Almost Everything You Wanted to Know about Recoveries on Defaulted Bonds

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This study documents, for the first time, the severity of bond defaults stratified by Standard Industrial Classification sector and by debt seniority. The highest average recoveries came from public utilities (70 percent) and chemical, petroleum, and related products (63 percent). The differences between those sectors and all the rest are statistically significant, even when adjusted for seniority. The original rating of a bond issue as investment grade or below investment grade has virtually no effect on recoveries once seniority is accounted for. In addition, neither the size of the issue nor the time to default from its original date of issuance has any association with the recovery rate. These results should provide important information for investors as well as analysts.

Perhaps the most critical analytical factor that determines required yields on risky corporate debt is the expected default probability and the severity of default. Bond-rating agencies focus almost exclusively on the probability of default and the timeliness of payment of interest and principal in their assigned risk categories. A fairly standard rule of thumb, however, reduces the rating of a firm's subordinate bond issues by two notches compared with its senior issues if the senior bond is below investment grade and by one notch if it is investment grade. This ad hoc adjustment is more than likely based on the expectation that the junior bonds will recover less than the more senior issues. Recently, the rating agencies have explicitly incorporated severity of default expectations in their private placement and structured finance analytics.

The severity issue, based on default recoveries, affects the expected loss from defaults and has been highlighted both in traditional calculations and in aging and mortality rate approaches. The term "recovery" can refer to the price of the bonds at the time of default or their value at the end of the distressed–reorganization period. In this study, we examined the recovery experience at default.[1] Recovery rates for defaulted bonds perhaps now share equal importance with default rate expectations and hence deserve increased scrutiny. We

continue that scrutiny by focusing on the industry affiliation of the defaulted debtor and, where possible, the seniority of the issue within each industry.

The reason industry affiliation is likely to be important is that the business activity of an enterprise dictates the types of assets and the competitive conditions of firms within different industrial sectors. Assuming the equality of other factors such as leverage structure, the more tangible and liquid the assets, the higher their liquidation value and, hence, the higher the expected price of the debt securities in a distressed situation. In addition, in certain industries, the more certain the future earnings of the distressed entity, the higher the enterprise value and its debt component. For example, the asset structure and regulatory environment of public utilities bodes for better recovery rates than those of industries that operate in a highly competitive environment and have little or no tangible assets. Because these factors need to be assessed in the pricing of debt securities throughout their duration—from original issuance and most definitely in a distressed situation—the actual recovery experience by industry and priority is likely to be useful and welcome information.

RECOVERY RATES BY SENIORITY

The ability to sell publicly held and traded bonds just after default at positive values has always been an attractive attribute. For decades, average prices at default have been calculated at approximately 40 cents on the dollar (e.g., see Hickman 1958). Indeed, this average overall recovery rate persists today. The arithmetic average recovery rate on a sample of more than 700 defaulting bond issues from 1978 to 1995 was $41.70 per $100 face value.[2] As Table 1

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Table 1. Weighted-Average Recovery Rates per $100 Face Value on Defaulted Debt by Seniority, 1978–95

Default Year	Senior Secured		Senior Unsecured		Senior Subordinated		Subordinated		Discount/ Zero Coupon	
	Number	Recovery Rate	Number	Recovery Rate	Number	Recovery Rate	Number	Recovery Rate	Number	Recovery Rate
1995	5	$44.64	9	$50.50	17	$39.01	1	$20.00	1	$17.50
1994	5	48.66	8	51.14	5	19.81	3	37.04	1	5.00
1993	2	55.75	7	33.38	10	51.50	9	28.38	4	31.75
1992	15	59.85	8	35.61	17	58.20	22	49.13	5	19.82
1991	4	44.12	69	55.84	37	31.91	38	24.30	9	27.89
1990	12	32.18	31	29.02	38	25.01	24	18.83	11	15.63
1989	9	82.69	16	53.70	21	19.60	30	23.95	0	—
1988	13	67.96	19	41.99	10	30.70	20	35.27	0	—
1987	4	90.68	17	72.02	6	56.24	4	35.25	0	—
1986	8	48.32	11	37.72	7	35.20	30	33.39	0	—
1985	2	74.25	3	34.81	7	36.18	15	41.45	0	—
1984	4	53.42	1	50.50	2	65.88	7	44.68	0	—
1983	1	71.00	3	67.72	0	—	4	41.79	0	—
1982	0	—	16	39.31	0	—	4	32.91	0	—
1981	1	72.00	0	—	0	—	0	—	0	—
1980	0	—	2	26.71	0	—	2	16.63	0	—
1979	0	—	0	—	0	—	1	31.00	0	—
1978	0	—	1	60.00	0	—	0	—	0	—
Total/average	85	57.89	221	47.65	177	34.38	214	31.34	31	21.66
Median		51.04		40.65		27.86		31.96		18.66
Standard deviation		22.99		26.71		25.08		22.42		18.35

shows, however, seniority does play the expected important role: Senior secured debt averages about 58 percent of face value; senior unsecured, 48 percent; senior subordinate, 34 percent; and junior subordinate, about 31 percent.

RECOVERY RATES BY INDUSTRY

We first stratified our sample of 696 defaulted bond issues into 61 groups by three-digit Standard Industrial Classification (SIC) codes.[3] A firm was assigned an SIC code corresponding to the product group that accounts for its greatest value of sales. Many of the sectors (14) included 20 or more observations, the majority of codes (47) had fewer than 20, and a large number had fewer than 10 observations. The weighted and unweighted (by dollar amount outstanding) recovery rates at default for those 61 sectors are shown in Table 2.

We cannot feel very comfortable with Table 2's summary averages because many sectors have so few data points and also because measures of variance are not meaningful. As a result, we combined a number of the three-digit SIC codes into logical groups to arrive at a reduced number of reasonable aggregations. Table 3 shows aggregate recovery prices per $100 for 18 industry categories, most of which have more than 20 observations each (some

have more than 50 observations). The highest arithmetic average recoveries came from public utilities (70 percent) and from chemicals, petroleum, and related products (63 percent). The difference in the recovery rates of these two industrial aggregations compared with all the rest is quite large. Next came heavy machinery and electrical instruments, business and personal services, food, wholesale and retail trade, diversified manufacturing, and casino, hotel, and recreation (all exceeding 40 percent). The remaining industrial sectors, with the exception of lodging, hospital, and nursing facilities (26 percent), had recovery rates in the 30–40 percent range. Weighted-average recoveries showed similar patterns with a few exceptions; for example, chemicals and related products actually exceeded utilities, and the lowest category had weighted recovery rates of less than 20 percent.[4]

Although the remaining industrial categories listed may appear to be fairly tightly clustered in the 30–40 percent recovery range, in reality, recoveries in the high 40 percent range are quite distant and significantly higher in many cases than those in the low 30 percent range. Machinery, instruments, and related products; business and personal services; and food product companies have recovered considerably more than, for example, drilling companies and textile/apparel firms.[5]

Table 2. Recovery Rates by Industry: Defaulted Bonds, 1971–95

SIC Code	Industry	Number of Observations	Recovery Rate Average	Recovery Rate Weighted
492	Gas utilities	25	$81.75	$90.42
150	Construction contracting	1	71.00	71.00
616	Mortgage banks	4	67.60	49.80
290	Petroleum and energy products	23	67.29	84.18
730	Personal business services—computer	3	64.87	70.90
491	Electric utilities	29	62.57	51.43
560	Apparel and accessory stores	1	61.00	61.00
790	Recreation services	10	59.00	60.70
280	Chemicals and allied products	6	58.00	61.63
470	Transportation services	5	52.73	43.16
350	Machinery (except electric)	20	50.54	49.95
300	Rubber and plastic products	6	49.96	56.55
500	Wholesale and retail trade	7	49.54	52.00
610	Finance companies	3	49.50	53.91
380	Instruments and related products	2	49.38	49.30
770	Casino hotels	11	48.91	44.22
609	Noncredit institutions	12	48.75	54.76
520	Retail trade	2	48.50	47.56
390	Manufacturing, miscellaneous	6	47.40	51.18
260	Paper and allied products	6	46.83	44.37
270	Printing and publishing	8	46.77	47.76
330	Steel and metal products	32	46.07	42.92
360	Electrical and electronic equipment	14	46.06	35.90
200	Food and related—manufacturing	18	45.28	37.40
208	Beverage bottlers	1	44.50	44.50
496	Steam and air conditioning supply	2	44.00	43.99
420	Trucking	4	43.63	40.59
620	Financial services	7	42.07	36.46
100	Mining	10	40.69	33.34
410	Bus transit	1	40.50	40.50
998	Diversified manufacturing	14	40.11	23.64
450	Air transportation	39	39.50	41.25
483	Radio and TV broadcasting	32	38.97	39.81
720	Laundry service	2	38.50	39.31
220	Textile and mill products	18	37.22	38.52
590	Retail miscellaneous	20	36.95	38.37
780	Movie production	15	35.00	35.41
540	Food stores	21	34.47	26.68
650	Real estate	34	34.21	27.93
320	Building materials	26	32.31	25.25
340	Fabricated metal products	10	32.15	24.62
130	Oil and gas drilling	33	31.54	31.91
580	Eating and drinking places	3	31.50	38.74
630	Insurance	10	31.48	35.17
530	Department stores	37	30.69	27.99
533	Variety stores	5	30.33	18.28
370	Transportation equipment	8	30.28	40.77
602	Commercial banks	22	29.33	21.60
510	Wholesale trade—nondurable goods	3	28.08	34.15
800	Hospitals and nursing facilities	11	26.89	18.47
482	Telegraph and related communications	10	26.43	34.85
701	Lodging places	11	26.09	22.12
230	Apparel and related products	13	23.96	26.13
570	Furniture, furnishings and equipment stores	2	23.00	23.20
632	Hospitals and medical services	3	22.50	31.41
670	Investment funds and trusts	2	20.82	28.21
138	Oil and gas field services	2	19.07	19.08
310	Leather products	1	13.00	13.00
250	Furniture	3	9.50	11.59
603	Savings institutions	6	9.25	19.68
240	Wood and related products	1	5.00	5.00

Table 3. Recovery Rates by Industry: Defaulted Bonds by Three-Digit SIC Code, 1971–95

Industry	SIC Code[a]	Number of Observations	Recovery Rate Average	Weighted	Median	Standard Deviation
Public utilities	490	56	$70.47	$65.48	$79.07	$19.46
Chemicals, petroleum, rubber, and plastic products	280, 290, 300	35	62.73	80.39	71.88	27.10
Machinery, instruments, and related products	350, 360, 380	36	48.74	44.75	47.50	20.13
Services—business and personal	470, 632, 720, 730	14	46.23	50.01	41.50	25.03
Food and kindred products	200	18	45.28	37.40	41.50	21.67
Wholesale and retail trade	500, 510, 520	12	44.00	48.90	37.32	22.14
Diversified manufacturing	390, 998	20	42.29	29.49	33.88	24.98
Casino, hotel, and recreation	770, 790	21	40.15	39.74	28.00	25.66
Building materials, metals, and fabricated products	320, 330, 340	68	38.76	29.64	37.75	22.86
Transportation and transportation equipment	370, 410, 420, 450	52	38.42	41.12	37.13	27.98
Communication, broadcasting, movie production, printing, and publishing	270, 480, 780	65	37.08	39.34	34.50	20.79
Financial institutions	600, 610, 620, 630, 670	66	35.69	35.44	32.15	25.72
Construction and real estate	150, 650	35	35.27	28.58	24.00	28.69
General merchandise stores	530, 540, 560, 570, 580, 590	89	33.16	29.35	30.00	20.47
Mining and petroleum drilling	100, 130	45	33.02	31.83	32.00	18.01
Textile and apparel products	220, 230	31	31.66	33.72	31.13	15.24
Wood, paper, and leather products	240, 250, 260, 310	11	29.77	24.30	18.25	24.38
Lodging, hospitals, and nursing facilities	700 through 890	22	26.49	19.61	16.00	22.65
Total		696	41.00	39.11	36.25	25.56

[a]For example, 490 includes 490 through 499; 280 includes 280 through 289; and 700 includes 700 through 709.

Table 3 also lists, by industry, standard deviations of the average recovery rates. Most are in the 20–28 percent range. Public utilities, which have the highest recovery rates, are among the lowest in variance. Textile and apparel manufacturers and mining and petroleum drilling both have low average recoveries and relatively low variance. In general, variability is quite high relative to the mean recovery price, indicating that knowledge of specific issuer characteristics is still important.

TESTING FOR STATISTICAL SIGNIFICANCE

Public utilities and chemicals, petroleum, and plastics manufacturers experienced much higher recovery rates than did the rest of the industrial sectors. Also, senior bonds recovered more than junior bonds. The higher recoveries in certain industries might be explained by a greater preponderance of senior secured bonds or senior unsecured bonds in the higher-recovery sectors. Table 4 lists recovery prices by seniority within the 18 industrial categories.[6] According to this table, public utilities, for example, appear to have the vast majority of their bonds in the senior classes (53/56 = 95 percent).

Chemicals and related industries have a lower senior priority ratio (63 percent), which is still higher than most, but not all, others.

Table 5 compares the average recovery prices of senior secured public utility issues ($64.42) and of senior secured chemical industry issues ($75.04) with all other senior secured debt ($56.59). The same test was applied to the senior unsecured class in the two industries (with recovery prices of $77.74 and $71.91, respectively) and versus all other senior unsecured defaults ($42.56 and $45.76).

The results show that the differences between public utilities and all other industries and between chemicals and all other groups are significant at the 1 percent or 5 percent level; that is, the observed differences did not happen by chance and are not determined by seniority. We thus concluded that the nature of the firms' assets and the industry's competitive structure, and perhaps other industry-related variables, explain differential recovery rates.

RECOVERY RATES BY SENIORITY AND ORIGINAL CREDIT RATING

Does a defaulting issue's original bond rating play any role in the recovery rate? One might expect that

Table 4. Recovery Rates by Industry and Seniority: Defaulted Bonds, 1971–95

Industry	Number of Observations	Recovery Rate Average	Recovery Rate Weighted
Mining and petroleum drilling			
Senior secured	1	$71.00	$71.03
Senior unsecured	9	43.60	37.37
Senior subordinated	12	37.78	36.51
Subordinated	21	25.41	27.48
Discount and zero coupon	2	17.75	19.84
Construction and real estate			
Senior secured	1	40.00	40.00
Senior unsecured	12	41.91	39.16
Senior subordinated	10	37.31	24.59
Subordinated	12	26.52	22.79
Food and kindred products			
Senior unsecured	6	54.42	48.27
Senior subordinated	6	31.00	36.22
Subordinated	6	50.42	36.68
Textile and apparel products			
Senior unsecured	8	34.47	36.24
Senior subordinated	14	31.65	36.56
Subordinated	6	28.25	24.80
Discount and zero coupon	3	31.00	32.51
Wood, paper, and leather products, and publishing			
Senior unsecured	3	47.33	58.54
Senior subordinated	8	36.63	27.32
Subordinated	5	44.33	47.14
Discount and zero coupon	3	15.00	8.27
Chemicals, petroleum, rubber, and plastic products			
Senior secured	6	75.04	89.17
Senior unsecured	16	71.91	81.71
Senior subordinated	7	63.07	77.81
Subordinated	6	25.54	31.46
Building materials, metals, and fabricated products			
Senior secured	7	48.33	47.66
Senior unsecured	20	44.23	36.55
Senior subordinated	9	44.08	33.02
Subordinated	28	35.39	31.83
Discount and zero coupon	4	6.31	7.15
Machinery, instruments, and related products			
Senior unsecured	11	47.55	51.36
Senior subordinated	8	58.41	35.40
Subordinated	15	44.75	41.60
Discount and zero coupon	2	46.50	50.52
Diversified manufacturing			
Senior unsecured	3	85.71	82.37
Senior subordinated	7	36.73	29.33
Subordinated	10	33.16	21.58
Transportation and transportation equipment			
Senior secured	14	55.72	58.12
Senior unsecured	22	30.83	36.28
Senior subordinated	8	45.81	48.02
Subordinated	8	21.60	15.00
Services—business and personal			
Senior secured	6	56.61	54.37
Senior subordinated	6	35.18	47.96
Subordinated	2	48.25	43.06
Communications, broadcasting, and movie production			
Senior secured	2	36.88	38.64
Senior unsecured	12	34.97	53.73
Senior subordinated	13	39.77	38.10
Subordinated	21	33.16	35.56
Discount and zero coupon	9	36.61	38.16

Table 4. Recovery Rates by Industry and Seniority: Defaulted Bonds, 1971–95
(continued)

Industry	Number of Observations	Recovery Rate Average	Recovery Rate Weighted
Public utilities			
Senior secured	21	$64.42	$59.64
Senior unsecured	32	77.74	71.53
Subordinated	2	44.00	43.99
Discount and zero coupon	1	17.75	17.75
Wholesale and retail trade			
Senior unsecured	2	39.00	33.50
Senior subordinated	2	76.45	69.18
Subordinated	7	37.88	47.17
Discount and zero coupon	1	32.00	32.00
General merchandise stores			
Senior unsecured	26	44.55	45.59
Senior subordinated	27	36.37	30.20
Subordinated	26	25.95	28.83
Discount and zero coupon	10	13.67	10.18
Financial institutions			
Senior secured	6	49.20	52.70
Senior unsecured	37	38.68	42.70
Senior subordinated	12	29.70	30.78
Subordinated	11	24.81	21.28
Lodging, hospitals, and nursing facilities			
Senior unsecured	4	20.50	19.39
Senior subordinated	8	26.75	15.49
Subordinated	9	28.08	18.63
Discount and zero coupon	1	34.00	34.00
Casino, hotel, and recreation			
Senior secured	10	40.78	37.18
Senior unsecured	1	100.00	100.00
Senior subordinated	5	34.20	44.59
Subordinated	4	26.13	26.22
Discount and zero coupon	1	60.00	60.00
Total	696	41.00	39.11

Table 5. Significance Test for Selected Industry versus Aggregate Recovery Rates by Seniority

Industry Group/Seniority	Industry Group Number of Observations	Industry Group Average Price	Industry Group Standard Deviation	Entire Sample[a] Number of Observations	Entire Sample[a] Average Price	Entire Sample[a] Standard Deviation	t-Test[b]
Public utilities							
Senior secured	21	$64.42	$14.03	64	$55.75	$25.17	1.98*
Senior unsecured	32	77.74	18.06	189	42.56	24.89	9.59**
Chemicals, petroleum, rubber, and plastics							
Senior secured	6	75.04	25.83	79	56.59	22.16	1.70*
Senior unsecured	16	71.91	18.41	205	45.76	26.52	5.27**
Senior subordinated	7	63.07	25.74	170	33.20	24.45	3.01**

[a]From Table 1, excluding observations from the particular industrial group(s) being tested.

[b]
$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\dfrac{\text{Std Dev}_1^2}{N_1} + \dfrac{\text{Std Dev}_2^2}{N_2}}}$$

*Significant at the 5 percent level.
**Significant at the 1 percent level.

because a bond issue is almost always below investment grade just prior to default, its original rating should play no role in determining its recovery rate.[7] If, however, firms affiliated with certain industries have a greater preponderance of higher-rated, senior secured, and senior unsecured original debt, then one might expect higher recovery rates. An obvious example of this structure would be public utilities, and indeed, utilities do recover more than other sectors.

The comparison of the average recovery price for high-rated, investment-grade original issues versus low-rated, non-investment-grade issues, presented in Table 6, shows clearly that original rating, at least in terms of the broad investment-grade versus junk-bond categories, has no effect on recoveries once seniority is taken into account. Although this finding is perhaps consistent with intuition and expected values, it is counter to what was observed when the original rating was not stratified by seniority.

The time between origination date and default date also has no effect on the recovery rate (Altman and Kishore 1996). We also tested for the association between the size of an issue (face value), stratified by seniority, and the default recovery rate. We found absolutely no statistical association between size and recovery rate.

CONCLUSION

We have documented average recovery rates on defaulted bonds stratified by industry and also by seniority. Aggregated by three-digit SIC codes, the results show similar recovery rates for a large number of industries, although great differences occur in a few sectors. We did not calculate default rates by industry, which would require assembling new issue and cumulative totals of amounts outstanding stratified by accepted definitions of industries. We intend to pursue this compilation in a subsequent study.[8]

Table 6. Recovery Rates by Seniority and Original Bond Rating, 1971–95

| | | Recovery Rate | | | |
Seniority	Number of Observations	Average Price	Weighted Price	Median Price	Standard Deviation
Senior secured					
Investment grade	16	$54.80	$48.58	$55.82	$15.11
Noninvestment grade	58	56.42	56.82	50.50	24.93
Senior unsecured					
Investment grade	49	48.20	41.34	40.00	30.63
Noninvestment grade	175	48.73	55.61	42.50	25.64
Senior subordinated					
Investment grade	26	32.74	37.26	29.75	20.43
Noninvestment grade	136	39.93	35.01	32.00	25.67
Subordinated					
Investment grade	63	31.89	33.97	30.00	18.75
Noninvestment grade	136	31.67	27.58	28.40	21.07
Discount and zero coupon					
Investment grade	7	24.14	23.57	23.50	10.79
Noninvestment grade	30	24.42	17.21	19.90	19.14
Total	696	41.00	39.11	36.25	25.56

NOTES

1. Altman and Eberhart (1994) observed recoveries at the confirmation of the Chapter 11 filing (or at liquidation) and found that the most-senior bonds recovered significantly more at default than less-senior bonds and also performed significantly better from default to confirmation and emergence. This finding is perhaps surprising because one would expect that the market would properly discount the junior bonds at default and that the postdefault return experience would be about the same for junior bonds as for those with senior priority—especially because the variance of returns was about the same for each class of bonds.
2. Altman and Nammacher (1987) found that the average recovery rate on a much smaller sample covering the period from 1974 to 1985 was essentially identical, at $41.60. It should be noted that our defaulted bond sample includes bonds that at issuance were investment grade (25 percent) and noninvestment grade (75 percent).
3. These SIC codes are from Standard & Poor's Compustat and Securities Data Company's compilations and may be different from industrial classifications found in other data sources. Indeed, Kahle and Walkling (1996) found that nearly 80 percent of the four-digit classification (the most finely separated categories) is different between Compustat and the CRSP stock data files; about 50 percent differences were found at the three-digit level and 36 percent at the two-digit level. Other sources of SIC codes are Lexis, the SEC Directory, the Million Dollar Directory, and the Value Line Investment Survey. Kahle and Walkling, after a controlled experiment, concluded that Compustat's SIC codes tend to outperform the CRSP codes, despite the fact that Compustat does not provide historical information about firms' industry affiliations.
4. The weighted recoveries were 80 percent for the chemicals group and 65 percent for public utilities. The relatively high price and size of Texaco's defaulting issues were primarily responsible for this reversal in averages.
5. We were somewhat surprised that services (personal and business) recovered more than 46 percent of face value. This sector's sample size was quite small, however, and had a few outliers.
6. Although we include discounted/zero-coupon bonds in our compilation, this category is less meaningful because it can encompass several of the seniority classes (e.g., senior subordinated or subordinated zero-coupon bonds).
7. In an earlier study (Altman and Kishore 1996), we observed that about 6 percent of bonds that defaulted had an investment-grade rating six months prior to default but that for the bond to be investment grade just prior to default is very rare (perhaps in just two or three cases during the past 25 years).
8. We would like to express our appreciation to Martin Fridson for his motivation and encouragement in this project.

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