss rate	0.4	0.9						
All Issues Adjusted to Universe Totals								
Distribution of par amount	100.0	93.3	11.8	37.2	26.1	18.2	6.7	$71,543.9
Promised yield	5.6	5.1	5.2	5.5	4.2	5.5	12.3	
Realized yield	5.6	5.0	5.2	6.7	4.7	1.8	13.7	
Loss rate	0.0	0.1	0.0	-1.2	-0.5	3.7	-1.4	

Yields and loss rates for large and small issues in the offerings experience sample are weighted averages with par amounts of included offerings as weights. Sample data are based on Tables 182, and 183 of *Statistical Measures*; distributions of universe data are from Table 6 (Chapter 1); estimated yields and loss rates for universe of straight corporate bonds were computed by weighting sample yields by universe distributions.

[a] Includes issues extinguished before maturity by other contractual methods as well as by call.

[b] Liquidation of these issues is assumed at prices prevailing in the first quarter of 1944. Experience on them may be eliminated from the totals by appropriate adjustment of weights.

[c] Includes issues defaulting 1900–1943, whether extinguished or outstanding January 1, 1944. In the latter case liquidation is assumed at prices prevailing in the first quarter of 1944.

[d] Issues offered by contract modification during corporate reorganizations, etc.

promised yields were suffered on defaulted bonds, as compared with somewhat smaller gains on the called bonds and those still outstanding in 1944. On the other hand, two-thirds of all offerings fell in the latter two groups, and gains on them more than offset losses on the 16 percent that defaulted.[1]

The irregular offerings (5 percent of the par-amount total for the sample of large straight issues) were principally contract modifications and exchanges growing out of the heavy corporate reorganizations of the late thirties and early forties. At the time they appeared they sold in a depressed market at substantial discounts, but the majority either had appreciated substantially by the end of the period studied or had previously been retired at a premium. Thus the promised and realized yields on irregular offerings alone reached the fantastically high levels of 12.2 and 13.1 per cent, respectively, and capital gains averaged out at 0.9 percent per annum.

Comparison of the yields and loss rates for the sample of small issues with the corresponding figures for the large issues sample reveals interesting similarities and differences. For both groups, the realized yields were highest on irregular offerings and called bonds, and lowest on defaulted issues and those outstanding in 1944. On the other hand, the promised yields on each class of small issues were above comparable yields on large issues, suggesting either that the smaller issues were offered in periods of high interest rates or that the market considered them to be somewhat riskier investments at date of offering than the large issues. As a matter of fact, Table 10 shows that the latter was borne out by experience, since the small issues had a higher proportion of defaults, and lower realized yields on defaulted issues, than the large issues. For issues that did not default, however, realized yields on small issues were either equal to or above the corresponding yields on large issues.

To examine this question further, and at the same time to obtain global estimates for all straight bonds, a further step was

[1] It is an interesting exercise to manipulate data of this type to determine the effect of contingencies of various types on the over-all loss rate. For example, since 16.4 percent of the large regular offerings defaulted with a loss rate of 3.5 percent, the contribution of defaulted issues to the over-all loss rate was 0.57 percent (16.4 percent of 3.5 percent). In later chapters, life-span default rates for issues in different quality classes are presented, as well as the corresponding loss rates on defaulted issues; if the reader desires, such data may be combined by multiplication to determine the contribution of defaults to the total loss rate for any particular class of issues.

ventured in Table 10 by adjusting and combining the sample values on the basis of universe totals. The estimates were obtained by weighting the yields in each of the two samples by the corresponding percentages from the universe distributions of offerings classified by default status and method of extinguishment, thus in effect correcting for discrepancies between the sample and universe distributions. The resulting estimates for all large offerings and for large regular offerings are very close to the unadjusted sample values; but owing to the increased weight given defaults, the small issues show substantially higher loss rates and lower realized yields for the regular offerings.

Comparison of the adjusted values for large and small issues shows that on the whole the small issues were undervalued at offering when regular and irregular offerings are combined. (The adjusted average realized yield for all small offerings was 6.1 percent as against 5.5 percent for all large.) On the other hand, the small regular offerings, which are the ones ordinarily acquired by institutional investors, appear on the whole to have been accurately priced in the market at offering. The yields on the regular offerings after adjustment to universe totals show that the higher promised yield on the small issues (5.8 versus 4.9 percent) was almost entirely offset by the high loss rate (0.9 versus —0.1 percent), so that the realized yield was nearly as high for the small issues as for the large (4.9 versus 5.0 percent). We shall return to this matter again in later sections of the report (see particularly Chapter 8) in an attempt to determine whether there is any consistency in the market's appraisal of large and small issues or whether the differences observed are ascribable simply to market conditions at the time of flotation.

It will be noted from the last section of Table 10 that the adjusted average realized yield for all offerings combined (large issues plus small issues; regular offerings plus irregular offerings) exactly equaled the average promised yield, so that the net loss rate was zero on the average for all issues offered in the period studied. On the other hand, small losses accrued on the regular offerings, which are the only ones ordinarily taken up by conservative investors. Allowing for that fact, for the slender size of the sample of small issues, and for the possible size of the sampling error, an annual accrual rate of about 0.1 percent would seem to be a fairly accurate estimate of the reserve that would have been required for all

straight issues floated between 1900 and 1944.[2] The record thus indicates an extremely high level of performance for domestic corporate bonds as a whole, considering the fact that the measures reflect the abnormally high default losses of the Great Depression. On the average and over the long pull, premiums on called bonds and market appreciation on outstanding issues were equal to losses on defaulted issues, so that investors obtained approximately the returns promised at offering. This of course does not mean that the market's valuation mechanism was perfect for each issue or for selected groups of issues: as we have seen, irregular offerings were undervalued by the market at offering, and possibly also the small issues. And as the next section indicates, the market has been subject to extreme aberrations in its valuation of bonds, depending upon the periods in which they were floated and extinguished. Nevertheless, the over-all record of corporate bonds offered in the forty-four-year period gives remarkable evidence of the resiliency and long-run stability of this class of investments.

Comparisons by Period of Offering and of Extinguishment

Like most global estimates the materials presented thus far gloss over important differences within the aggregates. The promised yields on corporate bonds are of course influenced by the general tenor of the market at the time of offering as well as by the quality, marketability, and various other characteristics of individual issues. Realized yields and loss rates reflect such factors as well, and, in addition, the entire set of economic forces impinging upon the bond market and the issuing corporations up to and including the time of extinguishment. As Tables 7 and 8 of the preceding chapter have indicated, such factors have fluctuated violently during the forty-four years studied. To hold them constant, in order to examine the influence of the economic environment on corporate bond behavior, it is necessary to group investments into fairly long but roughly homogeneous periods by date of offering and of extinguishment.

[2] A loss rate of 0.1 percent would, of course, be too high for some periods and not high enough for others. The reader may well wonder to what extent the level of performance depends on the year in which the record begins and terminates. Computations from Table 11 show that if only issues offered and extinguished before 1944 are included, the gain rate of 0.1 percent for all large issues changes to a loss rate of the same amount. On the other hand, it becomes a gain rate of 0.2 percent if only offerings and extinguishments before 1932 are included.

TABLE 11—Life-span Yields and Loss Rates, and Percents Called and Defaulted, 1900–1943, by Selected Periods of Offering and of Extinguishment

(large issues only)

PERIOD		*Prom-ised Yield*	*Real-ized Yield*	*Loss Rate*	*Percent Called*[a]	*Percent Defaulted*	*Total Par Amount (millions)*
Offered	*Extinguished*						
Major Periods							
Total	Total	5.3%	5.4%	−0.1%	38.7	17.3	$55,181.0
Out. 1900 or 1944		4.8	5.2	−0.4	1.1	16.5	22,550.7
1900–1943	1900–1943	5.6	5.5	0.1	63.9	17.8	32,630.3
Out. 1900	1900–1943	4.3	4.1	0.2	10.1	35.1	2,281.1
1900–1931	1900–1931	6.2	6.4	−0.2	49.9	17.2	12,904.9
1900–1931	1932–1943	5.4	4.6	0.8	65.4	23.1	14,613.9
1932–1943	1932–1943	4.9	6.0	−1.1	95.1	3.6	5,111.5
Before 1944	Out. 1944	4.8	5.3	−0.5	0.0	14.2	20,269.6
Minor Periods							
Out. 1900	1900–1931	4.2	4.1	0.1	9.0	28.3	1,595.1
Out. 1900	1932–1943	4.4	4.1	0.3	12.8	50.8	686.0
1900–1909	1900–1931	5.0	4.5	0.5	21.4	33.6	3,575.7
1910–1919	1910–1931	6.3	5.7	0.6	30.3	18.8	4,195.7
1920–1931	1920–1931	6.9	8.3	−1.4	84.5	4.7	5,133.5
1900–1909	1932–1943	4.6	4.4	0.2	26.2	27.1	995.5
1910–1919	1932–1943	5.2	5.1	0.1	45.6	26.4	1,921.1
1920–1931	1932–1943	5.5	4.6	0.9	72.0	22.2	11,697.3
1932–1939	1932–1939	6.4	7.7	−1.3	90.9	5.8	1,964.2
1932–1939	1940–1943	4.0	5.0	−1.0	97.4	2.4	2,992.7
1940–1943	1940–1943	3.4	5.1	−1.7	100.0	0.0	154.6
Out. 1900	Out. 1944	4.1	3.9	0.2	0.0	25.1	1,511.1
1900–1909	Out. 1944	4.4	4.1	0.3	0.0	30.1	1,809.1
1910–1919	Out. 1944	4.9	4.1	0.8	0.0	33.3	1,818.3
1920–1931	Out. 1944	5.3	3.7	1.6	0.0	23.6	5,365.2
1932–1939	Out. 1944	5.3	6.4	−1.1	0.0	0.3	6,106.3
1940–1943	Out. 1944	3.9	7.7	−3.8	0.0	0.0	3,659.6

Out. = Outstanding.

Data, based on Tables 182 and 183 of *Statistical Measures*, and on special tabulations, cover large issues in the offerings experience sample, except that par amounts of irregular offerings (made during corporate reorganizations etc.) were excluded before computing the percents called and defaulted. Yields and loss rates are weighted averages with par amounts of included offerings as weights.

[a] Includes issues extinguished before maturity by other contractual methods as well as by call.

One such grouping is set forth in Table 11, which presents yields and loss rates for the large straight issues in the experience sample classified by selected major and minor periods of offering and extinguishment. When studying the table it is well to keep in mind the following schedule of the principal characteristics of the bond market during the period covered:

January 1, 1900: A time of extremely low interest rates; relatively few outstanding issues had call provisions.

January 1, 1900–December 31, 1909: A period of low but rising interest rates; relatively few calls and defaults.

January 1, 1910–December 31, 1919: A period of high and rising interest rates, with bond yields reaching a crest toward the end of the period; few calls and few defaults.

January 1, 1920–December 31, 1931: A period of relatively high interest rates, with bond yields falling abruptly from abnormally high levels at the beginning of the period, then drifting gently downward during the middle and late twenties, and rising abruptly again at the end of the period; as interest rates drifted downward and the stock market boomed, the volume of issues called and extinguished from the proceeds of stock offerings grew; defaults on corporate issues rose sharply toward the very end of the period.

January 1, 1932–December 31, 1939: A period of rapidly falling interest rates, with extremely heavy defaults on the lower-grade issues and heavy calls and refundings of the better grades.

January 1, 1940–December 31, 1943: A period of low and stable interest rates, the result of the wartime pegging; a second large wave of refundings, and a reduced volume of defaults.

To divide the offerings into the minor periods presented in the table, they were first grouped by offerings dates into the periods indicated, and were then further classified on the basis of whether or not the issue was extinguished before or after January 1, 1932. That date makes a convenient benchmark for the classification of extinguishments, since it marks the end of an era of moderate defaults and refundings, and the beginning of a period in which defaults and refundings were extremely heavy. Since we wish to compare the experience of bonds extinguished before and after the beginning of World War II, offerings in 1932–39 were further classified according to whether the issue was extinguished before or

after January 1, 1940. Finally, weighted average yields and loss rates were calculated for the minor periods and for selected longer periods. Similar measures for other long periods can be obtained from the table by combining minor-period data weighted by the relevant par amounts.

The yields for all large corporate issues are reproduced in the first line of Table 11; they reflect the experience on all issues outstanding January 1, 1900 or January 1, 1944, as well as issues offered and extinguished between these dates. Since many large institutional investors enter the secondary bond market infrequently, the assumption of purchase of outstanding issues at the beginning of the period and of liquidation at the end is not entirely appropriate for them, and we therefore show the two groups separately in the next two lines of the table. Issues outstanding in 1900 or 1944 carried somewhat lower promised and realized yields than those offered and extinguished in the intervening years, and capital gains on them were quite high (0.4 percent per annum), principally because of the market appreciation of issues outstanding in 1944. Since the amount outstanding on one or the other of these dates was roughly two-fifths of the total par amount in the large issues sample, their inclusion had a small but important effect on the aggregate loss rate. When they are excluded the loss rate rises from —0.1 percent (inferring capital gains) to 0.1 percent (inferring capital losses). The implication would seem to be that investors who are unable to take advantage of market appreciation on outstanding issues (but are required by statute to write securities down to market under certain circumstances) would require somewhat higher loss reserves than those needed by investors generally.[3] So far as can be judged from the record before us, a reserve accumulated at the rate of 0.1 percent on book value would have been adequate to take care of default losses on large issues offered and extinguished within the period studied.

Examination of the first column of Table 11 shows that on the whole yields promised at offering followed the average pattern of yields on issues outstanding in the market (see also Table 12, which compares promised yields at offering with those on high-grade outstandings). Promised yields were quite low on issues outstanding in 1900, rose with the general level of money rates through the period ending in 1931, and then fell to extremely low levels during the last period shown. Realized yields, which are

[3] Life insurance companies, for example, are required by law to carry defaulted bonds and those rated "below grade" at market. Cf. pages 145 f.

equal to promised yields only for issues paid in full at maturity, departed rather markedly from promised yields in most periods, running above them when a large proportion of the par-amount total was extinguished by call, and falling below them in periods of heavy defaults. The loss rates, or differences between the promised and realized yields, also reflect differences in call and default experience.

Realized yields and loss rates for the major periods into which the data are divided show successive periods of good and bad experience. Issues outstanding at the beginning of the century were selling at high prices (low yields), few had call provisions, and relatively few of the callable issues were actually called during the subsequent period of rising rates of interest. (Note, however, the slight rise in the percent called for such of these issues as were extinguished during the period of falling interest rates after 1932.) In addition, many of the issues outstanding in 1900 were rail issues, which defaulted heavily during the Great Depression. As a result, realized yields fell below the already low level of yields promised at the beginning of the century, and capital losses resulted.

On the whole, bonds that were both offered and extinguished before the Great Depression had a favorable experience record (an average promised yield of 6.2 percent, a realized yield of 6.4 percent, and a capital gain rate of 0.2 percent). It will be noted that the record was particularly good for bonds offered and extinguished in the twenties. Many of them were initially offered at the high rates prevailing at the beginning of the decade, and were subsequently called and refunded with the proceeds from stock offerings. Moreover, few bonds offered during the twenties went into default before 1931. It follows that investors who purchased these securities obtained sizable premiums above the ample yields promised at offering.

In sharp contrast with bonds offered and extinguished before 1932, the record is particularly unfavorable for bonds floated before 1932 that were subject to the heavy default risks of the Great Depression (an average promised yield of 5.4 percent, a realized yield of 4.6 percent, and a loss rate of 0.8 percent). Although a substantial proportion of the par-amount total was called in the late thirties, call premiums were not sufficient to offset heavy losses on issues going into default. Loss rates were particularly high for bonds offered in the twenties and still outstanding in 1931, subject

to the acid test of the Great Depression. The record becomes quite favorable again on bonds offered during the thirties. Many of the issues floated after 1931 were called before January 1, 1944, were refunded into new issues, and the latter had reached substantial premiums in the market by the end of the period studied. As we have seen, issues offered at substantial discounts during the re-organizations of the thirties (the irregular offerings of Table 10) also sold up as earnings coverage improved during the early war years. In consequence of these developments, the realized rates of return on bonds floated after 1931 were considerably above the yields promised at offering, and large captial gains resulted.

One of the most interesting implications of Table 11 is the loose relationship between yields promised at offering and yields real-ized on bonds offered and extinguished in selected periods. The matter is approached in a slightly different way in Table 12, which shows promised and realized yields for large issues grouped by period of offering, irrespective of the date of extinguishment. As the table indicates, promised yields for large issues (whether in-clusive or exclusive of those still outstanding January 1, 1944) rose and fell over the decades with the basic market yields on high-grade bonds. The risk premiums or spreads between the average promised yields and the market yields on high grades, it is true, fluctuated somewhat with the changing climate of the market. Thus for all issues the average risk premium was 0.5 percent in 1900–1909, over 1.3 percent under the disorganized conditions of the 1932–39 period, and about 1 percent for the other periods. Nevertheless, general trends in promised yields were roughly similar to those in basic market yields.

Realized yields, however, were closely dependent upon subse-quent default and call experience (compare the percents called and defaulted in Table 11 with the realized rates of return) as well as upon the particular prices or yields prevailing at the time of flotation. Table 12 shows the life-span realized yields for all issues regularly increasing from one period of offering to the next, but this is principally the result of the large proportion of bonds offered in the thirties and forties that were still outstanding and selling at premiums in the market in 1944. When outstand-ing issues are eliminated, the realized yields show a somewhat closer relationship to basic market yields at offering. In fact, as the classical theory of investment values might lead us to expect (a matter to be enlarged upon below), the realized yields were

TABLE 12—Life-span Yields and Loss Rates on All Large Issues, and Market Yields on High Grades, 1900–1943, by Selected Periods of Offering

PERIOD OF OFFERING	ALL LARGE ISSUES				LARGE ISSUES EXTINGUISHED BY January 1, 1944				MARKET YIELDS ON HIGH-GRADE BONDS WEIGHTED BY	
	Promised Yield	*Realized Yield*	*Loss Rate*	*Total Par Amount (millions)*	*Promised Yield*	*Realized Yield*	*Loss Rate*	*Total Par Amount (millions)*	*Outstandings*	*Offerings*
Out. 1900	4.2%	4.0%	0.2%	$3,792.2	4.3%	4.1%	0.2%	$2,281.1	4.2%	4.2%
1900–1909	4.8	4.4	0.4	6,380.3	4.9	4.5	0.4	4,571.2	4.3	4.3
1910–1919	5.7	5.2	0.5	7,935.1	6.0	5.5	0.5	6,116.8	4.8	4.7
1920–1931	5.8	5.2	0.6	22,196.0	5.9	5.7	0.2	16,830.8	5.0	4.9
1932–1939	5.1	6.3	−1.2	11,063.2	5.0	6.1	−1.1	4,956.9	3.8	3.5
1940–1943	3.9	7.6	−3.7	3,814.2	3.4	5.1	−1.7	154.6	2.9	2.9

Out. = Outstanding.

Data (except on market yields) cover large issues in the offerings experience sample; yields and loss rates, based on Table 182 of *Statistical Measures*, are weighted averages with par amounts of included offerings as weights. Market yields on high-grade bonds were obtained by weighting Standard and Poor's indexes for rails, utilities, and industrials by corresponding par amounts of outstandings or offerings as given in *Volume of Financing*, Table A-2.

closer to the basic yields in the decades through the twenties than were the promised yields; but, contrary to that theory, they were further from the basic yields in the thirties and early forties. The reason is that of the offerings made in the first two decades (a period of rising interest rates) about 45 percent of the issues, by par amount, were extinguished by payment in full at maturity, while on the remainder call premiums just failed to match default losses, so that small capital losses occurred. Bonds offered in the twenties and later were frequently called but less frequently paid at maturity or defaulted. Losses on offerings in the twenties that later defaulted (bonds representing 17 percent of the par amount offered then and extinguished before 1944) more than offset the premiums on those that were called (76 percent), so that again there was a small net capital loss on such offerings. Up through the twenties, therefore, the realized yields were closer to the basic rates on high grades than were the promised yields. On the other hand, substantial capital gains occurred on bonds offered and extinguished in the thirties and early forties, and even higher capital gains occurred if offerings still outstanding in 1944 are included. Toward the close of the period studied, therefore, realized yields pulled away from the basic rates, and rose above the promised yields. It would appear, then, that realized yields are influenced by basic yields at offering but that in some periods the relationship is a loose one, owing to call premiums and default losses.

All of this may perhaps be generalized into the following important tentative conclusions: During periods of rising interest rates few issues are called, many are paid off at maturity, and though realized yields may rise with money rates, call premiums may be insufficient to offset default losses, and substantial capital losses may result. In periods of falling money rates the reverse appears to be true: few issues are paid off at maturity, many are called, and even though default losses may be substantial, call premiums may be more than sufficient to offset them, and capital gains may occur.

The failure to detect a closer relationship between basic yields on high-grade investments and realized rates of return would appear to raise questions of some importance for economic and actuarial theory. According to the classical theory of investment values, as expressed for example by Alfred Marshall, the promised yield at offering (aside from minor cost and marketability con-

siderations) is compounded of the basic riskless rental rate on high-grade securities outstanding at the time (roughly, high-grade bond yields) and a risk premium judged to be adequate, on the average, to take account of default losses, call premiums, etc.[4] Aside from statistical disturbances and errors of forecast, therefore, both the promised and realized yield should be related to basic money rates, the realized yield on the average being equal to the basic money rate, and the promised yield to the basic rate plus a risk premium, assuming of course that investors at offering have some notion of the risk of default, etc. The data of Table 12 suggest that promised yields at offering do in fact contain a common basic interest component as the theory would indicate. On the other hand the averages shown in the table, which appear to cover periods broad enough to damp out the effects of most random aberrations, reveal that the realized yields on the whole exceeded the rates promised on the best grades of bonds offered. Moreover, in the later years realized yields even exceeded the gross returns promised on all straight bond investments at offering.[5] More detailed data covering shorter periods, to be published in *Statistical Measures,* also fail to reveal a persistent and stable relationship between basic rates and realized returns. The practical implications of this finding may be rather far-reaching, particularly when it is recalled that the capitalization rates normally used for ordinary business purposes are geared to the yields ruling on the best grades of bonds outstanding in the market.[6]

[4] See the discussion of the difference between gross and net interest in his *Principles of Economics* (London, 1930), pp. 588 ff.

[5] Realized yields would doubtless be more closely related to basic yields on high grades outstanding at the time of flotation of the original issues if it could be assumed that successor securities (refunding issues for bonds extinguished by call; issues received during corporate reorganizations for bonds extinguished following default) had the same maturity dates as those of the original issues. Such, however, is seldom the case in practice. Fully one-fifth of the defaulted issues were settled by exchange on some date later than that of the original issue. Similarly, most refunding issues had a maturity date later than that of the original issue.

[6] Yields used by actuaries in computing insurance premiums and reserves provide an interesting example. These yields, while conservative, tend to follow current accounting estimates of earnings, which are in turn related to promised rather than to realized rates of return. Since the volume of investments already on the books of most life insurance companies is large as compared with the volume of new investments over a year or even a span of several years, there is, of course, a considerable lag in company earnings behind promised yields on new investments. Because insurance policies are long-term contracts and a possible long-run adverse movement in promised yields must be guarded against, it is usual practice to set the assumed yield well below the yield shown

Comparisons by Major and Minor Industry Group

Aggregate measures of investor experience on bonds offered by obligors in major industry groups are presented in Table 13, and similar materials for the minor components are given in Table 14. The promised and realized yields of the first table are conservative estimates since the higher yielding small issues are excluded, along with irregular offerings and issues still outstanding on January 1, 1944. Table 14 also covers only large issues; but, to obtain the largest samples possible for the minor industry components, the irregular offerings are included. If desired, yields and loss rates for the minor groups may be combined by weighting to obtain broader groupings comparable to those of Table 13.

Of the three major industry groups covered by our records, the railroads turned in by far the poorest performance. Since many of the rails were offered in the early part of the century when interest rates were low, and since they were judged in that period to be high grade by most investors, their weighted average promised yield at offering was the lowest of the three major groups (4.9 percent, as against 5.3 percent for utilities, and 5.6 percent for industrials). Moreover, a relatively large proportion, by volume, subsequently went into default, and a relatively small proportion was called, so that the average realized yield on rail bonds also fell well below the others (4.4 percent, as against 5.5 percent for utilities and 6.0 percent for industrials). Since default losses on large rail offerings outweighed call premiums, a substantial loss rate of 0.5 percent was recorded.

Large industrials exhibited the best record of the three major groups. Industrial bonds were first offered in large volume during the early twenties, when interest rates were unusually high, and many issues were shortly retired from proceeds of stock offerings; others were later called and refunded at the low interest rates prevailing in the thirties. In consequence, the proportion of industrials called was high; call premiums outweighed default losses; and realized yields rose above the yields promised at offering. On the whole, investors enjoyed substantial capital gains on their industrial holdings (an average capital gain rate of 0.4 percent per annum).

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as earned on the company's books. The absence of a close relationship between realized yields and promised yields provides further evidence of the need for conservatism in selecting the assumed interest rate for actuarial calculations of insurance premiums and reserves.

TABLE 13—Life-span Yields and Loss Rates for Issues Paid at Maturity, Called, and Defaulted, 1900–1943
(*large issues only*)

	Regular Offerings of Large Issues	*By Payment in Full at Maturity*	*By Call*[a]	*After Default*	*Total Par Amount (millions)*
		EXTINGUISHED			
	Distribution of Par Amount				
All industries	100.0%	20.8%	60.2%	19.0%	$33,734.2
Railroads	100.0	44.9	27.1	28.0	8,870.2
Public utilities	100.0	13.9	71.5	14.6	14,554.2
Street railways	100.0	21.5	11.4	67.1	1,311.1
All others	100.0	13.1	77.5	9.4	13,243.1
Industrials	100.0	9.8	72.8	17.4	10,309.8
	Promised Yield				
All industries	5.3	5.1	5.3	5.6	
Railroads	4.9	4.8	5.1	4.9	
Public utilities	5.3	5.4	5.2	5.7	
Street railways	5.5	5.4	7.4	5.2	
All others	5.3	5.4	5.2	6.0	
Industrials	5.6	5.9	5.4	6.4	
	Realized Yield				
All industries	5.4	5.1	6.5	2.1	
Railroads	4.4	4.8	6.1	2.3	
Public utilities	5.5	5.4	6.4	1.4	
Street railways	4.2	5.4	8.9	3.1	
All others	5.6	5.4	6.3	0.2	
Industrials	6.0	5.9	6.9	2.6	
	Loss Rate				
All industries	−0.1	0.0	−1.2	3.5	
Railroads	0.5	0.0	−1.0	2.6	
Public utilities	−0.2	0.0	−1.2	4.3	
Street railways	1.3	0.0	−1.5	2.1	
All others	−0.3	0.0	−1.1	5.8	
Industrials	−0.4	0.0	−1.5	3.8	

Data, based on Table 183 of *Statistical Measures* and special supplementary tabulations, cover large issues in the offerings experience sample, except that irregular offerings (made during corporate reorganizations, etc.) and issues outstanding January 1, 1944 are excluded. Outstandings January 1, 1900 are included. Yields and loss rates are weighted averages with par amounts of included offerings as weights.

[a] Includes issues extinguished before maturity by other contractual methods as well as by call.

The utilities occupy a position intermediate between the rails and industrials with respect to both promised and realized yields. Utility bonds were offered in volume somewhat later than the rails but earlier than the industrials, and during a period when interest rates were rising but still low as compared with the extremely high levels of the twenties. Hence, the average yield at which utilities were floated falls between that of the industrials and rails. Moreover, an unusually large proportion of the paramount total of utility bonds was subsequently called and refunded at the low interest rates prevailing in the thirties, and a relatively small proportion went into default. Thus the capital gains obtained on utility investments were substantial. As Table 13 indicates, the result would have been better except for the very poor record of street railways. Since some 67 percent of the offerings of that group defaulted, realized yields fell substantially below promised returns, and large losses resulted. When street railways are excluded from the utility group, the average realized yield rises and the capital gain rate becomes almost as high as that for industrials.

One of the surprises of Table 13 is the exceptionally poor performance of the small group of utility bonds (exclusive of street railways) that defaulted (a realized yield of only 0.2 percent, and a loss rate of 5.8 percent). These were mainly issues in our group "electric including other services." The chief offenders were systems operating street railways as well as generating and distributing electricity, and pyramided utility holding companies. (For the experience of the holding companies, cf. Chapter 7.) For most utilities during the twentieth century earnings were stable or expanding, and fixed charges were well covered, so that little difficulty was encountered in servicing and refunding the debt. However, for the 9.4 percent of offerings of utility bonds (exclusive of street railways) that went into default, the salvage value of the investment appears to have been quite meager, as judged by the low realized returns and large capital losses.

Table 14, and Chart 3 which is based on it, permit us to take a closer look at the performance of bonds offered by obligors in the minor industry divisions. As measured by realized yields and loss rates, stone, clay, and glass; machinery (except electrical); tobacco; and mining had the best performance (realized yields of 7.6 percent or above, and capital gains of 1.6 percent or better). Transportation equipment (except automobiles) and the forest products

TABLE 14—Life-span Yields and Loss Rates, and Percents
Called and Defaulted, for Offerings 1900–1943, by Minor
Industry Group
(large issues only)

INDUSTRIES (ranked by realized yield)	*Promised Yield*	*Realized Yield*	*Loss Rate*	EXTINGUISHED		*Total Par Amount (millions)*
				By Call[a]	*After Default*	
Stone, clay, glass*	5.2%	10.7%	−5.5%	80.0%	18.1%	$97.6
Machinery (except electrical)*	5.2	10.0	−4.8	77.7	19.6	204.4
Tobacco*	6.2	8.6	−2.4	31.4	62.1	406.1
Mining**	6.0	7.6	−1.6	66.1	20.4	1,199.9
Printing and pub-lishing*	6.4	7.2	−0.8	61.5	18.3	51.5
Rubber*	5.9	6.7	−0.8	73.4	14.4	536.0
Automobiles*	7.8	6.7	1.1	66.8	20.1	153.4
Electrical machinery*	5.9	6.7	−0.8	81.1	4.1	269.5
Leather*	5.9	6.5	−0.6	31.0	0.0	80.7
Nonferrous metals*	5.4	6.1	−0.7	84.8	0.0	290.1
Electric excluding other services++	5.2	6.0	−0.8	85.0	2.4	2,232.7
Petroleum and coal prod.*	5.4	5.9	−0.5	91.7	3.6	2,099.3
Food and kindred prod.*	6.4	5.8	0.6	76.4	15.4	946.2
Communication++	5.1	5.7	−0.6	65.1	2.8	1,998.7
Electric including other services++	5.5	5.7	−0.2	80.8	11.0	7,776.3
Trade**	5.6	5.6	0.0	78.1	13.6	656.5
Iron and steel*	5.2	5.6	−0.4	80.0	8.1	1,954.1
Chemicals*	6.2	5.5	0.7	59.1	26.8	283.3
Miscellaneous utilities++	5.8	5.5	0.3	58.9	28.0	703.4
Textiles*	5.9	5.5	0.4	66.6	26.2	241.5
Paper*	5.8	5.4	0.4	73.3	24.6	256.3
Gas++	5.3	5.3	0.0	71.2	15.2	782.6
Railroad services+	4.8	5.2	−0.4	70.6	10.7	282.5
Railroads (passenger and freight)+	5.4	4.6	0.8	25.6	28.5	9,101.3
Street railways++	6.7	4.4	2.3	11.4	67.2	1,529.8
Agriculture**	6.4	4.1	2.3	26.3	49.9	75.9
Service industries**	5.9	3.4	2.5	31.4	56.0	402.2
Transportation equip-ment (except automobiles)*	7.5	2.8	4.7	12.1	71.8	62.0
Lumber*	6.5	2.6	3.9	0.0	100.0	40.3
Furniture*	5.6	−0.8	6.4	26.5	73.6	136.0

+ Rail group   * Manufacturing
++ Public utilities group   ** Nonmanufacturing industrial

(footnotes on next page)

industries (lumber and furniture) stood at the bottom of the list. Generally speaking, industries in the group with better than average realized yields had lower than average default rates and higher than average call rates; the converse relationships held for industries with poorer than average realized yields.

TABLE 15—Correlation Coefficients for Calls and Defaults with Life-span Yields and Loss Rates, 1900–1943

	Promised Yield	Realized Yield	Loss Rate
	Rank Coefficient		
Percent called	−0.56	+0.54	−0.60
Percent defaulted	+0.55	−0.51	+0.62
	Product-moment Coefficient		
Percent called	−0.49	+0.55	−0.64
Percent defaulted	+0.50	−0.55	+0.64

Based on average experience of minor industry groups, Table 14. All the above coefficients are statistically significant; that is, coefficients of this size or larger would be obtained by chance in less than five out of a hundred trials if drawn from a population in which the variables were uncorrelated.

The influence of calls and defaults on bond yields and loss rates has been summarized by means of correlation coefficients in Table 15, the coefficients measuring the strength of the covariation between the pairs of variables indicated in the stub and caption. The coefficients were computed from the data of Table 14, and thus summarize the relationships among the yield averages for the various minor industry groups and the corresponding percentages of offerings that were called or defaulted.

All of the coefficients in the table are significant in the statistical sense. As has been indicated, high default rates generally imply

Footnotes to Table 14

Data, based on Tables 212 and 213 of *Statistical Measures* and special supplementary tabulations, cover large issues in the offerings experience sample, except that issues outstanding January 1, 1944 are excluded throughout, and par amounts of irregular offerings (made during corporate reorganizations, etc.) were excluded before computing the percents called and defaulted. Outstandings January 1, 1900 are included. Yields and loss rates are weighted averages with par amounts of included offerings as weights. Yield averages are based on five or more issues; industry groups omitted because not meeting this criterion are apparel, construction, and miscellaneous manufacturing.

a Includes issues extinguished before maturity by other contractual methods as well as by call.

CHART 3—Life-span Yields on Bonds Offered 1900-1943, by Minor Industry Group
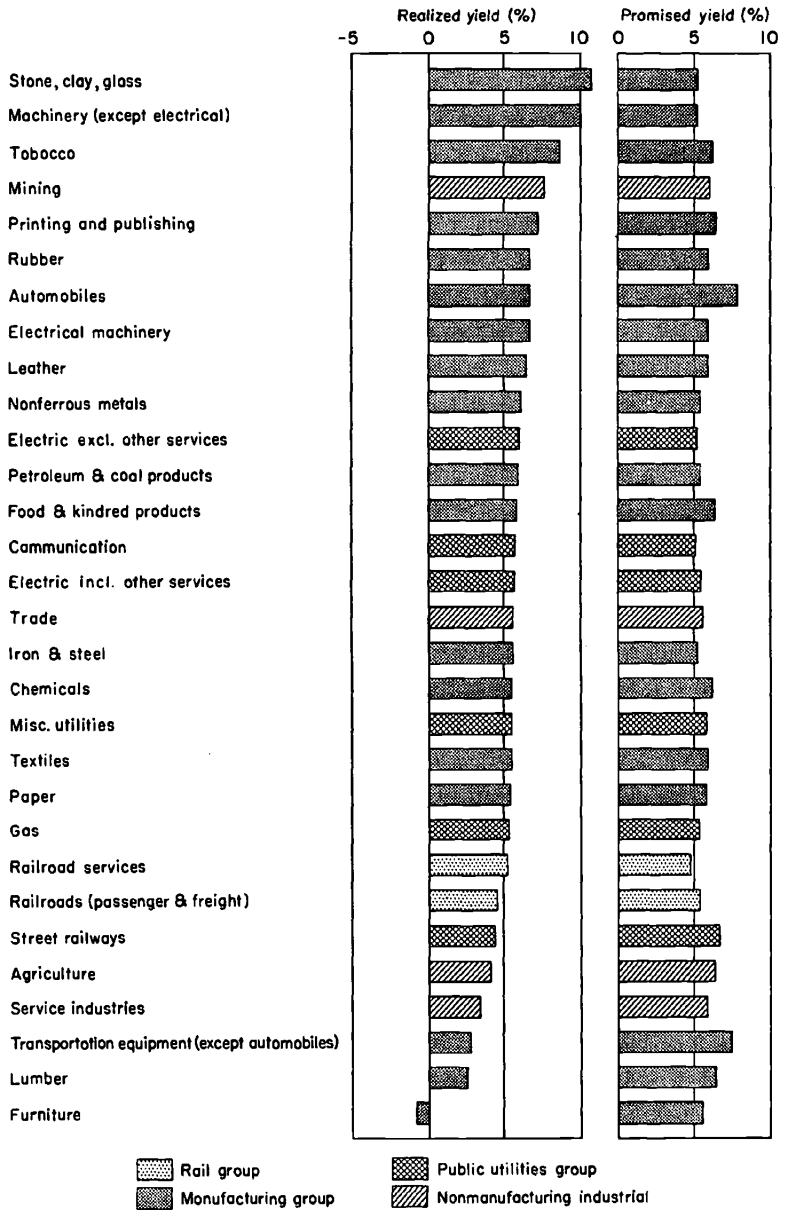
From Table 14. Yields are weighted averages with par amounts of the included offerings as weights.

low realized yields and high loss rates, while high call rates imply the reverse.[7] So far as interindustry variations are concerned, the market appears also to have appraised correctly the risks of default. Despite differences among minor industries in the timing of flotations and associated differences in basic money rates, the positive correlation between the yield promised at offering and the percent subsequently defaulting suggests that risk premiums in yield were on the whole greater, the greater the risk of default. The significant negative correlation between the yield promised at offering and the percent subsequently called is perhaps surprising in view of the large volume of high-coupon bonds called in the thirties. Since corporate bonds are usually floated near par, high coupon rates usually imply high promised yields at offering. The reason for the negative correlation is the factor of quality, or the size of the risk premium included in the promised yield. Over the years, industries with particularly high promised yields (large risk premiums) generally had higher default rates and lower call rates than industries with lower promised yields (see also Chapter 5).

[7] Despite the statistical significance of the correlation coefficients in Table 15, it would be a mistake to infer that the mere incidence of default and of call in particular industry groups is sufficient to explain all, or even most, of the variation in the loss rate. Only about 45 percent of the total interindustry variation in loss rates is "explained" by the call and default rates jointly (the square of the multiple correlation coefficient of 0.67 between loss rates, default rates, and call rates), leaving 55 percent to be explained by industry differences in the size of call premiums, default losses, etc.

It is of interest to note also that either the default rate or the call rate taken separately accounts for approximately as much of the total variation in the loss rate as do the two taken jointly (41 percent for each variable separately as against 45 percent for the pair). The reason is the extremely high intercorrelation between default and call rates (−0.85), which is in turn caused by the fact that interindustry differences in the percent of bonds paid in full at maturity are quite small, and that this percent plus the percents called and defaulted exhaust the possibilities for each group (they sum to 100 percent). The call rate is therefore virtually the complement of the default rate. In short, a high call rate for an industry group suggests a correspondingly small loss rate, both because the call premiums are reflected in the realized yields and because the incidence of default is thereby reduced. Conversely, a high default rate suggests few calls, and call premiums insufficient to offset default losses.

A purely logical consequence of the fact that the percentages of offerings extinguished by call, by payment in full at maturity, and by noncontractual methods after default sum to 100 percent is that any pair of these variables is as efficient as any other in explaining the total variation in the loss rate; similarly, the three variables jointly are no more efficient than any pair. (That is to say, each of the three-variable multiple correlation coefficients is identically equal to the four-variable coefficient.)

By definition, the promised yield, realized yield, and loss rate are joined in an accounting identity, the loss rate being simply the algebraic difference between the promised and realized yields. Thus if the investor is interested in estimating the realized yield he will receive if he purchases new bonds at offering and holds them to extinguishment, he must consider the influence of the promised yield and of the loss rate on the realized yield. If, on the other hand, he is attempting to set up a loss reserve for corporate bonds, it would be helpful if he knew whether the promised yield or the realized yield had the greater influence on the loss rate.

TABLE 16—Correlation Coefficients and Variance Ratios for Promised Yields, Realized Yields, and Loss Rates over Life Span of Bonds Offered 1900–1943

	Rank Coefficient	*Product-moment Coefficient*	*Ratio of Variances*[b]
Promised yield and loss rate	+0.43[a]	+0.46[a]	12.2[c]
Realized yield and loss rate	−0.87[a]	−0.96[a]	1.2
Promised yield and realized yield	−0.10	−0.20	10.0[c]

Based on average experience of minor industry groups, Table 14. For definitions of the above measures, see any standard statistical text. The test of significance for the rank coefficients is that given by M. G. Kendall, S. F. H. Kendall, and B. B. Smith in "The Distribution of Spearman's coefficient of Rank Correlation in a Universe in Which All Rankings Occur an Equal Number of Times," *Biometrika*, Vol. XXX, 1939, pp. 251–73. For a joint test of the product-moment coefficients and variance ratios for variables joined by an accounting identity, see *Volume of Financing*, pp. 82–90.

[a] Coefficients of this size or larger would be obtained by chance in less than five out of a hundred trials if drawn from a population in which the variables were uncorrelated.

[b] Ratio of variance of second variable in stub to first variable. The variances are: promised yield, 0.445 percent; realized yield, 4.445 percent; and loss rate, 5.439 percent.

[c] A ratio of this size or larger would be obtained by chance in less than five out of a hundred trials if drawn from a population in which the variables had equal variances.

Some evidence bearing on this matter is presented in Table 16, which shows the correlation coefficients for yields and loss rates computed from the minor industry averages of Table 14. The table shows that the market predicted loss rates with some degree of accuracy but not realized yield (the positive correlation co-

efficients between promised yield and loss rate are significantly different from zero, but the negative coefficients between promised yield and realized yield are too low to be statistically significant).[8] The coefficients show high negative correlation of the realized yield and loss rate, so that whichever of them is considered to be the dependent variable, it is dominated by the other.

Whenever a variable (such as the loss rate) is defined as the difference between two variable components (in the present case, the promised and realized yields), it will necessarily be dominated by the component with the greater variation, unless the two components are highly correlated.[9] Since the variance of the realized yield is ten times that of the promised yield, and the promised and realized yields are virtually independent of one another, the loss rate is largely determined by the realized yield. On the assumption of complete independence of components, approximately ten-elevenths (91 percent) of the variance in loss rates among minor industry groups may be attributed to the realized yield and only one-eleventh (9 percent) to the promised yield.[10] It follows that the loss rate is dominated by the realized yield (or the realized yield by the loss rate). Moreover, since the realized yield is substantially dependent upon the subsequent call and default experience of the issues, the loss rate is similarly determined. These conclusions are rather negative for those who might attempt to set up loss reserves, given only a knowledge of the promised yields at offering. Fortunately, as we shall find in later chapters, other variables more closely related to quality than promised yields provide better bases for estimating realized yields and establishing loss reserves.

One further point is of interest in connection with the yield and default data for the industry groups. From a cursory examination of the major industry groupings, it might be surmised that

[8] The absence of a close relationship between contract interest rates on mortgage loans and realized yields has also been noted by R. J. Saulnier. See his Introduction to J. E. Morton's *Urban Mortgage Lending: Comparative Markets and Experience* (Princeton University Press for the National Bureau of Economic Research, 1956).

[9] See *Volume of Financing*, pp. 82-90, for a full explanation.

[10] Since the sample product-moment correlation coefficient for the promised and realized yields is only —0.20, roughly the same conclusion is obtained by calculating "coefficients of determination" or squares of the correlation coefficients for the loss rates and realized yields, and for the loss rates and the promised yields. These are 92 and 21 percent, respectively, the sum exceeding 100 percent because of the low intercorrelation of the component variables.

industries that enjoyed the most rapid expansion during the past half century were the ones having the lowest default and loss rates and the highest realized yields. The public utilities, with the exception of the street railways, enjoyed an exceptional growth in output, expanding almost as rapidly as the manufacturing industries, and both groups on the whole had favorable yield and loss experience. The street railways, on the other hand, are typical of a declining industry, and the railroads, of one well past the stage of most rapid growth; and in both cases the yields and loss rates were unfavorable.

Comparison of the minor industry data in Table 14 with indexes of output may illuminate the role of economic growth as a factor in bond safety. Such a comparison requires consolidating the data in Table 14 to conform as closely as possible with the basic industry classification of the various available studies of output.[11]

Two estimates of output expansion were used for the purpose, one covering the period 1899–1937, the longest covered by Fabricant's data on output (the major source for our analysis), and the other the period 1929–37, which spans the Great Depression. The first period compares most closely with the years covered by our data; the second was included to test the hypothesis that those industries that expanded least during the Great Depression, or contracted most, would have the highest default rates and poorest yield performance.

Rank correlation coefficients were calculated between net percentage changes in physical output and the default rates, loss rates, and realized yields. In general the results of our experiment

[11] The indexes of output are from the following: Solomon Fabricant, *The Output of Manufacturing Industries, 1899–1937* (1940), pp. 60–61; Harold Barger, *The Transportation Industries, 1899–1946: A Study of Output, Employment, and Productivity* (1951), pp. 70 and 114; Harold Barger and Sam H. Schurr, *The Mining Industries, 1899–1939: Output, Employment, Productivity* (1944), p. 14; Jacob Martin Gould, *Output and Productivity in the Electric and Gas Utilities, 1899–1942* (1946), pp. 42 and 103, all published by the National Bureau of Economic Research; also Harold Barger, *Distribution's Place in the American Economy since 1869* (1955), p. 22, published by Princeton University Press for the National Bureau of Economic Research. To obtain comparability of industrial classification, we combined Fabricant's indexes for the food and beverage groups into one index (roughly corresponding to our "food" group); similarly our measures of bond experience for the lumber and furniture groups were combined, as were the groups "automobiles" and "transportation equipment (except automobiles)," and electric utilities including and excluding other services.

were inconclusive; although the signs of the coefficients were what would be expected, their magnitudes were quite low, and none was significantly different from zero.[12] The inference would appear to be that in a rapidly expanding economy such as ours (physical output increased by 276 percent between 1899 and 1937, and by 3 percent even during the Great Depression) fixed charges on most issues are well covered. Under such conditions there is little relationship between default experience among minor industry groups and the rapidity of industrial growth. For rapidly growing industries, the actual loss rates observed depended largely upon the investment quality of the individual issues floated by the members of the group, i.e. upon their profit margins, cash flows, and myriads of other factors relating to the risk of default. Examples are petroleum and coal products, which had the highest growth rate of any industry in the manufacturing group over the period 1899–1937, and had a low default rate and loss rate; and transportation equipment (in Table 14, automobiles plus transportation equipment except automobiles), which had the second highest growth rate, but a high default rate and loss rate. Greater regularity is to be observed among industries that suffered substantial declines in output, such as the street railways and the forest products group (lumber and furniture in Table 14), and among industries that were retarded by competition of other products or services (e.g. the railroads). Most issues of such industries had low earnings protection, so that default rates and loss rates were high. But the slow-growing industries were too few in number in our expanding economy to govern the over-all performance.

[12] The rank correlation coefficients are as follows:

PERIOD	RANK CORRELATION COEFFICIENTS FOR NET CHANGES IN PHYSICAL OUTPUT AND			*Number of Industry Groups*
	Realized Yield	*Loss Rate*	*Default Rate*	
1899–1937	+0.29	−0.27	−0.33	17
1929–1937	+0.25	−0.22	−0.22	20

In no case was the coefficient statistically significant. A further check was made by comparing the net changes in physical output during 1929-37 with the default rates of bonds offered before 1932 that were still outstanding in 1932: issues subjected to the heavy default risks of the 1930's. That test also failed to yield significant results.

Secular Drifts in the Retrospective
Quality of Bond Offerings

Substantial evidence has been presented in preceding passages to
the effect that realized yields and loss rates calculated from offer-
ing to extinguishment are influenced to a significant extent by
subsequent default experience. It is thus possible to use the per-
cent of the total par amount of offerings that subsequently went
into default as a retrospective measure of the quality of the offer-
ings, and as a check on various prospective measures (agency rat-
ings, market ratings, etc.) to be examined in later chapters. In
this section the default rate and the loss rate are used to investi-
gate the relationship between the year of offering—or more prop-
erly, the speculative temper of the market at the time of offering
—and bond quality in the retrospective sense.

Declines in the retrospective quality of various types of securi-
ties offered in the twenties have been noted by several investiga-
tors: by G. W. Edwards in his analysis of corporate bond issues
outstanding in default in December 1931; by Ilse Mintz in a
study of foreign dollar bonds offered in the domestic market in
the 1920's; and by R. J. Saulnier in an analysis of differences in
foreclosure rates on real estate mortgage loans of life insurance
companies made before and after January 1, 1924.[13] Each of these
investigations suggests a definite decline in the quality of invest-
ments originating in the late 1920's.

Data of the same type, but covering the period 1900–1943, are
presented in Table 17 and Chart 4; they indicate the percent of
the par amount of offerings of all straight corporate bonds (uni-
verse estimates) subsequently going into default, classified by
year of origination and by major industry division. Since the
annual data are rather erratic, a five-year moving average has
been passed through them on the chart as a guide to the eye,
five years being chosen for the averages because it is a period
long enough to damp out most of the temporary disturbances,

[13] Cf. George W. Edwards, "Control of the Security-Investment System,"
Harvard Business Review, October 1933, p. 7; Ilse Mintz, *Deterioration in the
Quality of Foreign Bonds Issued in the United States, 1920-1930* (National
Bureau of Economic Research, 1951), p. 39 ff.; and R. J. Saulnier, *Urban
Mortgage Lending by Life Insurance Companies* (National Bureau of Eco-
nomic Research, Financial Research Program, 1950), Table B 10. See also
Geoffrey H. Moore's "The Quality of Credit in Booms and Depressions,"
Journal of Finance, May 1956, pp. 288-300, for an interesting summary and
discussion of these and other relevant studies.

but not so long as to introduce spurious long cycles in the data. These materials, like those of other investigators, reveal a definite decline in the quality of corporate bonds offered in the late twenties, for all industries combined, and for each of the major components. At the same time, Chart 4 reveals a point not noted

TABLE 17—Percent of Par Amount of Offerings, Annually 1900–1943, That Went into Default before 1944

YEAR OF OFFERING	*All Issues*	*Railroads*	*Public Utilities*	*Industrials*
1900	35.3%	31.9%	45.6%	5.0%
1901	28.0	21.5	25.4	37.8
1902	48.4	45.9	61.3	31.2
1903	31.2	40.0	33.2	16.0
1904	44.5	40.6	45.2	51.3
1905	38.4	39.5	37.7	34.3
1906	41.1	43.2	43.4	27.0
1907	36.1	22.2	57.2	33.8
1908	32.5	33.7	40.1	6.5
1909	33.9	39.7	39.2	8.6
1910	24.4	26.2	25.7	18.3
1911	33.6	42.8	18.3	44.2
1912	30.4	39.1	27.2	24.1
1913	43.8	55.5	38.6	21.7
1914	30.2	28.2	39.3	16.1
1915	25.7	27.1	28.2	13.6
1916	29.2	40.6	28.9	11.1
1917	25.1	37.8	29.3	3.3
1918	27.2	27.7	29.0	18.4
1919	12.8	9.3	9.4	24.8
1920	17.6	11.8	14.0	22.1
1921	13.4	15.1	10.3	14.7
1922	15.4	3.6	11.1	25.8
1923	12.4	28.4	2.0	20.4
1924	21.8	26.8	6.1	44.0
1925	18.3	50.1	1.8	26.9
1926	21.9	55.2	7.8	31.6
1927	27.1	56.7	16.2	30.4
1928	39.9	56.8	36.9	34.1
1929	33.9	41.0	25.2	43.8
1930	27.9	51.1	14.8	32.3
1931	18.1	28.5	12.2	32.6
1932	15.6	66.9	10.1	17.4
1933	35.4	41.7	35.4	30.4
1934	11.6	21.3	4.3	6.8

TABLE 17
(concluded)

YEAR OF OFFERING	*All Issues*	*Railroads*	*Public Utilities*	*Industrials*
1935	6.6%	10.4%	0.4%	16.2%
1936	2.9	3.0	3.2	2.1
1937	0.3	0.0	0.7	0.0
1938	0.0	0.0	0.0	0.0
1939	0.5	0.0	0.9	0.0
1940	0.1	0.6	0.0	0.0
1941	1.0	11.5	0.0	0.0
1942	0.0	0.0	0.0	0.0
1943	1.6	10.9	0.0	0.0
Trough years	24.3	32.0	21.9	23.2
Peak years	24.9	30.8	23.3	22.6
Contraction and trough years	24.1	33.2	20.6	24.6
Expansion and peak years	22.0	27.5	20.9	18.0

Based on Table 130 of *Statistical Measures*: par-amount data for all large (straight) corporate issues, and for 10 percent of small issues adjusted to universe totals, after removal in each case of amounts for which information was lacking on default status. Readers interested in computing weighted average default rates for combinations of years should consult Table 130. Peak and trough years are from the National Bureau's business cycle chronology; cf. Arthur F. Burns and Wesley C. Mitchell, *Measuring Business Cycles* (National Bureau of Economic Research, 1946) p. 78.

previously: that default rates even higher than those in the late twenties were experienced on bonds floated during the first fifteen years of the century.[14] Viewed in full perspective, the period of the late twenties and early thirties appears as simply a sharp break in a falling trend in default and loss rates.

Supplementary evidence on the deterioration of bond quality in the twenties is presented in Table 18, which contains loss rates on the large and small issues included in the offerings experience sample classified by year of offering, and the corresponding

[14] Actually, rail bonds offered in the twenties did worse than those offered in the first decade and a half, but utility bonds offered in the early period (mostly street railways) did very badly. There is little to choose from as between industrial bonds offered before 1916 and in the twenties.

CHART 4—Proportion of Offerings, Annually 1900-1943, That Later Defaulted, Annual Net Changes in Outstandings, 1900-1950, and Annual Gross New-money Offerings, 1900-1943
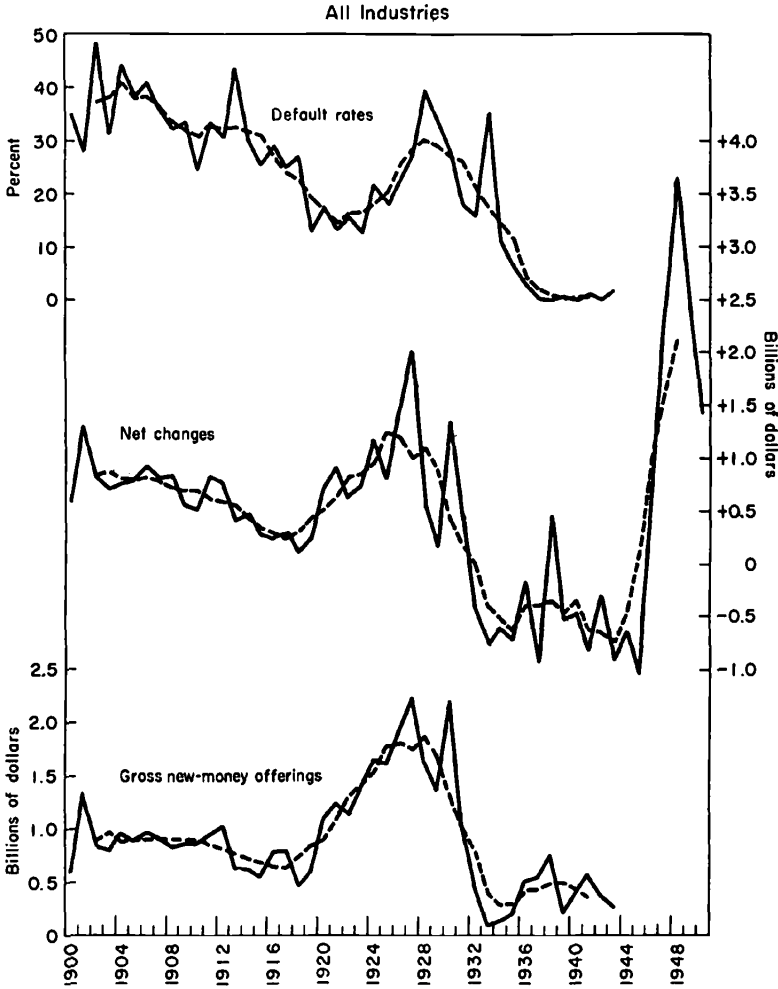
Data cover all straight corporate issues. Default rates are from Table 17, based on par-amount data; net changes and gross new-money offerings are from "Volume of Financing," Tables A-2 and A-12, respectively. Broken lines are centered five-year moving averages.

CHART 4, continued

Railroads
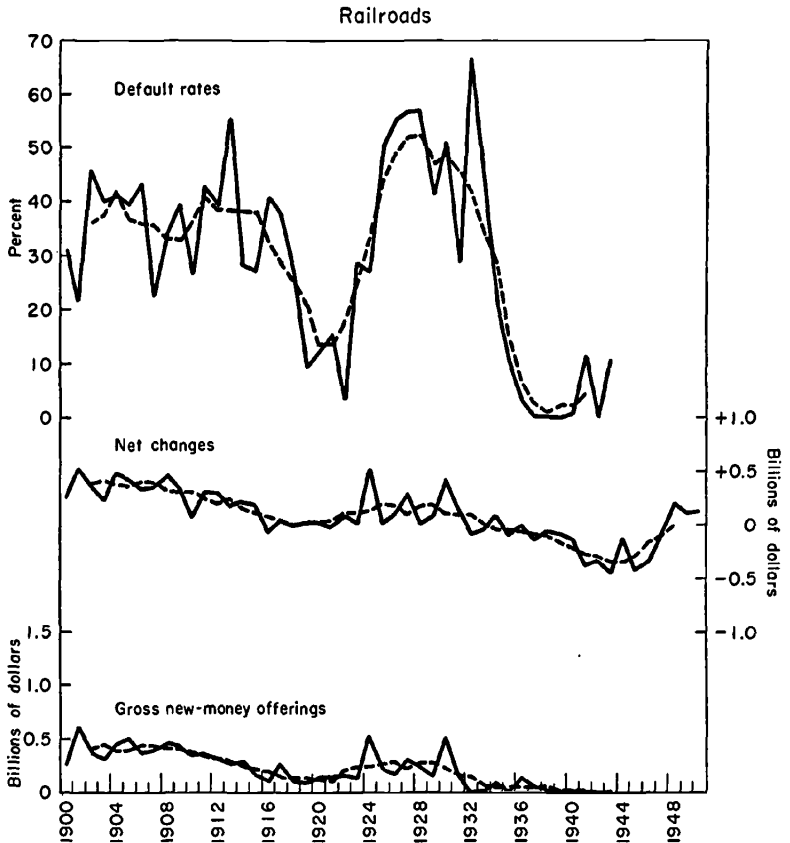
default rates. As the table shows, investors actually received more than was promised at offering in the early twenties, but less than the amount promised in the later years. The loss rates were particularly high for large issues in 1928–29, averaging 1.7 percent, and for small issues in 1927–29, averaging 3.3 percent. Loss rates and default rates for small issues were generally higher and more erratic than for large issues.

The rising default and loss rates of the twenties must not be accepted as conclusive evidence of quality deterioration throughout that period without further investigation. The principal difficulty with the default rates as calculated is that the rates for the earlier years reflect in part the favorable experience of issues

CHART 4, continued

Public Utilities
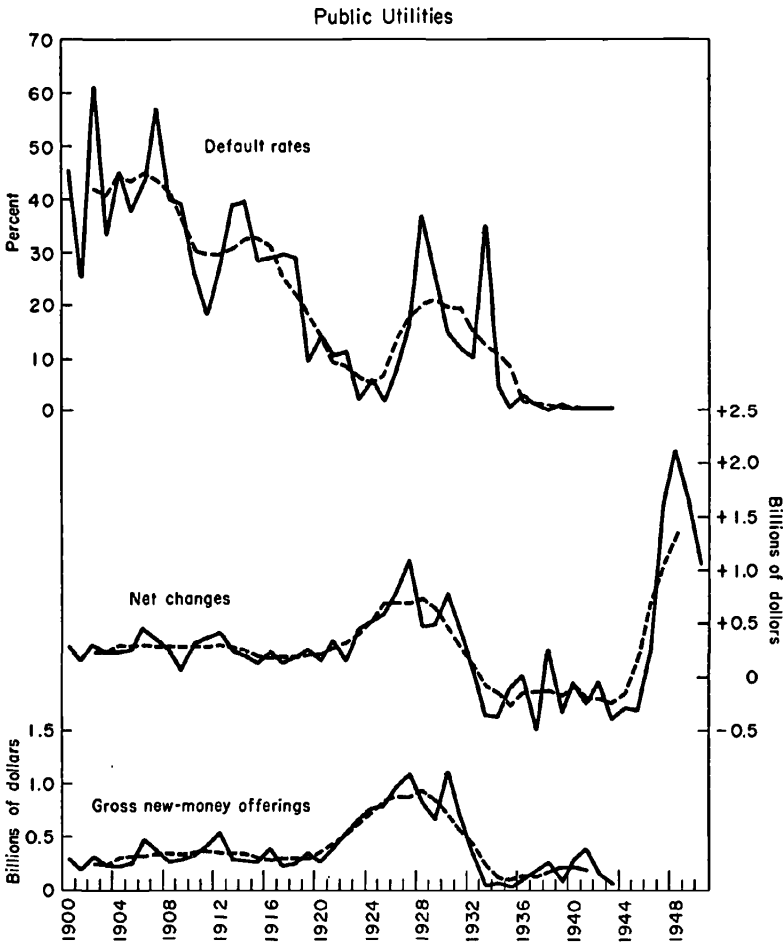
extinguished before the Great Depression and not subject to the financial stresses of the later era. On purely a priori grounds one would expect the default rates to rise whenever the year of offering approaches a period of heavy defaults. To eliminate this possible bias, supplementary default rates are presented, which include only the group of bonds still outstanding on January 1, 1930 (Table 19). If anything, such rates are biased in the opposite direction, since certain issues that, by reason of their high quality, were called and refunded during the late twenties are

CHART 4, concluded

Industrials
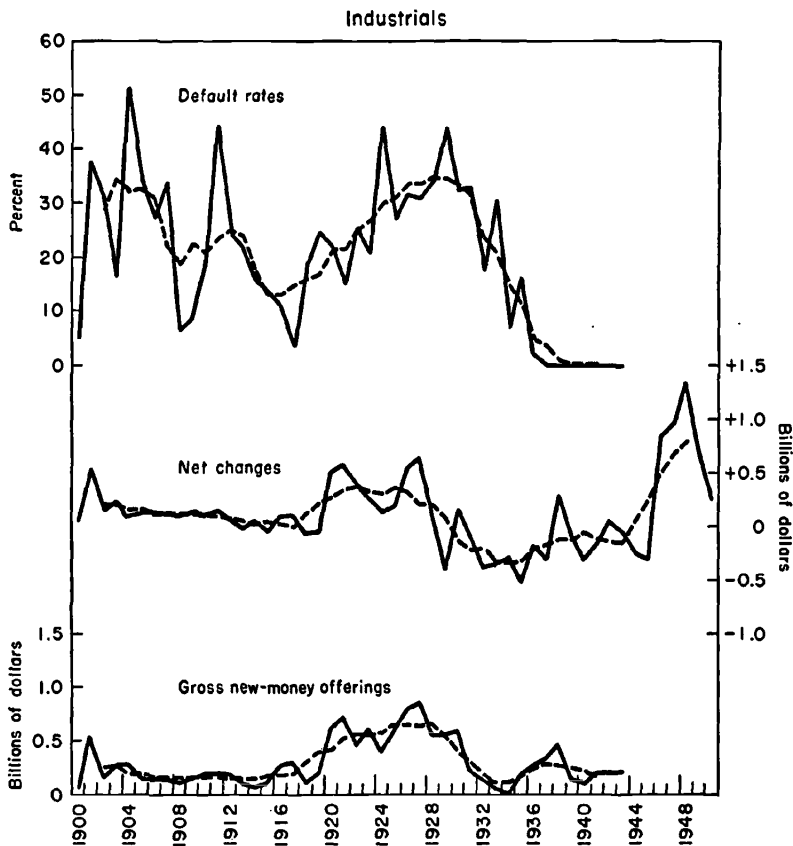
automatically excluded. The fact that the adjusted rates remain higher toward the end of the decade than at the beginning would seem to provide conclusive evidence of a definite decline in the quality of corporate bonds offered in the twenties as measured by their subsequent performance. This decline is even more striking when seen in temporal perspective, as a counter movement in the long trend of improvement in bond quality over the full period studied (Chart 4). For example, on the average, bonds offered during the first decade of the century, many years prior to the test period of the thirties, had even higher default rates, unadjusted, than the adjusted rates for bonds offered in the late twenties.

TABLE 18—Life-span Loss Rates and Default Rates on Bonds
Offered 1920–29

YEAR OF OFFERING	LOSS RATES		DEFAULT RATES	
	Large Issues	*Small Issues*	*Large Issues*	*Small Issues*
1920	−1.0%	1.6%	13.1%	31.5%
1921	−0.4	−1.7	12.2	17.1
1922	0.1	0.5	12.3	23.5
1923	−0.4	−0.4	8.3	23.6
1924	−0.2	0.5	19.2	29.4
1925	0.3	−0.4	19.2	15.8
1926	0.2	1.5	17.8	35.0
1927	0.8	3.4	19.2	61.7
1928	1.1	3.2	34.6	59.5
1929	2.6	3.3	33.3	36.5
1920–24	−0.3	0.0	13.0	25.0
1925–29	0.9	2.3	24.8	41.7
1920–29	0.4	1.2	18.9	33.4

Loss rates, from special tabulations covering issues in the offerings experience
sample, 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. Default rates are based
on Tables 130 and 131 of *Statistical Measures*: par-amount data for all large
(straight) corporate issues, and for 10 percent of small issues.

TABLE 19—Percent of Par Amount of Bonds Offered 1920–29
and in Good Standing January 1, 1930 That Went into
Default before 1944

YEAR OF FIRST OFFERING	*Large Issues*	*Small Issues*	*All Issues*
1920	2.1%	0.0%	2.0%
1921	14.0	28.6	15.8
1922	10.2	29.5	13.2
1923	6.0	16.6	8.3
1924	30.2	31.9	30.3
1925	17.7	19.1	18.0
1926	17.5	48.3	25.9
1927	19.6	52.7	25.2
1928	39.7	54.8	43.0
1929	36.9	36.5	36.8

From special tabulations of the National Bureau of Economic Research,
covering all large (straight) corporate issues and 10 percent of small. When
large and small are combined, the latter are adjusted to the universe of bonds
in good standing on January 1, 1930. For issues having more than one offering,
the total par amount was assigned arbitrarily to the year in which the issue
was first taken up by the investing public.

It is interesting to speculate upon the significance of the long swings that seem to have dominated the default rates on corporate bonds, the extremely high levels of the first fifteen years of the century, the lows during the early twenties, the upward rise until 1934, and the subsequent sharp decline. Since our records terminate on January 1, 1944, the default rates toward the close of the period do not reflect defaults after that date on issues then outstanding. Nevertheless, in view of the substantial proportion of bonds offered during the thirties that have already been retired, and the excellent record of corporate bonds generally since World War II, there seems little doubt that the full record, when it becomes available, will show a sharp dip in default rates for bonds offered during the late 1930's.

The rise in the default rates during the twenties and the subsequent decline appear to fit in well with the finding of Burns and Mitchell as to the growing instability of the financial series they examined between severe depressions. Between long-period minima, tentatively dated by Burns and Mitchell at June 1894, June 1908, September 1921, and March 1933, they found a striking dissimilarity in the behavior of series relating to industrial activity from those pertaining to interest rates and speculation. For example, while the average rise in the specific cycle amplitudes of the industrial series was largest for the group of specific cycles immediately following a severe depression, and smallest for the group of specific cycles immediately prior to the next severe depression, the reverse was true for bond yields, call money rates, and shares traded.

To Burns and Mitchell this suggested the tentative hypothesis of continuous deterioration in financial behavior between major depressions. In their words: "After a severe depression industrial activity rebounds sharply, but speculation does not. The following contraction in business is mild, which leads people to be less cautious. Consequently, in the next two or three cycles, while the cyclical advances become progressively smaller in industrial activity, they become progressively larger in speculative activity. Finally, the speculative boom collapses and a drastic liquidation follows, which ends this cycle of cycles and brings us back to the starting point."[15]

Lacking suitable monthly or quarterly data, we cannot accu-

[15] Arthur F. Burns and Wesley C. Mitchell, *Measuring Business Cycles* (National Bureau of Economic Research, 1946), p. 460.

rately date specific cycles in corporate defaults by period of origi-
nation nor analyze their changing amplitudes between dates of
severe depressions. Nevertheless, the long swings in the data do
provide some evidence of deteriorating credit conditions toward
the end of "major cycles," and of a possible tightening up of credit
standards near the beginning of new major cycles. Thus Burns
and Mitchell tentatively place a trough of a major cycle in June
1908 and we can detect a corresponding dip in default rates on
bonds offered around that time. (Because of the erratic nature
of the data the best that can be done, however, is to place the
turning point for rails in the years 1908–10, for utilities in the
years 1910–12, and for industrials in the years 1908–10.) Default
rates generally began to rise after that up to the outbreak of
World War I, and then turned downward, possibly because of the
credit restraint program of the Capital Issues Committee. De-
fault rates quite generally reached troughs around 1921 (1919–22
for the rails, 1919–25 for the utilities, but perhaps even earlier for
the industrials), and 1921 is the year assigned by Burns and
Mitchell as the date of the next major depression. The series
then all turned upward, reaching peaks around 1928 or 1929.

Some evidence as to one possible cause of the long swings in
bond quality is presented in the lower part of Chart 4, which
shows the net volume of bond financing and the volume of gross
new-money offerings for all industries and for the major indus-
try groups. (Gross new-money offerings are equal to total offerings
less refundings.) It will be observed that the trends in default
rates are roughly comparable with trends in net and gross new
financing, default rates tending to be high on securities issued
during years of high financial volume and vice versa, with the
default rates lagging behind the other series. This would seem
to suggest that some issues, perhaps those of marginal quality,
can find a ready market only when the market is buoyant, and
that in periods of market pessimism only the top grade issues
can be placed, a conjecture not incompatible with the Burns
and Mitchell thesis of financial deterioration between major
cycles. On the other hand, the timing of the upper and lower
turning points in the long swings of the default and volume series
does not correspond so closely as one could wish (note particularly
the rise in the volume of bond financing for all industries begin-
ning in 1919, and the fall in 1928). Moreover, it might be ex-
pected that if the quality of credit deteriorates between major

depressions, the same phenomenon would be observed, although perhaps to a lesser degree, within the shorter swings defining business cycles. Yet conformity indexes for the default rates show no evidence of sensitivity to business cycles as defined by the National Bureau.[16] At the same time, the longer swings in default rates do not appear to be entirely unrelated to the major cycles of the past nor to the long-run movements observable in the net volume of bond financing. The evidence, while hardly conclusive, seems sufficiently strong to suggest a need for possible review of present credit standards, particularly in view of the abrupt run-up in corporate bonded debt since World War II.

DEFAULTED BONDS: PERFORMANCE UP TO AND AFTER DEFAULT

Of the $71.5 billion par amount of straight corporate bonds offered in 1900-1943, $14.6 billion or 20.4 percent are known to have defaulted in that period, with modest to substantial losses to investors. This section examines in somewhat greater detail than previously the realized returns obtained on defaulted issues per se, and the extent of the losses suffered. A principal objective is to test the policy imposed by statutory rules and regulatory bodies upon many investment institutions during the thirties of selling bonds promptly at default or of writing them down to market. For that purpose, realized yields were computed for the following periods in the life of defaulted issues: offering to extinguishment, offering to default, default to extinguishment, default to two and to five years later, and, for successor securities, from extinguishment of the original issue to five years later (Table 20). Comparison of the results with norms judged as reasonable by the investor will test the wisdom of selling at default,

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[16] Conformity indexes for the percent of the par amount of corporate bonds subsequently going into default by year of offering are presented below for the ten cycles 1900-1938:

	Expansion	*Contraction*	*Full Cycle*
All industries	−20	+20	−5
Railroads	+20	−40	−16
Public utilities	0	+40	+16
Industrials	0	0	−16

An index of +100 indicates perfect positive conformity, and an index of −100 perfect negative conformity. The indexes presented here have not been adjusted for possible leads and lags in the data at reference-cycle turning points, but are so low as to suggest, nevertheless, negligible conformity with business cycles.

and, for those with a speculative bent, of purchasing defaulted bonds or their successors.

Since the purpose is to reveal variations in experience as between different natural periods up to and after the default of an issue, information on defaulted bonds has been handled issue by issue, without regard to separate offerings if such there were. That is to say, yields from offering to default and from offering to extinguishment cover only the first offering (the principal offering for most issues); yields from default to two and to five years later, of course, cover the experience of the entire issue. As Chapter 1 indicates, yields from offering to default and from offering to extinguishment were computed at compound interest, while other yields covering shorter natural periods after default were computed at simple interest. Because of the difficulty of obtaining offering prices, it was not possible to compute quite as many yields from offering to default and to extinguishment as yields from default to extinguishment; hence Table 20 always specifies the number of issues included. Yields from default to two and to five years later were computed only for the smaller number of issues still outstanding at the end of those periods; similarly, yields from extinguishment to five years later could be computed only for defaulted issues extinguished by exchange for successor securities. To avoid the problem of shifting par-amount weights between dates of offering and default, the statistics on yield experience of defaulted issues are presented as simple unweighted averages.

Comparison of the results for the various industry-size breakdowns in Table 20 indicates that for each group substantial losses were suffered by investors who liquidated at default as compared with those who held to extinguishment; for all except the rail bonds, realized yields were actually negative on bonds sold at default. With the advantage of hindsight, it now appears that the practice of selling at default was quite costly to institutional investors, and that the legal rules and regulatory directives encouraging that practice were unnecessarily harsh. Although capital losses were substantial on defaulted bonds even when held to extinguishment, in that case they were lower by 50 percent or more for each of the industry-size groups (except small industrials, 40 percent) than the comparable rates from offering to default. Moreover, the realized returns obtained from offering to extinguishment on all large and all small issues were positive,

TABLE 20—Yields and Loss Rates up to Default, over Selected Periods after Default, and over Life Span of Issues Defaulting 1900–1943

PERIOD	Number of Issues	Promised Yield at Offering	Realized Yield	Loss Rate
	Large Issues, All Industries			
First offering to extinguishment[a]	549	6.4%	2.3%	4.1%
Offering to default	549	6.4	−3.4	9.8
Default to 2 years later	368		7.3	
Default to 5 years later	215		5.3	
Default to extinguishment[a]	581		20.0	
Successors, for 5 years	341		20.3	
	Large, Railroads			
First offering to extinguishment[a]	234	6.1	3.3	2.8
Offering to default	234	6.1	0.1	6.0
Default to 2 years later	173		−0.5	
Default to 5 years later	134		1.1	
Default to extinguishment[a]	247		18.6	
Successors, for 5 years	114		23.1	
	Large, Public Utilities			
First offering to extinguishment[a]	171	6.4	1.7	4.7
Offering to default	171	6.4	−4.9	11.3
Default to 2 years later	108		0.9	
Default to 5 years later	50		5.8	
Default to extinguishment[a]	182		17.0	
Successors, for 5 years	119		18.7	
	Large, Industrials			
First offering to extinguishment[a]	144	6.9	1.4	5.5
Offering to default	144	6.9	−7.5	14.4
Default to 2 years later	87		30.7	
Default to 5 years later	31		22.5	
Default to extinguishment[a]	152		25.8	
Successors, for 5 years	108		19.2	

and do not compare too unfavorably with the promised yields on government securities outstanding during the thirties and forties, the years when corporate defaults were heaviest.

As the table shows, the reason for the better performance of defaulted bonds held to extinguishment than of those sold at default was the extremely high rate of return obtained after the date of default (note, for example, the realized return of 20.0 percent per annum obtained on the large issues when purchased at default and held to extinguishment, and the comparable return

TABLE 20
(concluded)

PERIOD	Number of Issues	Promised Yield at Offering	Realized Yield	Loss Rate
		Small Issues, All Industries		
First offering to extinguishment[a]	119	7.8%	2.4%	5.4%
Offering to default	119	7.8	−4.0	11.8
Default to 2 years later	62		−1.2	
Default to 5 years later	37		11.6	
Default to extinguishment[a]	137		26.7	
Successors, for 5 years	61		20.9	
		Small, Railroads		
First offering to extinguishment[a]	17	5.2	4.2	1.0
Offering to default	17	5.2	1.6	3.6
Default to 2 years later	12		−4.0	
Default to 5 years later	8		7.5	
Default to extinguishment[a]	23		8.6	
Successors, for 5 years	11		7.1	
		Small, Public Utilities		
First offering to extinguishment[a]	48	6.8	3.6	3.2
Offering to default	48	6.8	−5.0	11.8
Default to 2 years later	23		3.9	
Default to 5 years later	15		20.3	
Default to extinguishment[a]	59		31.3	
Successors, for 5 years	30		21.2	
		Small, Industrials		
First offering to extinguishment[a]	54	9.6	0.9	8.7
Offering to default	54	9.6	−4.9	14.5
Default to 2 years later	27		−4.4	
Default to 5 years later	14		4.7	
Default to extinguishment[a]	55		29.5	
Successors, for 5 years	20		27.9	

From *Statistical Measures*, Tables 217 and 218 (total columns) and special supplementary tabulations, covering issues in the default experience sample. Yields and loss rates are unweighted averages.

[a] For issues still outstanding on January 1, 1944 liquidation is assumed at prices prevailing in the first quarter of that year.

of 26.7 percent on the small issues). In addition, returns obtained on the successor securities were quite attractive. The evidence is mixed only for securities held from default to two and to five years later. Clearly it would have paid to hold bonds of the smaller issues for the longer period (note the improvement in the realized

rate of return in each of the industry groups). But the opposite pattern obtained for large issues of the combined industries, where the return from assumed sale at the end of two years was higher than for the five-year period. The high average realized yield from default to two years later for large issues is dominated by the extremely high rates of return obtained on a few industrial issues that were not outstanding five years after default. When only issues are considered for which both yields could be computed, i.e. issues outstanding five years or more, the average realized yield for total large issues rises from 1.2 percent for the period from default to two years later to 5.4 percent from default to five years later. We conclude that the practice of selling bonds at default was costly during the period covered by our records, and that the yield experience generally improved, the longer the issue was held after default.

Corporate Bond Defaults before and during the Great Depression

Table 21 is similar to Table 20 in that it provides data on the yield experience of defaulted issues held over various natural periods, but is different in that it contains a breakdown of issues defaulting before and after January 1, 1930. The purpose is to determine whether the tendency, previously observed, for the realized yields to increase with the length of the investment period measured from date of default was simply a characteristic of the peculiar market conditions of the 1930's, or whether it prevailed in earlier periods as well.

The table reveals, first, that the levels of realized rates of return after default were typically higher for issues defaulting after 1929 than for those defaulting earlier. For the large issues, this was true of fourteen of the sixteen yield comparisons that can be made in the table, the only exceptions being rails held from default to two years later, and industrial successors purchased at extinguishment. The same general pattern characterizes the small issues as well, average realized yields on defaults after 1929 exceeding those of the earlier period in twelve of the sixteen comparisons. Yields on successors of small industrial issues, however, were again somewhat lower in the later period, as were yields on the various groups of defaulted rail issues after default. Despite these exceptions, the general pattern is quite pronounced, indicating that realized yields were definitely higher on defaulted bonds purchased during the Great Depression. In part, the ex-

planation is the extremely depressed prices of defaulted bonds in the thirties, the result of the forced liquidation by institutional investors; in part, the generous payouts and rapid price recovery in the late thirties and forties. It is worth noting that the low bond prices at default in the thirties, which resulted in the subsequent high yields, reflect a reverse type of cyclical error to the high prices (and high default rate) of bonds offered during the boom of the late twenties.

A second point of interest in connection with Table 21 is the regularity with which the yields on defaulted bonds improved with the length of the period that they were held after default. In each of the two subperiods, 1900–1929 and 1930–43, realized yields were generally higher for issues held for five years after default than for those held only two years and were higher still for issues held until extinguishment. So far as the two- and five-year periods are concerned, the pattern was most pronounced for the small issues, and failed to appear in Table 21 only for large railroads defaulting in 1900–1929 and for large industrials defaulting in 1930–43. In those cases, however, the explanation is that the averages do not cover an identical sample of issues. When only issues outstanding for at least five years after default are considered, the average realized yield for large rails defaulting 1900–1929 increases from —3.4 percent for liquidation at the end of two years to —1.6 percent for liquidation at the end of five years, and the comparable yield for large industrials defaulting 1930–43 increases from 18.1 percent to 25.2 percent. Many issues outstanding for less than five years after default were situations in which prompt settlement could be anticipated at the end of two years (i.e. settlement within three to five years after default), so that the price appreciation and yield realized from default to two years later was large. The yield averages of Table 21 for large rail defaults 1900–1929 and for large industrial defaults 1930–43 were most affected, since rail and industrial defaults in those periods were settled quickly.[17] Realized yields from default to extinguishment were higher than from default to five years later for every group but one—small rails defaulting 1900–1929, where the yield averages are unreliable because of the small number of issues included and the special circumstances involved in a multiple default of a single issue.

[17] For information on the speed of settlement in the major industry groups over selected periods, see *Volume of Financing*, pp. 210 ff.

TABLE 21—Realized Yields before Default, over Selected Periods after Default, and over Life Span of Issues Defaulting before and after January 1, 1930

	DEFAULT TO 2 YRS.		DEFAULT TO 5 YRS.		DEFAULT TO EXTINGUISHMENT[a]	
	Number of Issues	*Realized Yield*	*Number of Issues*	*Realized Yield*	*Number of Issues*	*Realized Yield*
	Defaulted 1900–1929					
Large Issues, all industries	110	−3.3%	52	−2.2%	187	6.4%
Railroads	47	0.7	25	−2.4	80	6.4
Public utilities	47	−6.8	24	−2.0	63	6.2
Industrials	16	−4.9	3	−2.3[b]	44	6.7
Small Issues, all industries	18	−9.3	10	8.6	32	13.6
Railroads	4	12.6[b]	2	24.5[b]	7	12.1
Public utilities	11	−12.3	7	7.7	17	10.6
Industrials	3	−27.6[b]	1	−16.3[b]	8	21.3
	Defaulted 1930–43					
Large Issues, all industries	258	11.9	163	7.7	394	26.4
Railroads	126	−0.9	109	1.9	167	24.4
Public utilities	61	6.9	26	12.9	119	22.7
Industrials	71	38.8	28	25.2	108	33.6
Small Issues, all industries	44	2.1	27	12.7	105	30.7
Railroads	8	−12.3	6	1.8	16	7.0
Public utilities	12	18.7	8	31.3	42	39.6
Industrials	24	−1.5	13	6.3	47	30.8

So far as concerns the yield performance of defaulted bonds purchased at offering, it appears that on the whole the railroads turned in the best performance in each of the two subperiods while the industrials turned in the worst. Utility defaults had a better record than industrials in the early period, but industrials were slightly better in the thirties, except for small issues held to extinguishment. Tables in *Statistical Measures* show that the superior performance of the railroads from offering to default and from offering to extinguishment arose from the fact that they appeared earlier than the utilities and industrials and had a longer period of uninterrupted coupon payments before default occurred. In the early period the utilities behaved similarly and on the average were outstanding before default for about the same number of years as the rails, but industrials, which had the poorest record, were outstanding for just over half as long.

TABLE 21
(concluded)

	EXTINGUISH-MENT TO 5 YRS.		FIRST OFFERING TO DEFAULT		FIRST OFFERING TO EXTIN-GUISHMENT[a]	
	Number of Issues	*Real-ized Yield*	*Number of Issues*	*Real-ized Yield*	*Number of Issues*	*Real-ized Yield*
Defaulted 1900–1929						
Large Issues, all industries	117	13.7%	168	−1.7%	168	2.3%
Railroads	55	8.2	74	0.8	74	2.6
Public utilities	33	5.8	56	−0.1	56	2.9
Industrials	29	33.2	38	−8.7	38	0.8
Small Issues, all industries	14	13.1	26	−2.3	26	2.9
Railroads	5	6.6	5	1.1	5	6.7
Public utilities	7	12.6	13	−0.6	13	4.1
Industrials	2	30.7[b]	8	−7.3	8	−1.5
Defaulted 1930–43						
Large Issues, all industries	224	23.8	381	−4.3	381	2.3
Railroads	59	36.9	160	−0.3	160	3.6
Public utilities	86	23.6	115	−7.2	115	1.0
Industrials	79	14.1	106	−7.0	106	1.7
Small Issues, all industries	47	23.2	93	−4.5	93	2.3
Railroads	6	7.5	12	1.8	12	3.1
Public utilities	23	23.8	35	−6.7	35	3.4
Industrials	18	27.6	46	−4.4	46	1.3

From *Statistical Measures*, Table 218 (total column) and special supplementary tabulations, covering issues in the default experience sample. Yields are unweighted averages.

[a] For issues still outstanding on January 1, 1944 liquidation is assumed at prices prevailing in the first quarter of that year.
[b] Note that the average is based on less than five issues.

Discounted Values of Receipts on Defaulted Issues

The preceding section noted the extremely liberal returns obtained by investors who purchased bonds at default and held to extinguishment. The high rates of return thus obtained were the resultant of two factors: (1) the depressed market prices of defaulted bonds at the date of default and (2) the liberal payouts and market appreciation on these securities and their successors.

We shall now attempt to disentangle the effects of these two fac-
tors by considering the "present value" on date of default of all
subsequent receipts of interest and principal up to the date of
cash liquidation, or up to five years after extinguishment in the
case of securities exchanged for successors. Liquidation of the
successor securities by sale in the open market five years after
the extinguishment of the original issue was assumed, in the event
that the successors had not already been liquidated for cash. Sale
in the market was also assumed for securities still outstanding at
the end of the period studied (January 1, 1944).

In computing the discounted values (Table 22) two different
rates of discount were used, 3 percent and 6 percent, with interest
in each case compounded semiannually. The use of two discount
rates makes it possible for the analyst to obtain rough estimates
of discounted values by interpolation or extrapolation for other
values that he might wish to take as normal. For example, the
nine-point spread shown in the table between the present value
of receipts on large industrial issues discounted at 3 percent (62)
and at 6 percent (53) suggests a price decrement of about three
points per one point increase in the discount rate (an implied
present value of about 65 at 2 percent, 59 at 4 percent, etc.).[18]

The difference between the average market prices at default
and par (100) provides a measure of the lump-sum capital loss on
bonds sold at default,[19] while the difference between the price
at default and the discounted value at 3 or at 6 percent gives an
estimate of the lump-sum capital gain or loss (at the assumed rate
of discount) for bonds purchased at default. As the table indicates,
lump-sum capital losses on bonds sold at default were extremely
large in each industry-size group, averaging for the full period

[18] If a small payment is made on a defaulted bond that was previously con-
sidered as worthless by the market, the "purchaser" will receive an infinitely
large rate of return. From this fact it is evident that the discounted value
at default must decline at a decreasing rate as the assumed discount rate in-
creases. Thus linear interpolation of present values between those presented in
the table at 3 and at 6 percent provides very rough results.

[19] Conceptually, a better measure of the lump-sum capital loss on issues
sold at default would be the book value (cf. Chapter 1 and Table 9). Under
present accounting practices, however, the difference between par and book
is seldom very large for corporate bonds up to the date of default, so that it was
not felt worth while to provide separate estimates for book values. It will be
observed further that the capital losses indicated at default will be incurred
only for issues liquidated or written down to market at that time and then
only where suitable loss reserves had not been provided.

TABLE 22—Market Prices at Default, and Discounted Values of Receipts after Default, for Issues Defaulting before and after January 1, 1930

	Number of Issues	*Average Price at Default*	RECEIPTS DISCOUNTED AT		DIFFERENCE BETWEEN MARKET PRICE AND RECEIPTS DISCOUNTED AT	
			3 Percent	*6 Percent*	*3 Percent*	*6 Percent*
Defaulted 1900–1943						
Large Issues, all industries	581	43	63	53	20	10
Railroads	247	44	64	52	20	8
Public utilities	182	45	65	55	20	10
Industrials	152	38	62	53	24	15
Small Issues, all industries	137	40	63	54	23	14
Railroads	23	56	69	59	13	3
Public utilities	59	43	75	65	32	22
Industrials	55	29	47	41	18	12
Defaulted 1900–1929						
Large Issues, all industries	187	61	71	59	10	−2
Railroads	80	65	75	62	10	−3
Public utilities	63	60	72	59	12	−1
Industrials	44	56	62	53	6	−3
Small Issues, all industries	32	56	79	67	23	11
Railroads	7	64	94	77	30	13
Public utilities	17	60	86	73	26	13
Industrials	8	42	50	45	8	3
Defaulted 1930–43						
Large Issues, all industries	394	34	60	50	26	15
Railroads	167	34	58	48	24	14
Public utilities	119	37	61	53	24	16
Industrials	108	30	62	52	32	22
Small Issues, all industries	105	35	58	50	23	15
Railroads	16	52	58	51	6	−1
Public utilities	42	37	71	61	34	24
Industrials	47	27	46	40	19	13

From *Statistical Measures*, Table 218 (total column) and special supplementary tabulations, covering issues in the default experience sample. Receipts include liquidating values of securities still outstanding on January 1, 1944 at prices prevailing in the first quarter of that year. Prices and discounted values are unweighted averages.

1900–1943, 57 points for the large issues and 60 points for the small. However, comparison of the market prices ruling at default with the discounted values of subsequent receipts (using any discount rate that might seem reasonable for the purpose) reveals that such losses could usually have been pared considerably by holding to extinguishment. From the opposite point of view, there was a tendency for market prices to be depressed at default, so that substantial capital gains were obtained by purchase on the date of default and retention to extinguishment (for the large issues, 20 points at 3 percent and 10 points at 6 percent; for the small issues, 23 points and 14 points).

One is particularly impressed by the uniformity of the levels of discounted values of receipts on large defaulted issues for the full period 1900–1943. This uniformity shows in particular that the large industrial issues, which had a lower average market price at default than the rails and utilities, were relatively undervalued by the market, so that subsequent capital gains were unusually large (see also Table 21). The recovery value and default price of the small issues averaged about the same as on large issues, but there was less uniformity among the industry groups. Small rail issues sold at somewhat higher prices than other issues, large or small, since many of them were underlying divisional obligations of larger systems well secured as to lien position. Perhaps for the same reason, the discounted value of subsequent receipts on the small rails was good, but not as remarkable as that of the small utilities. Among the six industry-size groups covered for the period 1900–1943, the small industrials had the poorest record as measured both by the price at default and the discounted value of subsequent receipts. But since small industrials, like other issues, were undervalued at default, subsequent capital gains were substantial.

Comparison of the records of corporate bond defaults prior to and during the Great Depression reveals that prices at default were consistently lower in the later period for each of the industry-size groups. Discounted values at 3 and 6 percent were also substantially lower in the later period (except for large industrials, where the discounted values for the two periods were practically the same), partially because prices of defaulted bonds and their successors still outstanding on January 1, 1944 had not yet fully recovered from the depression lows. But the differentials between receipts and market prices at default were larger, with the result

that capital gains on bonds purchased at default in the thirties were generally extremely high.

Again we note a rough comparability between the experience on small and on large issues within the two subperiods shown in Table 22, although the subsequent pay-outs on small issues defaulting in 1900–1929 were substantially higher than on the large. The reason was the exceptionally good recovery of small rail and utility issues, which more than offset the poor perform-ance of small industrials. In the later period also, the small in-dustrials did poorly, both as compared with other small issues and with large industrials. In both periods covered, small rails and utilities performed better than the comparable classes of large issues.

In summary, it would appear from the materials of this and the preceding section that corporate bonds were usually under-valued at default, and particularly in the 1930's. Capital losses on issues sold at that time were excessive, and subsequent recov-eries were substantial.

OVER-ALL PERFORMANCE IN DIFFERENT CHRONOLOGICAL PERIODS

Weighted average yields and loss rates, and distributions of out-standings by default status and method of extinguishment, are presented in Table 23 for all issues in the periodic experience sample that were outstanding at the beginning of selected chron-ological periods. It will be recalled from Chapter 1 that only issues in good standing at the beginning of a period for which realized yields could be computed are in the periodic experience sample. The table covers all eleven four-year periods, 1900–1903, 1904–07, and so on, and nine longer periods. The yields for individual is-sues on which the averages are based were computed on the assumption that an investor purchased at the beginning and sold at the end of the periods indicated; since the averages were com-puted by weighting each individual yield by the corresponding par amount of the issue outstanding at the beginning of the pe-riod, they are applicable to an investor who diversified his invest-ments between issues in rough proportion to size. To avoid in so far as possible the problem of an assumed reinvestment rate, issues maturing during the period were excluded; the yields should be particularly interesting therefore to investors who trade in long-term securities.

TABLE 23—Yields and Loss Rates over Four-year and Longer Periods of Investment, with Percents Called, Defaulted, or in Good Standing; 1900–1943

LARGE ISSUES, ALL INDUSTRIES

PERIOD	Promised Yield	Realized Yield	Loss Rate	Percent Called[a]	Percent in Good Standing Throughout Period	Percent Defaulted[b]	Total Par Amount (millions)	Direction of Change in Bond Market Values
1900–1903	4.2%	4.1%	0.1%	1.2	96.8	2.0	$3,677.6	Doubtful
1904–1907	4.6	3.7	0.9	2.3	93.9	3.8	5,939.8	−
1908–1911	5.1	6.5	−1.4	1.0	95.7	3.3	7,825.7	+
1912–1915	4.7	2.7	2.0	1.7	88.2	10.1	9,824.3	−
1916–1919	5.0	0.2	4.8	2.3	92.8	4.9	10,669.7	−
1920–1923	6.9	8.8	−1.9	1.7	95.3	3.0	11,654.3	+
1924–1927	6.0	8.5	−2.5	8.3	87.4	4.3	14,889.1	+
1928–1931	5.0	−0.9	5.9	12.7	84.7	2.6	18,911.0	−
1932–1935	8.9	11.7	−2.8	8.9	74.7	16.4	21,850.9	+
1936–1939	4.9	1.3	3.6	30.9	60.3	8.8	17,911.1	−
1940–1943	5.6	7.8	−2.2	22.7	75.0	2.3	17,078.3	+
1900–1907	4.2	3.6	0.6	0.9	98.4	0.7	3,540.1	−
1900–1919	4.2	3.3	0.9	0.9	89.7	9.4	3,209.4	−
1908–1915	5.1	4.8	0.3	2.0	88.3	9.7	7,514.7	+
1920–1927	6.7	8.7	−2.0	4.0	91.3	4.7	10,759.9	+
1920–1931	6.6	6.1	0.5	10.9	84.6	4.5	9,527.5	−
1920–1939	6.5	5.9	0.6	21.6	55.8	22.6	7,499.0	+
1924–1939	5.8	5.1	0.7	32.3	50.4	17.3	10,396.0	+
1928–1939	4.9	3.1	1.8	35.8	45.4	18.8	15,905.6	−
1932–1939	8.2	7.3	0.9	31.3	49.7	19.0	19,754.2	+

TABLE 23
(continued)

LARGE ISSUES, RAILROADS

PERIOD	Promised Yield	Realized Yield	Loss Rate	Percent Called^a	Percent in Good Standing Throughout Period	Percent Defaulted^b	Total Par Amount (millions)	Direction of Change in Bond Market Values
1900–1903	4.1%	4.0%	0.1%	1.3	97.5	1.2	$3,080.9	Doubtful
1904–1907	4.2	3.0	1.2	3.6	95.7	0.7	4,287.1	−
1908–1911	4.7	5.6	−0.9	1.1	96.7	2.2	5,448.5	+
1912–1915	4.5	1.9	2.6	0.2	89.0	10.8	6,624.2	−
1916–1919	4.8	0.1	4.7	1.2	96.3	2.5	6,868.3	−
1920–1923	6.6	8.6	−2.0	0.4	97.0	2.6	7,207.8	+
1924–1927	5.7	8.7	−3.0	1.7	95.1	3.2	7,869.8	+
1928–1931	4.6	−2.8	7.4	2.0	96.0	2.0	8,296.3	−
1932–1935	8.4	10.2	−1.8	1.7	76.1	22.2	9,270.6	+
1936–1939	4.6	−2.5	7.1	7.8	75.8	16.4	7,240.2	−
1940–1943	7.3	12.1	−4.8	7.6	90.2	2.2	6,865.0	+
1900–1907	4.1	3.5	0.6	1.1	98.3	0.6	2,956.4	−
1900–1919	4.1	3.3	0.8	0.4	91.4	8.2	2,709.7	−
1908–1915	4.7	4.0	0.7	0.5	89.8	9.7	5,214.3	+
1920–1927	6.5	8.7	−2.2	1.0	94.1	4.9	6,892.4	+
1920–1931	6.5	5.6	0.9	1.0	93.3	5.7	6,145.4	−
1920–1939	6.3	5.2	1.1	3.5	70.0	26.5	4,981.9	+
1924–1939	5.5	3.7	1.8	4.4	72.0	23.6	5,680.3	+
1928–1939	4.5	1.1	3.4	6.0	64.6	29.4	7,243.4	−
1932–1939	8.1	3.8	4.3	6.1	63.3	30.6	8,675.0	+

TABLE 23
(continued)

LARGE ISSUES, PUBLIC UTILITIES

PERIOD	Promised Yield	Realized Yield	Loss Rate	Percent Called[a]	Percent in Good Standing Throughout Period	Percent Defaulted[b]	Total Par Amount (millions)	Direction of Change in Bond Market Values
1900–1903	4.6%	3.8%	0.8%	0.0	96.3	3.7	$ 445.1	Doubtful
1904–1907	5.2	2.8	2.4	0.0	96.5	3.5	758.3	–
1908–1911	5.9	8.4	–2.5	0.6	90.6	8.8	1,313.3	+
1912–1915	5.3	4.0	1.3	3.0	89.1	7.9	2,007.8	–
1916–1919	5.6	–0.8	6.4	3.0	84.3	12.7	2,516.6	–
1920–1923	8.1	10.4	–2.3	2.6	93.6	3.8	2,920.0	+
1924–1927	6.3	8.8	–2.5	13.6	81.8	4.6	4,297.2	+
1928–1931	5.1	1.0	4.1	15.6	82.8	1.6	7,062.5	–
1932–1935	8.2	11.7	–3.5	8.7	81.1	10.2	9,250.1	+
1936–1939	5.0	4.1	0.9	43.2	53.4	3.4	8,679.3	–
1940–1943	4.5	5.1	–0.6	27.0	70.9	2.1	8,146.3	+
1900–1907	4.6	3.4	1.2	0.0	100.0	0.0	426.4	–
1900–1919	4.7	3.4	1.3	3.7	80.4	15.9	392.8	–
1908–1915	5.9	6.4	–0.5	1.7	87.8	10.5	1,287.0	+
1920–1927	7.4	9.5	–2.1	8.0	90.4	1.6	2,492.0	+
1920–1931	7.4	7.5	–0.1	18.0	78.8	3.2	2,259.8	–
1920–1939	7.3	7.8	–0.5	44.5	35.2	20.3	1,668.6	+
1924–1939	6.2	6.9	–0.7	58.7	30.1	11.2	3,283.2	+
1928–1939	5.1	4.9	0.2	55.4	36.6	8.0	6,213.1	–
1932–1939	7.6	9.2	–1.6	46.7	45.8	7.5	8,448.3	+

TABLE 23
(continued)

LARGE ISSUES, INDUSTRIALS

PERIOD	Promised Yield	Realized Yield	Loss Rate	Percent Called^a	Percent in Good Standing Throughout Period	Percent Defaulted^b	Total Par Amount (millions)	Direction of Change in Bond Market Values
1900–1903	5.1%	5.8%	−0.7%	2.7	87.0	10.3	$151.6	Doubtful
1904–1907	5.9	8.0	−2.1	0.0	81.7	18.3	894.4	−
1908–1911	5.9	8.4	−2.5	1.2	97.8	1.0	1,063.9	+
1912–1915	5.1	4.9	0.2	6.0	83.7	10.3	1,192.3	−
1916–1919	5.1	2.7	2.4	5.6	93.2	1.2	1,284.8	−
1920–1923	6.1	6.8	−0.7	5.8	91.4	2.8	1,526.5	+
1924–1927	6.3	7.3	−1.0	18.3	74.5	7.2	2,722.1	+
1928–1931	5.5	0.1	5.4	29.3	65.1	5.6	3,552.2	−
1932–1935	12.6	15.6	−3.0	28.1	54.6	17.3	3,330.2	+
1936–1939	5.2	3.2	2.0	58.2	35.8	6.0	1,991.6	−
1940–1943	4.1	4.5	−0.4	48.9	50.7	0.4	2,067.0	+
1900–1907	5.1	5.2	−0.1	0.0	94.4	5.6	157.3	−
1900–1919	4.9	4.7	0.2	4.3	82.0	13.7	106.9	−
1908–1915	5.9	7.0	−1.1	9.5	82.0	8.5	1,013.4	++
1920–1927	5.9	7.0	−1.1	10.8	79.2	10.0	1,375.5	+
1920–1931	5.9	5.9	0.0	48.5	50.0	1.5	1,122.3	−
1920–1939	5.6	6.3	−0.7	79.3	16.1	4.6	848.5	+
1924–1939	5.8	6.6	−0.8	81.0	12.4	6.6	1,432.5	+
1928–1939	5.4	4.9	0.5	71.5	13.1	15.4	2,449.1	−
1932–1939	10.8	12.6	−1.8	64.6	18.3	17.1	2,630.9	+

TABLE 23
(continued)

SMALL ISSUES, ALL INDUSTRIES

PERIOD	Promised Yield	Realized Yield	Loss Rate	Percent Called[a]	Percent in Good Standing Throughout Period	Percent Defaulted[b]	Total Par Amount (millions)	Direction of Change in Bond Market Values
1900–1903	4.3%	4.4%	−0.1%	4.2	95.2	0.6	$134.0	Doubtful
1904–1907	4.4	3.0	1.4	0.7	98.8	0.5	120.6	−
1908–1911	5.1	5.7	−0.6	4.0	88.6	7.4	147.2	+
1912–1915	5.0	3.1	1.9	2.7	87.1	10.2	188.4	−
1916–1919	5.6	2.0	3.6	4.2	85.1	10.7	190.9	−
1920–1923	7.1	8.7	−1.6	3.0	89.6	7.4	171.7	++
1924–1927	6.7	8.1	−1.4	20.7	73.9	5.4	302.6	−
1928–1931	5.8	−1.3	7.1	15.2	73.8	11.0	303.9	+
1932–1935	12.4	13.8	−1.4	8.2	63.2	28.6	283.1	−
1936–1939	6.3	3.7	2.6	29.8	63.5	6.7	212.3	+
1940–1943	6.4	8.6	−2.2	37.2	50.8	12.0	153.6	+
1900–1907	4.4	3.8	0.6	5.3	93.9	0.8	107.5	−
1900–1919	4.4	3.8	0.6	7.2	81.3	11.5	70.6	−
1908–1915	5.1	4.4	0.7	2.9	83.4	13.7	131.9	++
1920–1927	7.0	8.4	−1.4	12.3	83.2	4.5	161.0	−
1920–1931	7.0	6.6	0.4	18.7	75.5	5.8	134.3	++
1920–1939	6.6	6.4	0.2	28.6	55.7	15.7	77.6	−
1924–1939	6.3	6.0	0.3	41.3	43.3	15.4	152.9	++
1928–1939	5.4	3.9	1.5	36.6	45.0	18.4	202.4	−
1932–1939	11.1	10.2	0.9	32.0	50.4	17.6	223.9	+

TABLE 23
(continued)

SMALL ISSUES, RAILROADS

PERIOD	Promised Yield	Realized Yield	Loss Rate	Percent Called^a	Percent in Good Standing Throughout Period	Percent Defaulted^b	Total Par Amount (millions)	Direction of Change in Bond Market Values
1900–1903	4.3%	4.3%	0.0%	5.6	93.8	0.6	$95.1	Doubtful
1904–1907	4.3	3.0	1.3	0.4	98.9	0.7	78.4	−
1908–1911	4.8	5.4	−0.6	3.9	92.3	3.8	85.3	+
1912–1915	4.5	2.4	2.1	2.4	82.9	14.7	90.0	−
1916–1919	5.3	1.1	4.2	0.1	89.4	10.5	84.7	−
1920–1923	6.5	8.1	−1.6	1.1	97.4	1.5	76.7	+
1924–1927	6.0	8.1	−2.1	1.5	94.9	3.6	82.3	+
1928–1931	4.9	−1.4	6.3	3.9	93.6	2.5	78.0	−
1932–1935	7.9	10.5	−2.6	2.3	75.1	22.6	58.3	+
1936–1939	4.5	0.0	4.5	9.2	84.7	6.1	45.7	−
1940–1943	6.8	9.7	−2.9	6.1	79.3	14.6	34.1	+
1900–1907	4.3	3.8	0.5	6.9	92.6	0.5	73.8	−
1900–1919	4.3	3.6	0.7	10.2	83.1	6.7	50.2	−
1908–1915	4.7	4.0	0.7	1.1	82.7	16.2	71.1	+
1920–1927	6.3	8.2	−1.9	1.7	96.6	1.7	72.4	+
1920–1931	6.4	5.8	0.6	0.1	98.7	1.2	66.2	−
1920–1939	6.5	5.9	0.6	10.1	74.1	15.8	43.5	+
1924–1939	5.7	4.3	1.4	10.2	75.4	14.4	45.0	+
1928–1939	4.7	2.2	2.5	6.4	80.6	13.0	49.3	−
1932–1939	7.5	6.3	1.2	10.6	79.1	10.3	45.3	+

TABLE 23
(continued)

SMALL ISSUES, PUBLIC UTILITIES

PERIOD	Promised Yield	Realized Yield	Loss Rate	Percent Called^a	Percent in Good Standing Throughout Period	Percent Defaulted^b	Total Par Amount (millions)	Direction of Change in Bond Market Values
1900–1903	4.4%	4.4%	0.0%	0.8	98.4	0.8	$35.9	Doubtful
1904–1907	4.5	2.9	1.6	0.9	98.7	0.4	39.1	−
1908–1911	5.7	6.2	−0.5	3.3	90.6	6.1	55.2	+
1912–1915	5.5	3.7	1.8	2.4	92.0	5.6	83.0	−
1916–1919	5.4	1.4	4.0	3.0	84.3	12.7	80.8	−
1920–1923	7.2	8.7	−1.5	4.4	84.0	11.6	74.9	+
1924–1927	6.8	8.6	−1.8	24.2	72.8	3.0	157.1	+
1928–1931	5.8	0.9	4.9	18.1	71.6	10.3	157.9	−
1932–1935	10.9	14.0	−3.1	8.5	71.8	19.7	158.9	+
1936–1939	6.5	4.5	2.0	35.2	57.5	7.3	136.1	−
1940–1943	5.3	6.6	−1.3	48.3	42.6	9.1	94.7	+
1900–1907	4.4	3.6	0.8	2.9	95.8	1.3	30.7	−
1900–1919	4.5	3.9	0.6	2.9	75.5	21.6	17.4	−
1908–1915	5.7	4.7	1.0	4.8	87.0	8.2	54.1	+
1920–1927	7.3	8.2	−0.9	14.7	78.2	7.1	68.9	+
1920–1931	7.1	7.4	−0.3	26.9	62.7	10.4	50.5	−
1920–1939	6.6	7.6	−1.0	46.4	39.2	14.4	27.2	+
1924–1939	6.5	7.4	−0.9	58.1	30.2	11.7	87.7	+
1928–1939	5.5	5.2	0.3	51.0	37.9	11.1	116.1	−
1932–1939	9.7	10.6	−0.9	42.6	46.2	11.2	135.3	+

TABLE 23
(concluded)

SMALL ISSUES, INDUSTRIALS

PERIOD	Promised Yield	Realized Yield	Loss Rate	Percent Called[a]	Percent in Good Standing Throughout Period	Percent Defaulted[b]	Total Par Amount (millions)	Direction of Change in Bond Market Values
1900–1903	5.2%	5.6%	−0.4%	0.0	100.0	0.0	$3.0	Doubtful
1904–1907	5.0	3.7	1.3	1.6	98.4	0.0	3.1	−
1908–1911	5.7	6.0	−0.3	6.4	72.9	20.7	6.7	+
1912–1915	5.5	3.1	2.4	4.3	81.4	14.3	15.4	−
1916–1919	7.4	7.1	0.3	16.4	79.0	4.6	25.4	−
1920–1923	8.6	11.4	−2.8	2.2	93.5	4.3	20.1	+
1924–1927	7.3	7.1	0.2	33.1	54.7	12.2	63.2	+
1928–1931	6.8	−6.2	13.0	19.2	61.9	18.9	68.0	−
1932–1935	19.8	16.2	3.6	12.6	36.5	50.9	65.9	+
1936–1939	8.6	5.5	3.1	35.6	59.2	5.2	30.5	−
1940–1943	10.4	15.0	−4.6	41.8	41.9	16.3	24.8	+
1900–1907	5.2	4.8	0.4	3.2	96.8	0.0	3.0	−
1900–1919	5.2	4.9	0.3	0.0	100.0	0.0	3.0	−
1908–1915	5.7	5.7	0.0	1.2	72.7	26.1	6.7	+
1920–1927	8.6	10.1	−1.5	27.8	69.9	2.3	19.7	+
1920–1931	8.7	7.8	0.9	37.0	61.8	1.2	17.6	−
1920–1939	7.4	4.9	2.5	27.6	51.7	20.7	6.9	+
1924–1939	7.1	3.3	3.8	35.8	31.7	32.5	20.2	+
1928–1939	6.4	2.0	4.4	31.9	23.0	45.1	37.0	−
1932–1939	19.2	13.2	6.0	26.9	33.6	39.5	43.3	+

Yields, loss rates, and total par amount are from *Statistical Measures*, Table 163, covering 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. Distributions of total par amount by default and extinguishment experience (after exclusion of issues paid in full at maturity) are based on Tables 164 and 165 of *Statistical Measures*, and special supplementary tabulations. Directions of changes in market values summarize movements in high-grade bond yields and in yield spreads on corporate bonds given in Tables 7 and 8 and shown in Chart 5.

[a] Includes issues extinguished before maturity by other contractual methods as well as by call.
[b] Covers issues defaulting during periods, whether extinguished or outstanding at end.

A glance at the table will illustrate the wide range of experience obtained on bond portfolios held over different periods during the past half century. Although the average levels of promised yields to maturity at the beginning of the periods differed rather markedly and erratically from the yields promised on the very best bonds outstanding at the time in the market (cf. Table 7), the trends were substantially the same. Thus the promised yields for the large and small issues were low at the beginning of the century, when basic yields were low, and were high in 1920 and 1932, when basic yields were high. In general, the weighted average promised yields of the major industry-size components followed the same pattern. The principal exception occurred in 1940, when large utility and industrial issues were selling at their top prices of the century while rail bonds sold at near lows. Rail earnings in 1940 had as yet shown little recovery from the depressed levels of the 1930's; and rail bonds, which were outstanding in large amounts, dominated the totals for all issues. It is worth noting also that small industrial concerns had not fully recovered by 1940, and that the yields on the outstanding obligations of that group were still very high (10.4 percent).

Roughly speaking, the realized yields over different four-year periods of investment conformed to the pattern of promised yields at the beginning of the four-year periods. Thus realized yields were particularly high for the periods 1932–35, 1920–23 and 1924–27, since bonds were selling at bargain prices (high promised yields) at the beginning of each of those periods. Moreover, the realized yields for the major industry and size components show a high degree of conformity to the over-all averages for most periods covered. Realized yields over the period 1932–35 were the highest of any of the four-year periods for the utilities and industrials and were the second highest for the large rails. The highest returns on large rail bonds were obtained over the period 1940–43, when rail earnings snapped back with the wartime expansion in general business activity (an average realized rate of return of 12.1 percent). On the other hand, realized returns were exceptionally low for most groups during the periods of financial collapse, 1928–31, and 1916–19. In the 1928–31 debacle, the over-all average return was negative (—0.9 percent for all large issues, and —1.3 for all small). It is noteworthy that the worst performers in that period were the small industrials (realized yield, —6.2 percent), followed by the large rails (—2.8 percent) and the small

rails (—1.4 percent). Over the same period the utilities had the best record (a realized yield of 1.0 percent for large utilities and 0.9 percent for small). In this worst period large industrial issues yielded virtually a zero rate of return (0.1 percent). The only other comparable period was 1936–39, when the realized return on large rail issues was —2.5 percent. Evidence as to the resiliency of the bond market is provided by the realized yields for the longer periods, which were always positive, and even in the period of greatest stress, 1928–39, did not drop below 3.1 percent for all large issues and 3.9 percent for all small. Comparably low returns were obtained only in the periods 1900–1907, and 1900–1919, when interest rates were rising and capital losses were substantial. Even so, realized returns did not drop below 3.3 percent for the large issues and 3.8 for the small.

The Impact of General Market Conditions on Average Yields and Loss Rates

In the discussion of yields and loss rates calculated from offering to extinguishment, it was observed that the average yield promised at offering frequently had little bearing upon the yield actually realized to extinguishment, because default status and method of extinguishment play so important a role in the determination of the realized rate of return over certain long periods (large default rates causing low realized yields and high loss rates, and large call rates causing the opposite behavior). On purely a priori grounds we should expect the situation to be quite different in the case of yields and loss rates calculated over short chronological periods. And as a matter of fact, during most of the four-year periods covered by our records, the proportion of the total par amount of bonds going into default or extinguished by call was indeed small as compared with the proportion in good standing throughout the period. It follows that the rates of return to investors over short periods were usually governed by the condition of the capital market on the assumed dates of purchase and sale, falling promised yields over a period (rising prices) implying high realized returns and low loss rates, and rising promised yields implying a reverse pattern of behavior. It was only for the assumed investment periods of the thirties that default and call rates played a significant role, and even then the effects of market conditions at the terminal dates are clearly apparent in the yield averages.

One method of detecting the influence of capital market condi-

tions on trading profits in corporate bonds is to compare the directions of change in the average promised yields over the periods with the signs of the loss rates. Other things equal, a rise in average promised yield (or a fall in bond prices) implies a positive loss rate (less received than promised); conversely, a fall in average promised yield implies a negative loss rate (more received than promised). The evidence is summarized in Table 24, which shows

TABLE 24—Number of Times That the Loss Rate and the Change in Promised Yield over Four-year Periods 1900–1943 Agreed in Sign

| | LARGE ISSUES | | | SMALL ISSUES | | | | | |
SIGN	Rail- roads	Public Utilities	Indus- trials	Rail- roads	Public Utilities	Indus- trials	All Large	All Small	Total
Same	11	10	7	10½	8½	9	28	28	56
Opposite	0	1	4	½	2½	2	5	5	10

Based on Table 23. In cases in which no change occurred in one of the variables, the value ½ was assigned to each category. For promised yields in 1944, see *Statistical Measures*, Table 163.

for the six industry-size groups the number of times that the sign of the change in average promised yield over the eleven four-year periods was the same as that of the loss rate and the number of times that it was opposite (a case when one of the variables did not change being split as one-half "same" and one-half "opposite"). As the table indicates, both for large and for small issues the signs were the same in 28 out of 33 possible comparisons, results that are highly significant in the statistical sense. Exceptional behavior occurred principally in 1936–39, for utilities and large industrials.[20] In other periods when the signs disagreed, either the loss rate or the change in promised yield was very small.

Substantially the same results are obtained by an analysis based on the yields of high-grade bonds and the quartiles of yield spreads for other issues (see Chart 5 and Table 8). An examination of

[20] The behavior of the two groups in that period as shown in Table 23 is particularly interesting. For each, the average promised yield fell, the default rate was fairly low, and the proportion extinguished by call was large, all conditions normally leading to high realized returns. Nevertheless, capital losses were incurred because an appreciable volume of the bonds called had been selling at or above their call prices at the beginning of the period. Investors in effect erred in assuming that the issues would not be called promptly.

CHART 5—Selected Indicators of Capital Market Conditions and General Business Activity, and Corporate Bond Loss Rates, 1900-1944
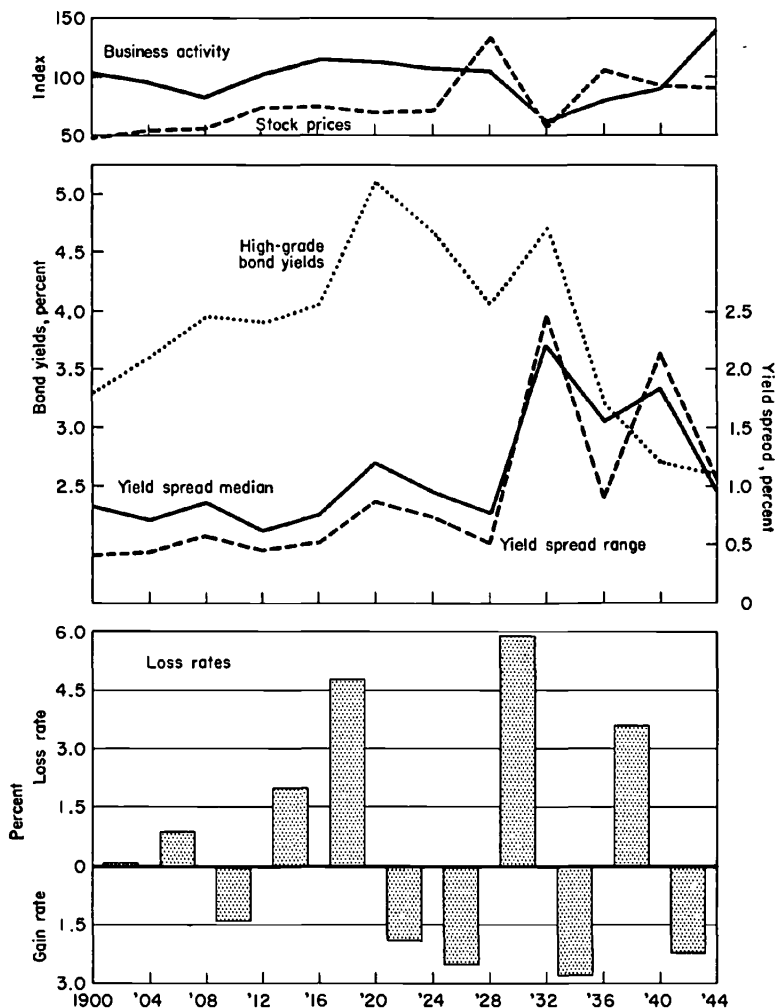
Yield spread range is the semi-interquartile range (one-half the difference between the first and third quartiles of yield on corporate bonds).

All series except loss rates are from Table 7, first quarter data for quadrennial years. Stock prices are represented by the Cowles Index, with Standard and Poor's index for 1940 and 1944 chained to it. The index of business activity is a composite of the A.T. & T., Ayres, and Persons indexes, each adjusted for economic drift. High-grade bond yields are from the works of David Durand and Willis J. Winn cited in Table 7. Loss rates are weighted averages for large issues from Table 23.

those data reveals that it is usually possible to classify the periods unambiguously into two classes: periods of market appreciation, and periods of market depreciation. As noted in Chapter 1, a fall in basic yields on high-grade issues was usually associated with declining yield spreads on lower-grade issues (a clustering up about the basic rates), the two conditions jointly indicating a general appreciation of bond market values. Conversely, a rise in basic yields was usually associated with a fanning out of other yields, both conditions indicating deteriorating investment values. Ratings were assigned on that basis to each of the periods studied (see the extreme right-hand column of Table 23). The period 1900–1903 was classified as doubtful since basic rates rose while yield spreads narrowed slightly, leaving the semi-interquartile range virtually unchanged. In 1936–39 and 1928–39 the reverse situation occurred as basic rates fell while spreads widened; but the market was classified as deteriorating since the basic rate change affected only the very highest-grade issues, and was clearly not representative of market behavior at that time. For the long periods 1920–39 and 1924–39 a similar situation was encountered, but the decline in high-grade bond yields was so drastic that these periods were classified as improving.

Twenty comparisons were made, for four-year periods from 1904 on, of the assigned directions of change in capital values and the signs of the loss rates—ten for all large issues and ten for all small. In all twenty cases the signs were in the directions anticipated: deteriorating capital market conditions were always paired with positive loss rates, and improving conditions with negative loss rates. A glance at Table 23 will indicate that for longer periods of investment, the realized yields and loss rates were dependent less upon bond market conditions on initial and terminal dates, and more upon default and extinguishment status. Note particularly the periods 1908–15, 1920–39, 1924–39, and 1932–39, over which bond prices generally rose, but the market gains were insufficient to offset default losses on particular issues.

The conclusion is that the successful short-term trader in corporate bonds is primarily concerned with short-term changes in general market conditions, and only secondarily concerned with the problem of defaults and calls. The long-term investor, who holds bonds from offering to extinguishment or over long chronological periods, is of course also influenced by the market: the future course of interest rates affects the proportion of bonds

called, the timing of calls, and in some cases the call price.[21] Over the long pull, however, the principal problem becomes one of predicting defaults, since they are at the root of most long-term capital losses. Even then, however, the loss may be reduced, if not entirely eliminated, provided the investor is able to wait out the default period. Moreover, as will be noted in subsequent chapters, the long-term bond investor is not without guides in his efforts to predict default risks on various types of securities.

High-grade Issues versus the Aggregates

One of the questions to which we shall return in later chapters is that of the comparative returns on high-grade issues and on other issues outstanding in the market. Interesting preliminary comparisons may be made by calculating the rates of return obtained by a hypothetical investor who purchased only the very top grade issues (issues selling at the basic yields on high grades) and held them over various chronological periods (Table 25). The table was computed on the assumption of purchase of a thirty-year 4 percent coupon bond at the beginning of a stated period at a price to yield the basic rate on thirty-year maturities, and sale at the end of that period at a price to yield the basic rate on $(30 - n)$-year maturities, where n is the length of the period. Such rates, of course, take no account of default losses or call premiums, or of deterioration in bond quality; they reflect solely changes in basic yields over the periods in question. A comparison of the basic experience in Table 25 with that of all outstanding issues, as given in Table 23, is summarized in Table 26. The results are expressed in the form of simple unweighted means of the quadrennial yields and loss rates for the eleven periods and of their variances about the general means.[22]

[21] For issues with variable call premiums, the timing of the call can influence the call price.

[22] Since the unweighted means of Table 26 do not take account of changing portfolio values in different periods, they should be interpreted simply as convenient summary statistics and not as measures of the returns actually obtained by investors. The situation would be different if portfolio values could be assumed stable, since an unweighted average of yields over successive periods would then measure the over-all return on the investment. For example, consider an investor who purchased a four-year Treasury note to yield 2 percent to maturity, and reinvested the proceeds at maturity in another four-year note selling to yield 3 percent to maturity. Assuming that the latter issue was not called before maturity, the annual realized rate of return at simple interest for the eight years would be the unweighted average of yields, or $2\frac{1}{2}$ percent. Our averages of quadrennial yields cannot be interpreted in

TABLE 25—Yields and Loss Rates on Hypothetical High-grade
    Bond Held over Four-year and Longer Periods of Invest-
    ment, 1900–1943
        (thirty-year, 4 percent coupon bond)

PERIOD	*Promised Yield*	*Realized Yield*	*Loss Rate*
1900–1903	3.30%	2.14%	1.16%
1904–1907	3.60	2.27	1.33
1908–1911	3.95	4.14	−0.19
1912–1915	3.90	3.33	0.57
1916–1919	4.05	0.25	3.80
1920–1923	5.10	6.65	−1.55
1924–1927	4.66	6.90	−2.24
1928–1931	4.05	1.73	2.32
1932–1935	4.70	10.60	−5.90
1936–1939	3.20	5.38	−2.18
1940–1943	2.70	3.12	−0.42
1900–1907	3.30	2.26	1.04
1900–1919	3.30	2.72	0.58
1908–1915	3.95	3.81	0.14
1920–1927	5.10	6.70	−1.60
1920–1931	5.10	5.41	−0.31
1920–1939	5.10	5.95	−0.85
1924–1939	4.66	5.81	−1.15
1928–1939	4.05	5.44	−1.39
1932–1939	4.70	8.05	−3.35

Promised yields are from *Basic Yields of Corporate•Bonds, 1900–1942*, by
David Durand, and *Basic Yields of Bonds, 1926–1947: Their Measurement
and Pattern*, by David Durand and Willis J. Winn (National Bureau of
Economic Research, Financial Research Program, 1942 and 1947, respectively).
Realized yields and loss rates were computed on the assumption of an issue
selling to yield the basic rate at both the beginning and end of the indicated
periods.

These materials indicate several persistent relationships among
the yields and loss rates. Promised yields on high grades were con-
sistently below those on large issues, while the latter were usually
below those on small issues (the averages are 3.9 percent for the
high grades, 5.5 percent for all large issues, and 6.3 percent for all
small). Interindustry comparisons for the quadrennial years show
that the average promised yields on small issues were above those
on the large twenty-one times out of thirty-three comparisons,

that convenient way since the investment values of the aggregates change
from the beginning to the end of the periods.

were below eleven times, and were equal once. Cases of lower promised yields on the small issues occurred most frequently in the rail and industrial groups, where many of the smaller issues were well secured as to earnings and assets. At the same time the promised yields on all large issues were considerably more stable than on all small (a variance of 1.8 percent for the large and 4.9 percent for the small). The small rails, however, were slightly more stable than the large rails since many were well-secured divisional issues. The promised yields on the best bonds were of course more stable than on other groups (variance, 0.5 percent), since they contained virtually no premium for default risk and were thus free of variations arising from the changing speculative temper of the market.

TABLE 26—Means and Variances of Quadrennial Yields and Loss Rates for Hypothetical High-grade Bond versus Total Outstandings; 1900–1943

	MEAN			VARIANCE		
	Promised Yield	*Realized Yield*	*Loss Rate*	*Promised Yield*	*Realized Yield*	*Loss Rate*
Hypothetical high-grade bond	3.9%	4.2%	−0.3%	0.5%	8.7%	7.0%
Large Issues,						
all industries	5.5	4.9	0.6	1.8	16.1	9.6
Railroads	5.4	4.4	1.0	2.0	25.7	16.5
Public utilities	5.8	5.4	0.4	1.6	15.6	9.5
Industrials	6.1	6.1	0.0	5.1	16.1	6.1
Small Issues,						
all industries	6.3	5.4	0.9	4.9	17.0	8.0
Railroads	5.4	4.7	0.7	1.4	16.3	10.0
Public utilities	6.2	5.6	0.6	3.2	14.4	6.3
Industrials	8.2	6.8	1.4	17.6	37.3	20.6

Based on Tables 23 and 25.

Most interesting relationships are shown among the realized yields. For the four-year periods, the lowest average was obtained on the high grades, and the highest on the small issues, with the large issues occupying an intermediate position. The same relationships were found to prevail over most of the longer chronological periods. Among the industry groups, the rails turned in

the poorest performance with respect to average realized yield, and the industrials the best. As might be expected, the high grades exhibit the greatest stability of realized yield (smallest variance) and the small issues the least stability. The large issues, however, were only slightly more stable than the small. The realized yields on large rails and small industrials were particularly unstable; on the other hand the large rails had an average level of realized yields almost as low as the high grades, while the small industrials had the highest level.

On the average, capital gains occurred only on the high-grade issues, whereas capital losses were general for the market as a whole. The tentative conclusion is that the highest returns were obtained by investors who could afford to take the greatest risks. Subsequent chapters will explore this matter further in an effort to determine the extent to which realized returns and losses are influenced by various aspects of investment quality.