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ANALYSIS OF JUNK BOND INVESTMENT RESULTS

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Recorder: J. CALVIN WINTER, III

The first report on a study of bond investment results of life insurance companies with high-yield bond portfolios will be presented. The study, covering years 1986–92, was commissioned by the Society of Actuaries Life Insurance Practice Research Committee. The study will be discussed by a member of a bond rating firm.

MR. ROBERT J. JOHANSEN: I'm chair of the Project Oversight Group (POG) that guided the Society's study of junk bond investment results. The study is a project of Ed Lew's Life Insurance Practice Research Committee. When the study began several eons ago, the committee was called the Research Committee and it covered all the bases. The other members of the project oversight group are Bob Callahan, Gregory Habeeb, Doug Hodes, Bob Miller and Chester Schneider.

Attendees were given a chance to read an excerpt from the Request for Proposal (RFP) prepared by the POG which covers problems in acquiring accurate data that was more prophetic than we knew. The excerpt from the RFP states, we were obliged to use only publicly available data for the study; this meant relying entirely on statutory annual statements. One of the reasons for the limitation was that the Society was at the same time conducting the Credit Risk Study and our study would have otherwise added to the burdens of some companies.

Through the cooperation of the National Association of Insurance Commissioner's (NAIC) central office in Kansas City, the Society was able to obtain computer records of annual statement data. The New York and California Insurance Departments provided access to their copies of Schedule DM for market and statement values of long-term bonds—these numbers were not in the NAIC database.

I have some words of caution on interpreting the results of this study. First, the NAIC changed its bond classification system at the end of 1990 and, more importantly, directed its securities valuation office (SVO) not to give a better rating to any bond than the rating given by a recognized rating agency, such as Moody's. Second, the accuracy of Schedule DM market values may vary by company. Schedule DM requires that companies describe how they obtained market values. From my review of a sample of the schedules, it appears that methods varied from generally reasonable to somewhat reasonable to not very reasonable. One company said they obtained their values from Drexel Burnham. I would expect, however, that results should be consistent from year to year for any given company.

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You would think that annual statement data filed with the regulators would be complete and accurate, or at least consistent. You would not believe the problems faced by our researchers. I had some idea because I had done a pilot study to make sure we could make meaningful analyses. My ingenuity was tested even though the pilot included only 12 companies.

Our list of people to whom we are indebted for help is long and our gratitude to them is deep. We leaned on the Society's able staff, especially Warren Luckner, research actuary and Mark Doherty, then director of research. Mark negotiated with the NAIC central office to provide the data we needed and he did yeoman work in obtaining access to copies of Schedule DM at the California Department of Insurance and other sources. A vote of thanks is due to the NAIC staff in Kansas City, to Harold Phillips at the California Department of Insurance and to Bob Callahan and Tom Hartman at the New York Department of Insurance. We are also indebted to two actuarial students, Mary Vizcarrondo and Valerie Chan, from Metropolitan Life Insurance Company's California office, who abstracted Schedule DM data using a laptop computer.

By dint of hard work, blood, sweat and tears, the study was completed and we are privileged to see the first results. Our researchers are Faye Albert and Dr. Paulette Johnson.

Faye Albert, a Fellow of the Society, is well qualified to conduct this study. She has managed all actuarial functions for several life insurance companies and a property/casualty company and has consulted for several continuing care retirement communities (CCRCs.) She has researched the historical impact of asset default on life companies and coauthored a paper in the *Transactions* on that subject ["The Risk of Asset Default," Report of the Society of Actuaries C-1 Task Force on Valuation and Related Areas, with Irwin T. Vanderhoof, Aaron Tenebein, and Ralph Verni, *TSA* XLI (1989): 547]. Faye also developed a probability technique to project default experience on bonds. She has served on the Education and Examination Committee in various capacities, including as General Officer.

This is not Faye Albert's first research project for the Society. A few years ago, she managed a Society research project to develop actuarial population and financial models for CCRCs. She also conducted a pilot project to compile a public actuarial database on mortality and morbidity for CCRCs.

Dr. Paulette Johnson, Professor of Statistics at Florida International University in Miami, provided the statistical expertise for this study. Paulette has an M.S. in mathematics from New Mexico State University and a Ph.D. in statistics from Kansas State University. She earned membership in two honor societies, Phi Beta Kappa and Sigma Xi. Her doctoral dissertation and several of her papers have dealt with analyses of nonlinear models. She has served on numerous committees for students applying for master's and doctoral degrees in a number of disciplines.

In addition to teaching courses in mathematics and statistics at several universities, Dr. Johnson has had considerable experience in statistical consulting in a wide variety of fields, both in and out of university settings. She is a member of the American Statistical Association and the Biometric Society. Considering that she has taught

courses in Business Statistics, this study would not have seemed at all strange and, of course, data problems are not unknown to statisticians.

We are most fortunate to have a commentary on the study and on junk bonds from Dr. Jerome Fons, vice president at Moody's Investors Service in New York City. Jerry manages Moody's research on corporate bond and commercial paper defaults and is involved in monitoring credit risk. Prior to joining Moody's, he was an economic advisor at Chemical Bank and was an economist at the Federal Reserve Bank in both New York City and Cleveland. Jerry has written extensively on the investment and risk characteristics of corporate debt. He has a B.A. from San Diego State University and a Ph.D. from the University of California; both degrees are in Economics.

Our recorder is Mr. Calvin Winter, senior vice president, Finance and Corporate Services at John Alden Life Insurance Company. Our first speaker is Dr. Jerry Fons.

DR. JEROME S. FONS: I'll give an introduction to the study. Actually, Faye and Paulette have been working on a study that looks at the investment performance of life insurance companies that had significant exposure to high-yield bonds or junk bonds and compares such companies with companies that had little or no exposure to high-yield bonds. How I would summarize what they are trying to do is to determine whether or not high-yield bonds are, in fact, high yield. And they are doing that by examining the ex-post investment returns of life insurance company high-yield bond portfolios.

What I'd like to do is give a little introduction to the risks associated with high-yield bonds. I don't usually call them "high yield" because I feel that's still an unsettled matter. And I don't call them "junk" bonds either because that's a little too tough. I usually call them speculative grade debt, a designation that we've used at rating agencies for decades. First I'm going to look at the relationship between risk and our rating system. And it is our rating system that actually defines a speculative grade bond. These ratings differentiate the characteristics of the types of investments that we're examining here.

What I thought I'd do is give a brief overview of some of the default research we've done at Moody's. It's a little self-serving; I apologize. But I think the research findings apply not just to our own ratings, but to ratings in general.

What I'll start with first is to bring you up to date with default activity so far this year. Through June of this year, seven public issuers have defaulted on $698 million of public debt globally. At Moody's we look at all public markets throughout the world. A group that works under my direction follows defaulted companies.

A *default* occurs where a company misses an interest or a principal payment, or they file for protection from creditors. It would also include situations where a company completes what we call a distressed exchange offer, where bondholders are forced to accept a package of securities of lower economic value than originally promised in the bond indenture. It would also include what we call grace period defaults. Many bond indentures allow for what's called a grace period. If the company misses an interest payment deadline, they usually have an additional 30 days to make it up. We include

these as defaults because we consider them an abuse of bondholders' rights to receiving due payment. Grace period defaults are sort of an involuntary loan.

As shown in Table 1, so far the activity this year is quite modest by historical comparison. Going back over the last four years, in 1993 we saw 38 companies default on $3.6 billion of debt. In 1992, we had 49 issuers default on $8.3 billion. (The study that Faye and Paulette have done ends in 1992. So, it contains that year.) In 1991, we saw 99 companies default on $20.3 billion of public debt. And in 1990, we saw 97 companies default on $22.0 billion of public debt.

TABLE 1
NUMBER AND DOLLAR VALUE OF DEFAULTS

	1993	1992	1991	1990
Defaulted Debt (billion)	$3.6	$8.3	$20.3	$22.0
Number of Companies	38	49	99	97

So, there has been a great deal of activity. The years 1990–91 had the major wave, which you can actually see in Chart 1. In this chart I've plotted defaults as a percentage of the number of public companies, rated or unrated. Chart 2 shows the public company counts, by rating. By the way, Charts 1 and 2 include all public companies, not just those that we rated at Moody's Investor's Service.

CHART 1
TRAILING 12-MONTH SPECULATIVE GRADE DEFAULT RATES

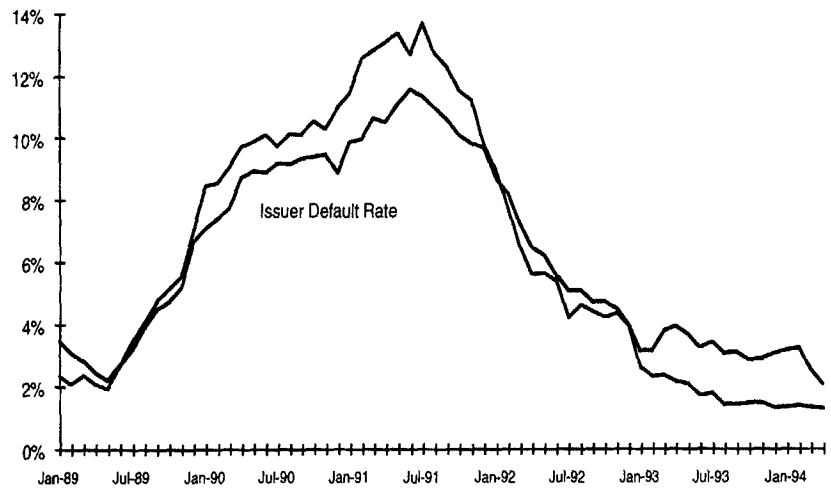
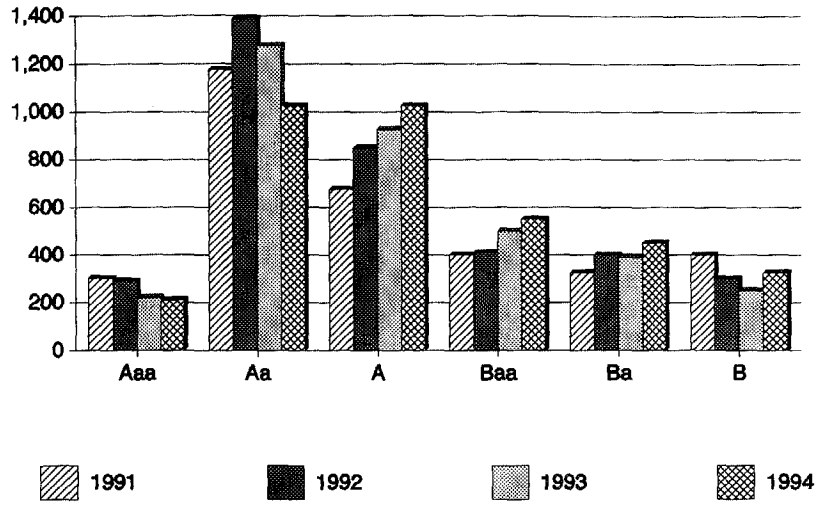


CHART 2
NUMBER OF RATED CORPORATE ISSUERS



Between 1940 and 1970, there were very few defaults. Prior to 1940, there were a number of defaults. And research on those defaults was actually conducted by a fellow named Braddock Hickman in a National Bureau of Economic Research (NBER)-sponsored study. He did basically the same thing that we did; his question was, Are investors compensated for the risks associated with low-grade bonds?

Table 2 shows that beginning in 1970 things picked up big. In 1970, there was the default of the Penn Central Railroad in 30 of its affiliates. We count all of those. That, by the way, also caused major turmoil in the commercial paper market. They had commercial paper outstanding. And no issuer, at least of any size, had defaulted in that market until that time. Otherwise, the 1970s were very quiet, with few defaults each year. In 1979, we saw only two defaults.

TABLE 2
DEFAULTING ISSUERS BY YEAR (TOTAL = 633)

Year	Count	Year	Count	Year	Count	Year	Count
1970	31	1976	5	1982	22	1988	34
1971	4	1977	8	1983	18	1989	70
1972	9	1978	5	1984	17	1990	97
1973	8	1979	2	1985	22	1991	99
1974	8	1980	6	1986	37	1992	49
1975	8	1981	4	1987	32	1993	38

But in the 1980s, starting in 1982 particularly, we had a large surge in default activity. Defaults rose each year, peaking at 99 companies in 1991 and then falling

somewhat to the recent experience shown. Again, the Society study covers the period 1986–92. So, the study has seven whole years of default experience to examine the relative performance of speculative grade versus nonspeculative grade portfolios.

Another very important aspect of defaults is defaulted bond recovery prices. It's often overlooked, but it's actually the case that most bond defaults do not result in a total loss to bondholders. In fact, what we found from one survey at Moody's is that investors typically recovered 44 cents on the dollar. Our ratings are measured as to risk of loss; they are not simply default estimates.

The risk of loss is the combination of two factors. One is the default probability. The other is the severity. As a proxy for severity, we look at its complement, recovery.

One measure of recovery is the price of a defaulted bond one month after default. In an ideal world we would actually track all defaulted issues back in time, calculate all the settlements and discount those back to the date of default, and come up with an actual loss measure. But that is, in fact, quite difficult to do, in part because companies tend to be in default for a long time, and to take a while to work out their reorganizations.

Hopefully, things will be a little bit easier in the future. It was reported in the newspaper that the Senate has finally passed a bill to actually simplify the bankruptcy process in the U.S. The change to the bankruptcy laws in 1978 allowed a number of defaults to occur that probably wouldn't have.

Table 3 shows public company recovery prices one month after default by the seniority of the bond. We see that secured bondholders, at the senior secured level, recover about 64 cents on the dollar; at the senior unsecured level, it's around 48 cents, and the subordinated holders typically recover between 16 and 40 cents on the dollar. In the private placement market, the recovery rates that I've seen for debt comparable to the secured rating categories are actually even much higher than these. Likewise, in the bank loan market, recovery rates also tend to be higher than these. So, you see that defaults are usually not a complete loss.

For the purposes of the default rates that I'm going to show, we're going to focus on just the senior unsecured rating. And we're going to try to adjust for this recovery aspect. We typically rate a company's bonds one notch lower if they're subordinated as opposed to if they have the senior rating. If it's a speculative grade company, we put two notches between the senior unsecured rating and the subordinated rating.

One other point with respect to Table 3 is how volatile the recoveries tend to be. Back in the 1990–91 period in particular (both years are in the sample of the Society study), we saw recovery rates averaging 33 cents on the dollar. In 1990, that was due in part to extremely low recoveries on the secured bonds. There were some that are called equipment trust certificates—that were backed by airplanes. When these defaulted, the planes were not maintained at all. The bond recoveries reflected the deterioration in the planes, creating an extremely low recovery rate that year.

TABLE 3
DEFAULTED BOND RECOVERY PRICES (AS A PERCENT OF PAR)

Years	Senior Secured	Senior Unsecured	Senior Subord.	Sub-ordinated	Junior Subord.	Weighted Average
1974–93	64.59	48.38	39.79	30.00	16.33	44.25
1993	46.50	34.88	79.61	31.66	—	57.25
1992	59.17	59.74	47.16	44.35	—	50.95
1991	56.26	41.06	35.84	20.01	6.60	33.86
1990	31.73	42.30	35.18	23.11	19.37	33.52
1989	74.51	45.65	40.85	25.93	19.52	38.96
1988	77.89	36.85	42.22	31.96	37.50	42.77
1987	88.00	80.12	46.00	43.00	—	77.20
1986	59.63	52.53	45.70	45.07	—	48.27
1985	66.56	46.04	26.94	39.79	—	37.06
1983	—	53.38	43.50	40.56	—	48.24
1982	72.50	39.08	44.96	44.71	—	40.59
1981	—	—	—	40.00	—	40.00
1980	—	53.40	—	40.30	—	41.59
1979	—	—	—	34.50	—	34.50
1978	—	60.00	—	67.00	—	61.73
1977	37.00	30.94	40.50	35.00	—	33.28
1976	—	—	—	—	—	—
1975	32.84	32.86	—	—	—	32.85
1974	—	—	—	5.81	—	5.81

On the other hand, 1987, which is also in the Society study, was a very good year for recoveries, in part because of the Texaco default. Texaco defaulted—as I'm sure you'll recall—because of litigation over its acquisition of Getty Oil. There was a huge judgment against Texaco made by a Texas jury, and Texaco filed for protection. They were only in default, however, for two months. I think investors even received back-interest. The Table 3 1987 recovery prices reflect these events.

So, there has been a great deal of volatility through time and even across seniority classes with respect to recovery. But when I'm referring to default rates, we're controlling for recovery by looking at the senior unsecured rating.

Table 4 gives you a better idea of why we're looking at the speculative grade market and why we differentiate it from the investment grade. What I've done is plot the rating histories of 473 companies that we rated and that defaulted between 1970 and 1993. For those 473 companies, I've shown the ratings at: default, January 1 of the year of default, January 1 two years before default, January 1 three years before default, and so forth, back to 20 years before default. Table 5 shows, by company, detail for the 17 of these companies rated investment grade at January 1 of the year of default.

TABLE 4
RATING HISTORIES OF 473 DEFAULTING ISSUERS

Company Rating	Rating at Default	Calendar Years Prior to Default							
		1	2	3	4	5	10	15	20
Aaa	0	0	0	0	1	2	2	2	1
Aa	0	2	1	3	6	5	2	1	2
A	1	1	8	19	15	13	19	11	8
Baa	1	14	31	33	44	39	37	32	20
Ba	43	118	176	163	151	138	61	36	32
B	289	280	213	166	118	86	28	19	7
Caa-C	136	58	17	12	11	11	9	7	3

What Table 5 tells us is that no issuer has ever defaulted while rated Aaa, our highest rating category. In fact, you had to go back four years before the date of default to find a defaulted company that had an Aaa rating. And that, in fact, was Getty Oil, relating to the previously mentioned Texaco fiasco. There were no companies that had an Aa rating at default. In fact, there were only two issuers that had an Aa rating as of January 1 of the year of default. They were on a privatized bank in New Zealand, for your information. There was one issuer that defaulted while rated A, and that was Johns-Manville, which used the courts to take care of a potential litigation problem with asbestos. And, finally, there was one issuer that defaulted while rated Baa, and that was Columbia Gas, also using the bankruptcy laws to avoid potential losses on contracts.

The majority of companies that defaulted were speculative-grade rated. Table 5 shows the dividing line between our speculative grade and investment grade rating categories. Ba and lower ratings are speculative grades. The majority of companies, 289, are rated B at default. Up to several years before default they are rated speculative grade. In fact, of all the companies that defaulted in 1993, none held an investment grade rating within four years of default—they were all anticipated well by our analysts.

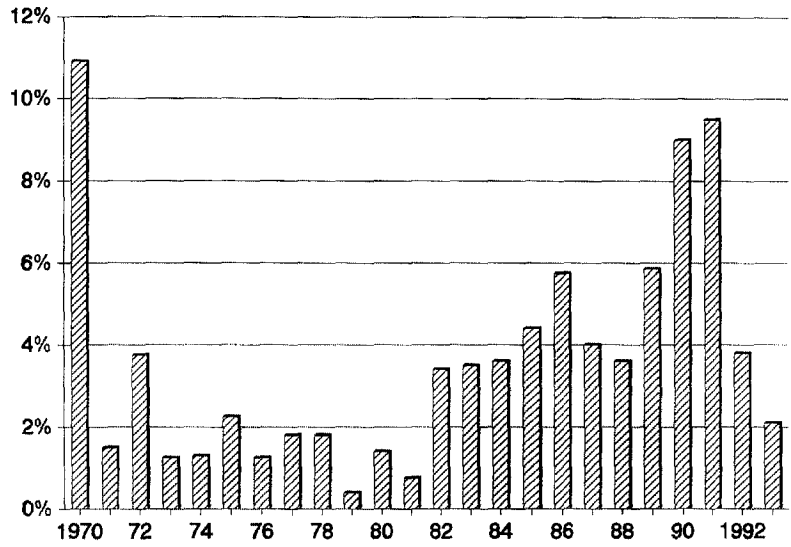
So, by and large, the ratings are a good guide to risk. And one thing we can do is look at defaults as a percentage of the speculative grade market because that's where defaults are concentrated (Chart 3). And that is one standard type of default rate that we look at.

Each bar on Chart 3 represents the number of rated issuers defaulting in that year, divided by the total number of companies that were rated speculative grade at the beginning of that year. The chart shows that there's much volatility in the speculative grade default rate. Second, the 31 companies that defaulted in 1970 represented about 10.5% of the 300 or so companies that held speculative grade ratings at the beginning of that year. Otherwise, the default rates were typically between 2% and 3%, right up until 1982. Starting in 1982, we have higher default rates in each year. We had a second peak rate in 1991. Nine and a half percent of companies rated speculative grade at the start of that year defaulted that year. In 1993, we were down to about 3%, or almost 4%.

TABLE 5
RATINGS HISTORIES OF ISSUERS RATED INVESTMENT GRADE
AT JANUARY 1 OF YEAR OF DEFAULT

Company	Default Date	Rating at Default	Year							
			1	2	3	4	5	10	15	20
Arlan's Department Store	05/13/73	Ba	Baa	Baa	Baa	Baa				
Columbia Gas System	06/20/91	Baa1	Baa1	Baa1	Baa2	Baa2	Baa1	A		
DFC Financial Overseas	10/03/89	Ba1	Aa3	Aa3						
DFC Overseas Investment	10/03/89	Ba1	Aa3							
Equitable Lomas Leasing	09/01/89	B1	Baa2	Baa1	A2	A2	A2			
Kaneb Services/Moran Brothers	11/01/86	Ba3	Baa3	Baa3	Ba3	Ba3	Ba			
Kaneb Services/Moran Energy	11/01/86	Ba3	Baa3	Baa3						
Kaneb Services/Moran Energy Int.	11/01/86	Ba3	Baa3	Baa3						
Lomas Financial Corporation	09/01/89	B2	Baa3	A3	A3	A3	A3			
Johns Manville Corporation	08/26/82	A3	A	A	A	Aa	Aa	A	A	A
Parkview Gem	11/01/73	B	Baa	Baa	Baa	Baa	Baa			
Penn Central/Phil Balt Wash RR	06/21/70	Ba	Baa	Baa	Baa	Baa	Baa	Baa	Baa	Baa
Revere Copper	10/27/82	Ba1	Baa	Baa	Baa	Baa	Baa	Baa		
Smith Industries	03/07/86	Caa	Baa3	A3	A1	A	A			
Storage Technology	10/31/84	B2	Baa3	Baa3	Baa					
Storage Technology/Documation	10/31/84	B1	Baa3	Baa2	Baa	B	Ba			
United Merchants	07/12/77	B	Baa	Baa	Baa	Baa	Baa			

CHART 3
ONE-YEAR SPECULATIVE GRADE DEFAULT RATE



I actually expect the rate to stay lower for the next year or so. I don't anticipate any major resurgence in defaults, barring a major, disastrous turn in our economy or something like that. But one of the points here is that defaults are very volatile.

Listed below are the default rate formulas used in Charts 3, 4, 5, 6, and 7.

$m_t^Y(R)$ is the number of issuers rated R defaulting in their tth year that were originally part of cohort Y.

$n_t^Y(R)$ is the number of issuers with rating R at the start of year Y that have not defaulted by year t.

Weighted Average Marginal Default Rate $$d_t(R) = \frac{\sum_{Y=1970}^{T} m_t^Y(R)}{\sum_{Y=1970}^{T} n_t^Y(R)}$$

Weighted Average Survival Rate $$S_t(R) = [(1-d_1(R))(1-d_2(R)) \ldots (1-d_t(R))]$$

Weighted Average Cumulative Default Rate $$D_t(R) = 1 - S_t(R)$$

Finally, I'd like to examine the difference in default risk between investment grade and speculative grade debt. Recall that there was no company that was rated Aaa within one year of default.

Chart 4 shows the weighted-average one-year default rates over the period of 1970–93. They essentially average the experience of cohorts that we form at the beginning of each year and track those through time. The default risk for the investment grade categories is extremely low, just basis points. Whereas when you get to the speculative grades, the Ba and B categories, the default rates are much higher. Roughly 8.3% of companies rated B defaulted within one year of having that rating, versus about 1.8% for those rated Ba.

CHART 4
WEIGHTED AVERAGE ONE-YEAR DEFAULT RATES
(1970–1993)

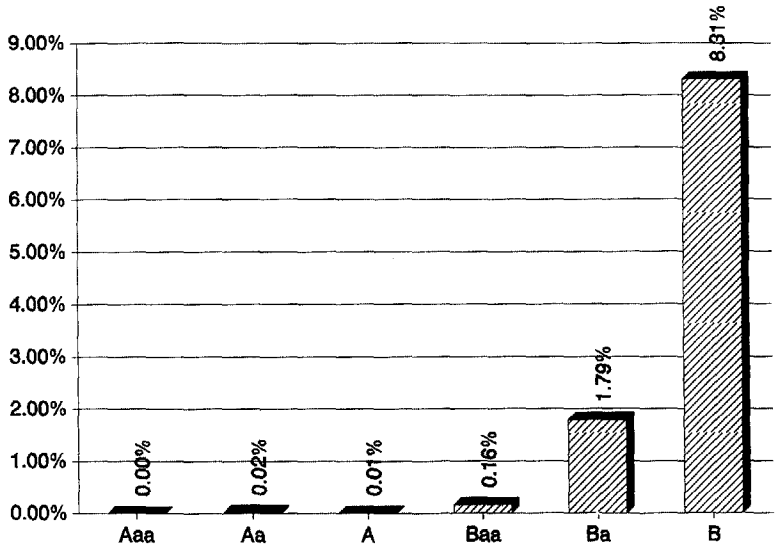


Chart 5 more closely matches the sample period for the Society study. We see default risk for the investment grades as insignificant, almost zero. Then default risk picks up dramatically for the lower rated categories, particularly in the B range where the difference between a B3 and a B1 is quite dramatic in terms of default risk.

Finally, we can look at default rates over longer time horizons. Based on the experience of cohorts that we follow through time, we constructed the multiyear and cumulative default rates for each rating category shown in Charts 6 and 7.

CHART 5
AVERAGE ONE-YEAR DEFAULT RATES BY MODIFIED RATING
(1983–93)

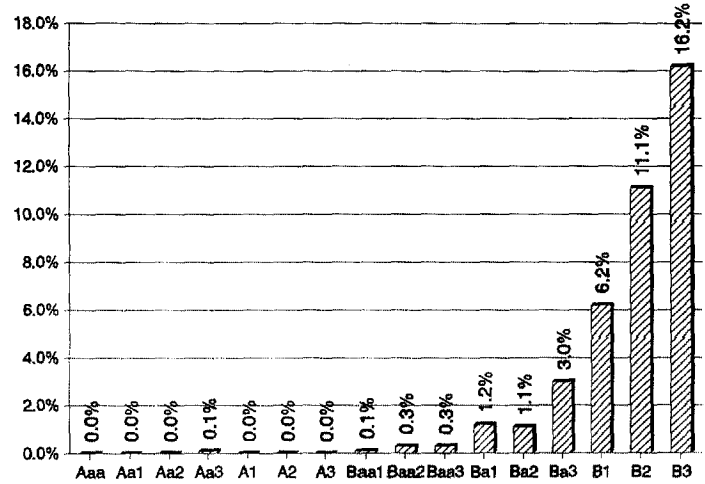


CHART 6
MULTIYEAR DEFAULT RATES

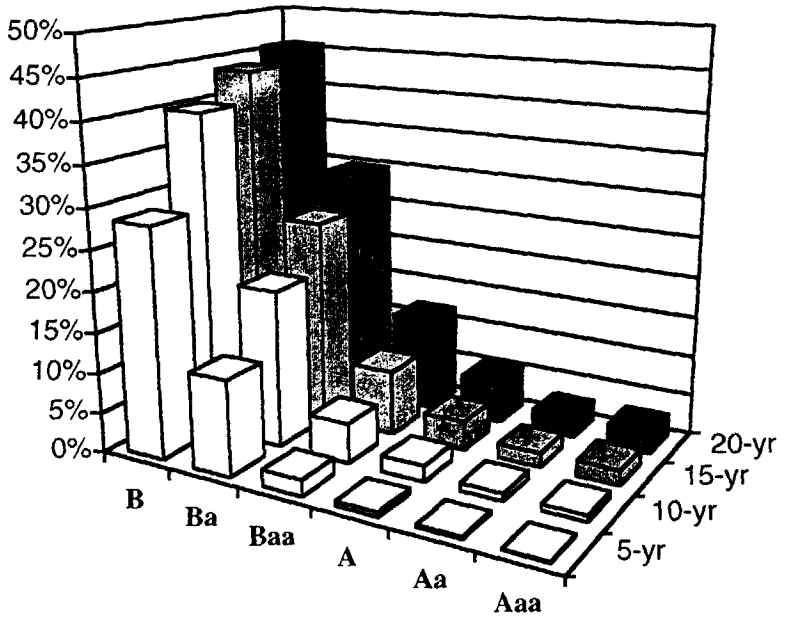


CHART 7
WEIGHTED-AVERAGE CUMULATIVE DEFAULT RATES

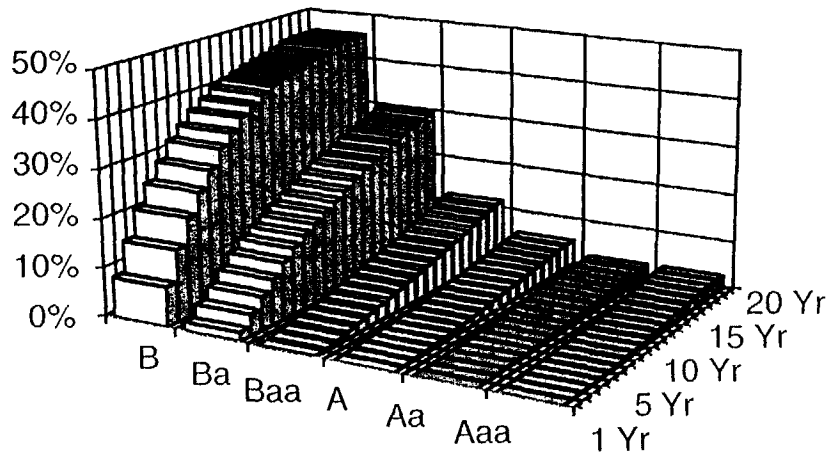


Chart 7 shows the cumulative default risk likely to unfold over longer periods. Every year has been filled in. Chart 7 shows that over the first couple of years within having an Aaa rating, the default risk is extremely low, and then it actually rises a little bit, to about 3%, at 20 years. Of issuers rated Aaa today, 3% can be expected to default within 20 years. In the speculative grade categories, the default risk is very high in the near future. At the B level we know it was 8.3% for the first year, but by the time 20 years have past after receiving that rating, the likelihood of default rises to almost 50%, but it is falling marginally. Basically, if companies are going to default with that rating, they're going to do it in the near future. If they survive, their default risk actually declines marginally in each year. The most stable rating category is actually the Baa rating.

Anyway, Chart 7 also shows the big difference between the speculative grades and investment grades. I think it shows reason enough to want to separately study the performance of these two different markets.

So, this is our default experience. What we'd like to do is look at returns net of defaults, which Faye and Paulette are going to talk about.

MR. JOHANSEN: Faye Albert and Paulette Johnson will present the results of the study more or less alternately. The later results of this study do not include casualties—those companies like Executive Life that did not survive—and the results are probably colored by that.

MS. FAYE ALBERT: We've been working on this research for two years, at least, and it has been a long grind. We're expecting to have our final results within the

next couple of months, but we're still getting data. And we're still looking at our output to make sure that everything is accurate. So, I'm happy to be able to present some preliminary results, and I hope that you'll find them interesting.

An important question is what numbers are interesting and not interesting. You might think of all numbers in the world and divide them into interesting and uninteresting subsets. Because there are so many numbers, surely you can further divide them into groupings. Let's consider the number 1 as an interesting number. Number 2, the first even number, is an interesting number. Eventually, you'll get to some number that you will think has nothing in particular to distinguish it. But the fact that it is the first undistinguished number could be considered interesting. And I'd like you to keep that in mind when we're looking at our results.

We were trying to determine whether companies that invested in high-yield bonds had superior net returns to other companies. In particular, what was the impact of high-yield bond investments? Jerry really looks at this directly by looking at the returns of high-yield bonds themselves. We were more interested in the returns of life insurance companies that had the strategy of investing in high-yield bonds. We wondered if they had been able, because of their investment and research department expertise, to do a better job of selecting investments that would give them better returns.

Just to give you a preview, we did find significant differences in the returns for the companies that we call junk companies for five of the seven years in our study. Our study went from 1986 to 1992. In three of these years, the returns were significantly better for those companies that had chosen to invest in high-yield securities, and for two of those years, they were significantly worse. So, there are significant differences.

Bob has covered some of the problems that we had in ferreting out the data. Paulette will share a little bit more detail on the statistical techniques that we used to analyze the data. Then I will share with you the statistics that we have so far. I would hope that you will listen carefully to our presentations and give us your comments, because we're not totally finished yet, and we might be able to include some of your suggestions in our final results.

DR. PAULETTE JOHNSON: I want to give you an overview on how the study companies were selected, what the variables were, and then finally what the statistical techniques were that we used.

"Junk companies" were (1) companies that had assets of $500 million or more and more than 5% of their assets in junk bonds as of the end of 1989 and (2) small companies with assets between $100 million and $500 million with more than 20% of their assets in junk as of the end of 1989. There were 63 junk companies in both groups combined.

Because we anticipated some data problems, we decided to match our junk companies against a control group of randomly selected "other companies" that had less than 5% of their assets in junk bonds. That gave us another 63 companies. As we went further into the analysis, it turned out that we had more data problems than we

expected. So, we added another nine companies to the control group. As a result, when you see the analyses that Faye will show you from year to year, you will see different sample sizes for different years, at least in one of the analyses.

All of the analyses that we did were carried out on this 1989 study sample. That was our base. For certain analyses, our study companies were reclassified every year from this base sample into a junk group and another group, again based on if they had more than 5% of their assets in junk. Then we thought that it would be nice to be able to compare a constant group of companies from year to year. For this, we chose a subsample of our 1989 study sample. It consisted of companies that had complete data on all variables for all years. In this last group there were 35 junk companies and 40 other companies. In the regression analysis, we used each company's actual junk percentage rather than 5%.

We had two dependent variables on the variable list. And those were bond-related returns, with and without using statutory annual statement Schedule DM data (see Table 6).

TABLE 6
JUNK COMPANIES RECLASSIFIED EACH YEAR
MEANS AND STANDARD DEVIATIONS FOR RETURN VARIABLES
REGRESSION ANALYSIS OF BOND INVESTMENT POLICY

	1992	1991	1990	1989	1988	1987	1986
Variable Percentage Return with DM							
Junk							
Mean	10.74	18.46	5.57	11.12	10.35	5.24	15.92
Std. Deviation	2.73	4.38	3.82	3.76	2.55	2.92	4.08
n	35	66	66	67	81	68	55
Other							
Mean	9.07	16.73	8.84	13.35	8.93	4.83	15.40
Std. Deviation	3.16	2.57	2.29	2.50	3.82	4.81	3.45
n	59	47	57	49	33	33	36
Difference	1.67	1.73	−3.27	−2.23	1.42	0.41	0.52
t-Statistic	2.61	2.42	−5.63	−3.60	2.32	0.54	0.63
p-Value	0.01*	0.02*	0.01*	0.01*	0.02*	0.59	0.53
Variable Percentage Return without DM							
Junk							
Mean	10.53	10.25	9.14	10.28	10.83	10.89	13.35
Std. Deviation	1.05	1.94	2.43	1.58	1.31	1.90	2.55
Other							
Mean	10.15	10.75	9.75	10.20	10.39	10.54	12.21
Std. Deviation	1.67	1.97	1.38	1.48	1.54	0.98	1.85
Difference	0.38	−0.50	−0.61	0.08	0.44	0.35	1.14
t-Statistic	1.22	−1.34	−1.68	0.29	1.56	1.00	2.31
p-Value	0.22	0.18	0.10	0.77	0.12	0.32	0.02*

* Groupings are significantly different at a 5% level.

Table 6 shows bond-related returns over the study period with and without Schedule DM data. The problem, of course, is the 1989–90 dip in the difference in mean returns between the junk and other companies in the "with DM" portion of the table. I had anticipated at the beginning of the study that somebody would hand me my data, and I would put it in the computer, and then I would just play with the analyses. Instead, I started getting Schedule DM diskettes here and hard copy there. We recently received more Schedule DMs; some Schedule DM data was provided by companies and some was from annual statements. We did have diskettes from the New York Insurance Department which were very helpful as a beginning.

So Schedule DM data was not easy data to get. There were times when we might have two sources for it, and the numbers weren't always the same. We always used the Schedule DM data if we had it. We assumed the market values and book values were correct and used these to derive book/market value differences, because sometimes people subtracted in the wrong direction in the schedule itself. So, they got a minus when the result should have been positive.

Another thing to note is that if we were missing a data point, it affected two years in a row. That was another problem.

We had four independent variables: percentage of junk, size (in terms of cash and invested assets as shown on line 10A of the Annual Statement, page 2), percentage of assets in bonds and growth rate.

The percentage of junk was calculated differently for three sets of years. In 1990, there was the annual statement reporting change that Bob mentioned previously. We had to sum up different lines from the different year's schedules. In two of the time periods, 1990–92 and 1988–89, we subtracted the percentage of investments in affiliates; however, for 1986–87, that data were not available in the annual statement. So, we approximated it by taking the average from the two later years, 1988 and 1989. That did not affect very many companies. Again, depending on which companies were used in each year, there were probably three to six companies that had any investments in affiliates. (See Table 7.)

There's nothing much to say about the size variable. We did take the log of it because, again, we had some very large companies, and we didn't want them to have undue influence in the regression. So, the typical thing to do there is to take the log.

The percentage of assets in bonds, most of the time, was between 40% and 70%. There were a few companies that had almost no assets in bonds. And there were quite a few companies that had percentages in the 90s; many of them were smaller companies. (See Table 8.)

Unfortunately, to determine the growth rate, you have to divide by the opening assets, and for some small companies, this produced some very large rates. One company had a growth rate one year of 1,742%. We couldn't tell whether there was something wrong with that piece of data. There were some other large growth rates, very much greater than 100%. But we really wanted to keep as many companies in the study as possible, and we really were worried that we were going to lose

many companies due to the lack of Schedule DM data. So, after trying various logs and other transformations that typically would correct for anomalies and then finding that they didn't work, I simply went ahead and arbitrarily defined a growth rate categorization that seemed to work.

TABLE 7
MEANS AND STANDARD DEVIATIONS FOR INDEPENDENT VARIABLES
JUNK COMPANIES RECLASSIFIED EACH YEAR
JUNK (MORE THAN OR EQUAL 5%) AND OTHER COMPANIES

	1992	1991	1990	1989	1988	1987	1986
Variable Average Percent Junk							
Junk							
Mean	7.93*	11.88*	13.69*	13.32*	15.79*	15.89*	14.20*
Standard Deviation	4.33	9.19	10.34	9.52	11.16	11.37	10.92
n	33	66	66	66	78	65	51
Other							
Mean	2.49*	2.37*	2.26*	2.57*	2.88*	2.88*	2.37*
Standard Deviation	1.40	1.30	1.33	1.32	1.29	1.33	1.40
n	59	47	57	49	33	33	35
Variable Log Size Assets							
Junk							
Mean	9.56	9.35	9.26	9.29	9.24	9.17	9.14
Standard Deviation	0.62	0.55	0.54	0.55	0.60	0.64	0.66
Other							
Mean	9.38	9.31	9.31	9.24	9.13	9.10	9.07
Standard Deviation	0.53	0.56	0.58	0.57	0.53	0.51	0.62

* Groupings are significantly different at a 5% level.

One variable not shown in the tables is duration to maturity of the bonds. We started trying to use that variable in 1989 results. But Faye felt that the durations we had computed looked very short for these kinds of companies. When we started looking at the data on the diskettes, we realized that if the duration was unavailable, the companies had been entering zeros. Even by 1989, there were a significant number of duration entries showing zeros. I'm hoping that we can go back to the later study years, 1990 and 1992, to determine if we can find enough companies that can supply complete data. Then we might still be able to examine this variable on a smaller subsample for a few years. I think it might be an interesting variable to look at.

Finally, let me review the statistical techniques that we used. Because we'd already spent so much time grooming data, we didn't do anything really fancy. We used some standard techniques.

TABLE 8
MEANS AND STANDARD DEVIATIONS FOR INDEPENDENT VARIABLES
JUNK COMPANIES RECLASSIFIED EACH YEAR
JUNK (MORE THAN OR EQUAL 5%) AND OTHER COMPANIES

Variable Average Bond Percent Assets							
	1992	1991	1990	1989	1988	1987	1986
Junk							
Mean	69.53	71.40*	71.75*	69.74*	67.40*	65.27*	61.65*
Standard Deviation	17.36	15.63	15.13	16.27	16.63	16.68	16.50
n	33	66	66	66	78	65	51
Other							
Mean	66.96	61.52*	59.18*	56.89*	54.65*	52.18	52.25*
Standard Deviation	16.54	15.65	18.00	18.13	18.76	19.41	19.87
n	59	47	57	49	33	33	35
Variable Growth (1-10)†							
Junk							
Mean	3.42*	4.56	4.85	5.32	5.68*	5.80*	5.88*
Standard Deviation	1.80	2.25	2.25	2.29	2.17	2.17	1.99
Other							
Mean	4.80*	4.43	4.70	4.96	4.58*	4.76*	4.86*
Standard Deviation	1.82	1.79	2.02	2.01	1.79	2.02	2.17

* Groupings are significantly different at a 5% level.

†1 = Less than -0.5%
2 = -0.5% to less than 0%
3 = 0% to less than 0.5%
4 = 0.5% to less than 10%
5 = 10% to less than 15%
6 = 15% to less than 20%
7 = 20% to less than 25%
8 = 30% to less than 50%
9 = 50% to less than 100%
10 = More than 100%

We did some T-tests and correlations—a T-test on the means between the junk and the other companies for each year (See Table 6). We ran these on the 1989 study sample. We ran them on the sample of companies reclassified every year. And we also ran them on the constant company group subsample. We then went ahead and looked at some correlations to test for the strength of the association between bond returns and each of the four independent variables (See Tables 9 and 10). We then looked at correlations of bond returns relative to each of the pairings of any two of our four independent variables (See Table 11). We also performed nonparametric tests on these same pairings. But because we had already groomed the data in a couple of ways, those results were the same.

We then tried to examine the relationship between the bond returns and the independent variables by means of multiple regression and analysis of covariance. (Table 12)

In the multiple regression analysis, we were trying to predict the bond return based upon our four independent variables. And the way to measure the accuracy of such a prediction is measured by the R-squared. The R-squared measures the percentage of the variability in a company's returns explained solely by our four independent variables.

TABLE 9
COMPANIES INCLUDED IN THE STUDY ALL YEARS
REGRESSION ANALYSIS OF BOND INVESTMENT POLICY
CORRELATIONS BETWEEN RETURN VARIABLES AND PREDICTOR

Return Including DM (Unrealized Capital Gains)				
Year	Average % Junk	Log Size Assets	Average Bonds As % of Assets	Growth
1992	0.20	0.13	0.03	0.22
1991	0.45*	−0.12	0.25*	0.11
1990	−0.71*	0.26*	−0.16	−0.14
1989	−0.53*	0.40*	−0.09	−0.08
1988	0.38*	0.05	0.00	0.05
1987	0.15	−0.27*	0.14	0.12
1986	0.03	0.10	0.02	−0.02

* Correlations are significantly different from zero at 5% level.

TABLE 10
COMPANIES INCLUDED IN THE STUDY ALL YEARS
REGRESSION ANALYSIS OF BOND INVESTMENT POLICY
CORRELATIONS BETWEEN RETURN VARIABLES AND PREDICTOR

Return Excluding DM (Unrealized Capital Gains)				
Year	Average % Junk	Log Size Assets	Average Bonds As % of Assets	Growth
1992	0.03	0.26*	0.21	0.12
1991	0.01	0.01	−0.14*	−0.11
1990	−0.20	0.26*	0.08	−0.01
1989	−0.13	0.36*	0.00	0.25*
1988	0.45*	0.08	0.12	0.29*
1987	0.28*	0.06	0.08	0.28*
1986	0.48*	0.06	0.11	0.29*

* Correlations are significantly different from zero at 5% level.

So it would really be nice to have an R^2 of 100%. Then, if you gave me an individual company and its four values, I could put the values in my equation and come out with a perfectly predicted bond return.

Now, of course, we didn't quite get that result. We performed our analysis separately for each year's data. What we were looking for was statistical significance rather than perfection. You determine statistical significance by doing the F-test to see if the R-squared is significantly greater than zero.

Then we turned it around a little bit and did analyses of covariants, which is more like doing the T-testing mentioned previously. We were still looking at the mean returns for the two groups, junk and other, but what we wanted to do was adjust those means for independent variable differences between the two groups. In other words, what if the junk companies and the other companies had the same averages on the other three independent variables, so that they had the same average size, the same

average growth rate, the same average percentage assets in bonds. What would their returns have been, and would they still be different?

TABLE 11
COMPANIES INCLUDED IN THE STUDY ALL YEARS
REGRESSION ANALYSIS OF BOND INVESTMENT POLICY
CORRELATIONS BETWEEN PAIRS OF PREDICTORS

Year	% Junk & Bond %	% Junk & Growth	% Junk & Size	Bond % & Size	Bond % & Growth	Size & Growth
1992	0.15	−0.26*	−0.03	−0.34*	0.32*	−0.11
1991	0.24*	−0.24*	−0.09	−0.37*	0.46*	−0.17
1990	0.34*	0.05	−0.20	−0.36*	0.24*	−0.10
1989	0.39*	0.16	−0.24*	−0.33*	0.16	−0.22
1988	0.35*	0.31*	−0.17	−0.34*	0.44*	−0.12
1987	0.35*	0.40*	−0.22	−0.36*	0.31*	−0.15
1986	0.33*	0.40*	−0.27*	−0.33*	0.40*	−0.25

* Correlations are significantly different from zero at 5% level.

TABLE 12
1989 STUDY SAMPLE AND JUNK COMPANIES RECLASSIFIED EACH YEAR
REGRESSION ANALYSIS ON RETURN WITH DM'S
INCLUDING UNREALIZED CAPITAL GAINS
COEFFICIENTS RAW/STANDARD ERROR/STANDARDIZED COEFFICIENT

Year	n	R-Squared	% Junk	Log Size Assets	Average Bonds As % of Assets	Growth	Intercept	F-Score	P-Value
1992	94	11.6%	0.272* 0.088 0.334	0.639 0.559 0.116	−0.011 0.020 −0.063	0.543* 0.177 0.339	0.871 5.770	4.05	0.0046*
1991	113	35.8%	0.291* 0.037 0.645	−0.003 0.541 −0.001	−0.014 0.021 −0.060	0.450* 0.161 0.244	14.379* 5.489	16.64	0.0001*
1990	123	54.0%	−0.282* 0.025 −0.748	0.640 0.406 0.099	0.011 0.014 0.056	−0.075 0.107 −0.045	3.112 4.058	36.78	0.0001*
1989	116	43.4%	−0.266* 0.030 −0.690	1.514* 0.450 0.243	0.014* 0.015 0.216	0.073 0.115 0.046	−2.668 4.511	23.00	0.0001*
1988	114	12.0%	0.118* 0.027 0.427	0.282 0.477 0.053	−0.022 0.018 −0.132	−0.054 0.142 −0.038	7.642 4.707	4.84	0.0012*
1987	101	2.0%	0.021 0.037 0.064	−1.137 0.627 −0.185	0.017 0.023 0.088	−0.009 0.176 −0.005	14.268* 6.239	1.50	0.2089
1986	91	−0.7%	−0.026 0.043 −0.072	0.634 0.671 0.103	0.003 0.026 0.015	−0.204 0.233 −0.111	11.137 6.648	0.85	0.4967

* Significant at a 5% level.

Below is our multiple regression equation. Faye is going to show you some of these values. The B-1, B-2, B-3 and B-4 are the raw coefficients for the four independent variables to predict return. We also looked at what are called standardized coefficients which are—and have been, in some sense—free of scale. So, you can compare the weights across the display.

Estimated Return = $B_1 \times$ *% Junk* + $B_2 \times$ *log size assets* + $B_3 \times$ *bonds as % assets* + $B_4 \times$ *growth*

The Appendix summarizes our group definitions, dependent variable computations, independent variable computations and statistical analysis techniques.

MS. ALBERT: So, here are our results. First, I wanted to return to the Table 7 comparison of log size between the two company groups. You don't really have to pay too much attention to the table numbering in our study. The labeling below each table tells you what it examines. The final table numbering for the study has not yet been determined. This log size comparison would show asterisks next to any of the numbers where our study showed statistically significant differences. You can see that the log size means are very close, 9.14 versus 9.07 in 1986, 9.17 versus 9.10 in 1987. None of those differences are significant. And that was as we'd hoped, because we wanted our junk companies and our other companies to be the same size. We're saying that if they were of different sizes that might, in itself, have affected the differences in returns.

Just one point about which one of our groupings was used in Table 7. Table 7 uses the grouping of companies based upon re-classification each year. If they had more than 5% of their assets in bonds, then they were considered a junk company for that year. Otherwise, they were in the other group.

We also performed studies using the other two ways of classifying companies that Paulette mentioned. First, we used 1989 only as a basis for establishing whether a company was junk or other. Second, we had a subgroup of companies for which we had complete data in all years. In most cases, there were not significant differences in where a company was classified between the three classification bases. I'll mention where there were any differences, at least that we haven't discussed so far.

The Table 7 comparison of average percentage of junk between our junk and other groups also shows that we picked our company classification criterion properly. There is a significant difference in every single year between the mean average percentage of junk for the junk and other companies.

Another interesting thing about Table 7 is that for the junk companies, the percentage of bonds in junk starts to go down in 1991, and then in 1992, it declines rather steeply. In 1991–92, many companies moved out of junk. You can also spot this phenomenon because our year-by-year reclassification puts some companies in the other category in 1991 that had been in the junk category in 1990. They moved down. They had less than 5% of their assets in junk bonds by 1991. Many companies, when market values started to appreciate relative to book and when they became concerned about risk-based capital (RBC) requirements, decided to sell their

junk bonds. And so that's the reason for what you see in the table. Nevertheless, our two groupings are still significantly different at a 5% level.

The first half of Table 6 summarizes returns for our junk and other company groups. These are the returns including Schedule DM data. So, these are total returns including a provision for unrealized capital gains and losses, as best we can determine from the data that we received from the annual statements and the supplemental reports. And this shows the statistical profile for our junk and other groups, with some additional statistical data at the bottom.

The columns that have the asterisks next to them are significantly different at the 5% level. So, you can see what I was alluding to earlier. From 1988 to 1992, there were statistically significant differences between the returns that both of these groups of companies had. The particularly interesting thing, if you look at the differences, is that in 1988, 1991 and 1992, the junk companies had significantly different higher returns than the other companies, and in 1989 and 1990 the junk companies had significantly different lower returns than the other companies.

The second half of our Table 6 shows the type of analysis that you might be more used to seeing. It is derived directly from annual statement data without provision for unrealized capital gains and losses. As you might expect, the results are more stable. That's the reason that annual statements were initially constructed as they were. Please note that there's only a statistically significant difference (at a 5% level) between the returns for these two groups of companies in 1986. In all other years, the returns are close enough so that they are not different at a statistically significant level of 5%.

The first half of Table 7 shows the average percentage of assets that were in bonds for the two groups of companies. You can see that there's a consistent difference throughout all of our years, and that difference is statistically significant from 1986 to 1991. It is still different in 1992, but not by a statistically significant amount. What is particularly interesting is that the other companies appear to be putting more and more of their assets into bonds. The junk companies are also increasing their bond levels through 1990, after which they level out. By 1992, the two groups reach a level that is not really all that different. Part of this bond percentage increase may be due to the desire of companies to have other assets reclassified as bonds. Maybe some real estate might be restructured in a way so that it can be classified as bonds, and that may be partly the reason for this bond percentage increase.

The second half of Table 8 shows an analysis of asset growth for our junk and other company groups. You can see that a "five" classification indicates an annual asset growth rate of 10–15%, and a "six" indicates annual growth of 15–20%. There are four years in which there were statistically significant differences in the asset growth rates of junk companies and other companies. In 1986, 1987 and 1988, junk companies grew faster, and in 1992 junk companies grew slower, perhaps as you might expect. I was pleased to see that we could substitute facts for impressions in this case.

Table 9 shows regression analysis correlations for our independent variables for returns including unrealized capital gains and losses. The most interesting column

here is the average percentage of junk, which shows four years in which the correlations between the average percentage of junk and the bond return are statistically significant, and in two of these years, 1988 and 1991, the correlations are positive. In the other two, 1989 and 1990, the correlations are negative. So, the percentage of junk was very important in predicting bond returns. There's nothing else too interesting about the correlations shown in Table 9.

Table 10 shows our regression analysis correlations for our independent variables for returns without unrealized capital gains. We didn't spend too much time on this. But you can see that for 1986, 1987 and 1988, such bond returns were positively correlated with both the average percentage of junk and with growth.

Table 11 shows our regression analysis correlation of bond returns against pairings of our independent variables. We see the pairing of average percentage of junk and the percentage of assets in bonds is significantly correlated to bond returns in six of the seven years. Our Table 6 T-statistics indicated the same correlations.

Table 11 correlations for the pairing of average percentage of junk and average growth are also interesting. There's a statistically significant, positive correlation for years 1986 to 1988. The correlations in 1989 and 1990 are insignificant but positive. And then in 1991 and 1992, there are statistically significant negative correlations.

The Table 11 correlations for the pairing of average percentage of bonds and average size show that small companies with more of their assets in bonds had a statistically significant tendency towards lower returns in all study years.

The Table 4C correlations for the pairing of average percentage of bonds and average growth show that rapidly growing companies with higher bond percentages had a statistically significant tendency towards higher returns in all but one study year.

Our Table 12 data show the results of our multiple regression analysis, which we were happy to see. The R-squared term indicates that in 1992 we were able to explain 12% of company investment return variability by using our four independent variables. The P-value indicates that this was statistically significant, to a small degree. The R-squareds for 1986–88 also aren't too interesting. But the R-squareds are 43%, 54% and 36% for 1989, 1990 and 1991 respectively, and the P-values indicate that this is quite significant. In these years, our four independent variables explain a great deal of investment return variability. The Table 12 data show that the percentage of junk is the most important independent variable in predicting returns.

Let me just mention that these three number groupings shown in Table 12 under our independent variables each year are the standardized coefficients. They are meant to give you an idea of how relatively important each of those variables was. Our formula takes the raw score and tries to compare each independent variable to each other one to establish relative importance.

Table 13 tries to look at what a company having a strategy of investing in junk, and being able to achieve the same average returns as our sample of companies, would have been able to achieve in year by year compound investment returns. The table

shows the accumulation of one unit of money at the mean net return rates observed for our junk companies. So, if in 1986, you had invested $1,000 at the beginning of the year and you achieved the average return that our junk companies had, you would have had $1,159 at the end of 1986, $1,579 at the end of 1990, and $2,072 at the end of 1992. If you had invested at the beginning of 1990, and if you achieved the average return of our junk companies by the end of 1991, you would have accumulated $1,251.

TABLE 13
INDEX OF TOTAL RETURNS
BASED ON JUNK COMPANIES RECLASSIFIED EACH YEAR
JUNK COMPANIES

	Year of Investment						
Year of Withdrawal	1986	1987	1988	1989	1990	1991	1992
1986	1.159						
1987	1.220	1.052					
1988	1.346	1.161	1.104				
1989	1.496	1.290	1.226	1.111			
1990	1.579	1.362	1.295	1.173	1.056		
1991	1.871	1.614	1.533	1.390	1.251	1.185	
1992	2.072	1.787	1.698	1.539	1.385	1.312	1.107

We also prepared the same set of accumulation data based upon the investment returns of our other companies. And because it's hard to compare these side-by-side, we looked at the differences between them to determine in which years you would have been better off using either a junk or another company investment strategy. Table 14 indicates with a 1 those years in which the junk company strategy produced superior results. That is, if you had invested in 1986, gotten the junk company return and left your money in through 1992, junk would have been your winning strategy. Had you done the same thing but taken your money out at the end of 1991, junk would not have been the better strategy.

TABLE 14
BASED ON JUNK COMPANIES RECLASSIFIED EACH YEAR
WHERE RESULT FOR INSURANCE COMPANIES INVESTING IN JUNK
HAS BEEN BETTER THAN OTHER INSURANCE COMPANIES

	Year of Investment						
Year of Withdrawal	1986	1987	1988	1989	1990	1991	1992
1986	1						
1987	1	1					
1988	1	1	1				
1989	1	0	0	0			
1990	0	0	0	0	0		
1991	0	0	0	0	0	1	
1992	1	0	0	0	0	1	1

So, I would just like to say that I think that so far our study has produced quite interesting results. But I can't tell you whether you should be invested in junk or not.

I would be very pleased to hear any of your comments, questions or suggestions on what you might like to see in connection with the study.

MR. JAMES A. GEYER: Were the results you just showed us the returns for all bonds for those companies or just the returns for the junk bond component?

MS. ALBERT: They were the returns for all bonds.

MR. GEYER: Were you able to look at the returns on just the junk bonds, separately?

MS. ALBERT: We weren't able to do that. The market value information that we had was not segregated between the high-yield bonds and the others for all of our study years.

DR. FONS: I think the study showed (See Table 7) that even the junk companies had, on average, less than 20% of their bond portfolios in junk bonds. So, the overall investment returns were still probably dominated by the investment grade portfolio results.

MS. ALBERT: That's right.

MR. SCOTT S. HARTZ: I applaud your effort with the study. I think many of us have tried to do similar things. I work in the bond department at John Hancock Life, and I know we've tried to explain our bond performance relative to other companies. And this always is one of the important variables.

I actually was on another panel and we talked about investment performance measurement. Many of us had the similar frustration of problems with the data. So we're putting together an intercompany survey to look at market value returns, splitting things out by NAIC rating categories and so forth. I hope that'll give us some good information going forward.

There are few things that you might want to look at in the study. First, an analysis of years to maturity is going to obviously be very important. And you acknowledged that. Obviously interest rates changed quite a bit over the study time period, hence companies that were invested long at the beginning of the time period would have done better. I realize that you'll have to overcome data problems to analyze the effect of portfolio length.

There are other problems in analyzing portfolio length beyond what you've cited. One example is that mortgage-backed securities are typically entered in annual statements as 30-year bonds. They're clearly not 30-year bonds, but that's their stated contractual maturity. So, that would be another issue to deal with in analyzing maturity.

Another variable you could think about analyzing is the percentage of bonds in private placements. It's probably going to be somewhat correlated to the size of the company; big companies tend to be the ones investing in private placements. But I think private placements have a little different return profile. You might even segregate the junk between what is in private placements and what is not. As Dr. Fons pointed out, private placements typically have higher recovery rates. And they might

do a little better as a result. At least that's what we hope for the companies that invest in them.

A final comment is that you had only a single yes or no company classification. Either it was a junk company or it was not. You might look at some sort of weighted average bond portfolio quality based upon RBC factors. There would obviously be a problem because the NAIC changed its annual statement bond classifications halfway through the study period.

An observation that I had for you was that the results looked reasonable to me. They matched up fairly well with Dr. Fons' slides. Those years where the junk companies did worse in the study were the bad years for the junk bond market as a whole.

I'm sure there are a number of other total-rate-of-return performance studies on junk bonds out there. I don't know if you've looked at any of these and tried to see if your results are consistent?

MS. ALBERT: There are just a couple of things that I'd like to note. I think that the data necessary to examine private placements may become available for future time periods. The NAIC is adding more and more information to the statements. Sufficient data to distinguish returns between private placements and publicly-traded bonds may become available. There will be more information on market value by individual bond, and consequently, by bond category. So for future periods, more information is going to be available than it was to us in the years that we examined.

Do we want to compare the total rates of return from other studies to our results? Absolutely. That's one of the things that we're intending to do. We're recently trying to finish looking at our data. Once we finish that we'll start comparing it to what else is available. So, you're a little bit ahead of us, but I think that's the next place we have to go.

MR. THOMAS J. HRUSKA: I'm from Jackson National Life and we're one of those companies on the junk-bond side. Or at least we were. I think if you presented this study to our chief financial officer and said, "See, junk bonds really don't do any better than nonjunk bonds," he'd probably say, "Yes, but we're smarter than the other companies."

Is there any way to look at particular investment houses and whether companies dealt with them. For instance, could you take companies that didn't deal with Drexel and look at them separately from those that did? That was one of the things that we didn't do. We didn't do anything with Drexel, and we've said, "See how smart we were!" Now, what we would probably end up doing by looking at such an analysis is deflating our egos terribly. But that might be something to consider.

MR. JOHANSEN: One of the points that we were trying to investigate in this study was whether companies that invested in junk bonds, as a matter of policy, could actually pick the higher quality junk bonds. And I think that in aggregate the study does not bear that out. However, some individual companies may have been able to

do so. I think we'll try to do a little bit more analysis on a company-by-company basis, without necessarily identifying them, to see if there were such companies.

But I recall the CEO of a company that invested substantially in junk bonds saying that they could pick the higher quality junk bonds, and they would get a higher return with safety. Unfortunately, his company did not survive.

We have this question of survivorship. Maybe we should have another analysis of the companies that did not survive. However these companies were, I guess, relatively few in number and differed quite a bit in size.

This preliminary study report indicates that we have some interesting results. We're not quite sure what they mean. And as Faye says, I think we'll be doing more work over the next couple of months to come out with a final study.

One question is whether this study, in its current form, should be continued. Someone suggested to me to at least continue it through 1994. Another way of doing it would be to make it an ongoing experience study where we invite companies to contribute their data. For that we would require, I think, a large number of companies of various sizes, and would need to make some distinctions by investment philosophy.

We, or maybe the Project Oversight Group, will consider follow-ups in the future. It's an interesting question. And I would appreciate any opinions or suggestions as to further studies of junk bonds.

As you can see from the statistical analyses that were made, you can do quite a bit with statistics in interpreting underlying data. I would like to congratulate both Faye and Paulette for doing a fine job with their analysis and a good job of explaining it to us.

Are there any more questions or suggestions? Any ideas?

MR. JOHN M. BRAGG: Ms. Albert and Dr. Johnson are to be thanked and congratulated for conducting this major study of junk bond investment results.

Some background comments may be in order. During the early 1980s, interest rates became very high. In 1980, for example, the yield on three-month Treasury bills was 13.61%. Such unprecedented rates led to the development of universal life policies, guaranteed investment contracts, and other interest-sensitive products. Great competition developed in the area of crediting rates. By the mid-1980s interest rates had dropped; in 1986 the rate on the three-month Treasury bill was only 5.97% (By 1992, incidentally, it had dropped to 2.98%!) All companies had a desire to maintain, as-far-as-possible, the high crediting rates which had been illustrated slightly earlier. As a result, many companies invested heavily in junk bonds, which appeared to offer high yields, and would presumably justify high crediting rates.

For the years 1986–92, the overall results of the study could be summarized as follows:

% Return with DM (Table 1A)—Junk Companies:	11.06%
Other Companies:	11.02%
Total Yield on Long-Term Treasury Bonds:	11.80%

I have included the total yield on long-term treasuries for the purpose of comparison. The study appears to show that junk bonds created no yield advantage, on average. I believe that junk companies typically credited higher interest than other companies. (Their higher growth rates in Table 8 appear to bear this out.) So with both factors combined, they probably did not fare as well as the nonjunk companies, but their policyholders may have fared better, however!

It is interesting to note, incidentally, that neither of the groups performed as well, on a total yield basis, as long-term treasury bonds. I hope that the Society will continue this particular study for several more years. When defaults and renegotiations become more mature, the junk and nonjunk companies may start to show different results. At this time, it is known (as a result of company failures, etc.) that the real culprits turned out to be real estate and commercial mortgage losses. Derivatives and collateralized mortgage obligations (CMOs) are also under suspicion. I hope that the Society will authorize a comparable study of such investments.

I do have a question for Dr. Fons regarding default rates. The fact that they were so high in the late 1980s and low in the 1970s is an amazing difference. I wondered if you have any comments as to why the change occurred.

DR. FONS: Yes, I do. While I don't intend to defend Drexel too much, some of our more spectacular defaults were not from Drexel issues. They were instead copycat deals that were done trying to piggyback on the initial success that Drexel had with the junk bond market. Yes, the default rates went up dramatically in the 1980s relative to the 1970s, 1960s, or 1950s for that matter.

MR. BRAGG: Is there any connection between defaults and the spread between the coupon rates on junk bonds versus other bonds. The incremental interest cost to the issuer is tremendous.

DR. FONS: Let's talk about spreads. Certainly, the high incremental cost of financing, because the coupon rates are so high, is another hurdle that a company has to overcome. And that may itself lead to default.

Another default consideration is the fact that the scenarios that were envisioned when many of these deals were put together did not pan out. People were very good at extrapolating straight-line trends. And they typically expected things to continue just as they had. And actually, most of the period through the 1980s was a long bull market. The economy was strong for most of that period.

There were recessions in 1979 through 1981, which really kicked off the first wave of defaults that you saw in my charts. This period also coincided with the emergence of the junk bond market itself. Although the first couple of defaults were in fact

"fallen angels" meaning debt that was issued at investment grade but was down-graded to a speculative grade.

We had rolling recessions throughout the 1980s; recessions hit the oil industry, the real estate market, banks, etc. They were major contributors.

And then the recession of 1990 was really the nail in the coffin of many companies who had put together financing based on extrapolating this long expansion in economic activity that started overall in about 1982 or 1983.

During the 1980s, there was a different attitude toward risk. People decided it was worth the risk. People were holding up copies of Hickman's study. Mike Milliken was being a good salesman saying, "Look, even though there are defaults, you're still compensated for those defaults." In fact, spread compensation for defaults is a major area of research that other people and I have been involved in for some time. Sometimes you are compensated, and sometimes you aren't.

MR. BRAGG: Faye's study seems to say that you were not compensated for the defaults.

DR. FONS: Yes. But her study only examined seven years of data. The modern junk bond markets have only existed for about 15 years or less. So I think the jury is still out. It will be some time before we can say, at the 5% level, whether or not the returns compensate the risk. There's also your point that the cost could be higher for the junk companies because of the perceived risk of their investment activities. That certainly is an important issue, I would think, from the point of view of an insurance company, though not from a mutual fund standpoint.

MR. JOHANSEN: One area where the junk bond companies were successful is in the area of growth. Some of the junk bond companies said that they would grow faster by investing in junk bonds and paying out higher interest rates. And one of the series of figures developing by Faye and Paulette does show that the junk bond companies did grow faster, significantly faster, than the other companies during the first three or four years of the study. In that case it paid off.

The big problem for the junk bond companies and their policyholders is analogous to a group of people fording a stream that on average is 2.5 feet deep. Some of them won't make it; and that's what happened here. But I think we will go ahead with the study and some way or other present a final wrap-up of what's been done so far.

MR. BRAGG: By all means.

MR. ERIN DANDRIDGE COLE: Am I understanding the study correctly; was it a study of all bonds, the investment grade as well as speculative grade. I'm wondering if all of you are convinced that the investment grade among companies was substantially the same, so that there's no effect on the results due to variations between companies in the quality of their investment grade holdings. Because all bonds were studied together, as I'm understanding it, any return difference between companies is assumed to come from the speculative grade only, as opposed to from variations in investment grade holding quality.

DR. FONS: There are certainly other ways to look at quality variations. You could look at the industries these companies tended to invest in. You could look at a number of things. But the study's annual statement derived data was broken up by just the broad rating categories, either the NAIC's or ours. The study's purpose was to identify those companies that had a higher percentage of what we call speculative grade bonds and to differentiate and test differences in performance between those and other companies.

MS. ALBERT: What I think you're asking is that within investment grade bonds, would some companies have invested more than others in higher grade investment grade bonds with significantly lower returns than lower investment grade bonds?

MR. COLE: Or would variations in the quality of selection of investment grade bonds within any NAIC category have influenced results?

MS. ALBERT: No, not enough that the selection between the various investment grade bonds would matter.

MR. COLE: It's not a wide enough range?

MS. ALBERT: I don't think that would make a difference. But we did not review the distribution or gradings of bonds within investment grade or within noninvestment grade.

DR. FONS: But such an analysis would actually be a good thing to do.

MR. JOHANSEN: I mentioned that the Standard Valuation Office (SVO) was instructed in 1990 to change its rating method. Prior to that time, the SVO, for some period of years, had taken a liberal attitude towards certain bonds rated as noninvestment grade by the rating agencies and rated them as investment grade. So, that could affect our study. There may have been junk bonds that were rated as investment grade in our study data, thus reducing the percentage of junk in our study companies.

MR. CHARLES BARRY H. WATSON: It seems to me that this study demonstrates once again the utility of trying to substitute facts for impressions. And I think it has done an excellent job. I think that Faye and Paulette should be congratulated for it.

The impression, of course, is that even if we did invest in junk bonds, we must have done it better than someone else because we didn't go broke. And that really ultimately proves there's nothing wrong with junk bonds. It's merely the incompetence or whatever of the people selecting them that caused the trouble. I think that the figures as shown should manage to ultimately correct that misimpression.

Having said that, I would like to advance an impression based upon the results that I saw. When I saw the Table 14 cumulative return comparison pattern of zeros and ones up there, what struck me was the absolutely beautiful symmetry of the pattern and how the zeroes and ones all lined up. It occurred to me that this proved that junk bonds are something like a boat. They are able to ride somewhat high in certain kinds of economic weather, but get into real serious problems in other types of

economic weather. And unfortunately, the weather in which junk bonds ride low tends to be the norm rather than the exception.

MR. JOHANSEN: If you want to talk about it in terms of weather, there was quite a thunderstorm when the savings and loans were told to divest their junk bonds immediately, regardless of whether there was a market or not.

MR. CHARLES E. MOES, JR.: Dr. Ross talked about mutual funds at this meeting. He said that the higher risk funds among the survivors appeared to do better. I guess that means we'll continue to debate this matter.

MR. JOHANSEN: Can we analyze some of the additional points brought up? I might mention that in *The New York Times* on Tuesday, April 12, 1994 there was a story about junk bond quotes beginning on NASDAQ. Somebody must have got wind of our study.

MR. HARTZ: I'd just like to add one comment related to whether the investment grade returns might be significantly different among companies. Working in the investment area, I think we'd all be disappointed if we learned that we all had the same returns even in the investment grade spectrum. But I don't think there's much you can do about that. I don't think you need to adjust much for it.

A good example of how they can be different is with regard to maturity, which is probably going to be the biggest thing. If you invested long, you did better over this time period, regardless of the quality of the bonds. I think it'd be nice if the study could differentiate returns by maturity.

But it might not matter so much if you can at least explain part of the difference in returns by how much was invested in junk bonds. I don't think you need to explain everything. So, I don't think it's critical whether the investment grade returns were the same across all companies for the study to be valid and give us a good understanding of what's going on.

MR. JOHANSEN: We are going to examine 1990 data two ways; one using the distribution of bonds at the beginning of the year and again using the distribution at the end of the year. There may be something useful in that. We'll have to find out.

APPENDIX

Selection of Companies

GROUPS: JUNK
More than 5% of bonds in junk in 1989 as calculated by the sum of lines 5.2–5.4 Part 1A, Schedule D, divided by current 10A assets, from Life Page 2.

Number of companies = 63

OTHER
Matched to Junk companies on 1989 10A assets but with less than 5% of bonds in junk as defined above.

Number of companies = 63

NOTE: Because data was not available for all companies for all variables studied, a few additional OTHER companies were selected to better reflect the population.

- All analysis from 1986 to 1992 were carried out on this 1989 Study Sample.
- Additional analyses reclassified these companies each year into junk and other where:

GROUPS: JUNK5
At least 5% of the average of prior and current junk percent (as defined in the VARIABLE LIST) divided by respective 10A assets, Life Page 2.

OTHER5
Less than 5% of the average of prior and current junk percent.

- To compare better across the years, a "complete cases" subsample of the 1989 Study Sample was subjected to all of the same analyses. Companies in this sample had no missing data on any of the variables for any of the years.

JUNK "complete cases" companies = 35
OTHER "complete cases" companies = 40

Variable List

Dependent Variables

1. BOND RATE OF RETURN WITHOUT DM =

$$100 \times \frac{2\ (\text{Gross Invest Income} + \text{Capital Gains})}{\text{Prior Bond Assets} + \text{Current Bond Assets} - (\text{GrossInv} + \text{CapGains})}$$

where
- Gross Investment Income = Sum of lines 1, 1.1, 1.2 from Gross Investment Income, Exhibit 3, Life Page 8.
- Capital Gains = Sum of lines 1, 1.1, 1.2 from Capital Gains and Losses on Investments, Exhibit 4, Life Page 8.
- Current and Prior Bond Assets = Line 1 Assets from Life Page 2.

2. BOND RATE OF RETURN WITH DM =

$$100 \times \frac{2\ (\text{Gross Interest} + \text{Capital Gains} + \text{DM Diff})}{\text{Prior Bond Assets} + \text{Current Bond Assets} - (\text{GrossInv} + \text{CapGains})}$$

- DM diff = MV − BV (current) − MV − BV (prior) for bonds.

NOTE: Sources of DMs include New York Insurance Department diskettes, copies of Schedule DM and Annual Statements, Schedule D, Part 1, from company records. If two sources were available, Schedules DM were used. Checks were made on DM values. It was assumed the MV and BV were correct and DM was calculated.

Independent Variables

1. AVERAGE % JUNK = 100 × Mean of (Current Junk divided by Current 10A assets, Prior Junk divided by Prior 10A assets), where Current, Prior 10A assets are Line 10A assets, Life Page 2, and where Junk Percent is defined below.

YEAR	JUNK PERCENT
1990–92	Sum of lines 5.3–5.6, minus % Affiliates (lines 4.3–4.6) from Part 1A, Schedule D, Life Page 29B.
1988,1989	Sum of lines 5.2–5.4, minus % Affiliates (lines 4.2–4.4) from Part 1A, Schedule D, Life Page 29B.
1986,1987	Sum of lines 5.2–5.4 from Part 1B, Schedule D, Life Page 29B minus the average of 1988, 1989 % Affiliates.

NOTE: The average for 1986 was calculated using "current" and "prior year" data from 1986 files, but all other averages were calculated from "current year" data.

2. LOG SIZE ASSETS = Log of the Mean of (Current 10A assets, Prior 10A assets)

3. AVERAGE BOND % ASSETS = 100 × Mean of (Current Bond Assets divided by Current 10A assets, Prior Bond Assets divided by Prior 10A assets), where Current, Prior Bond Assets are from Line 01 Assets.

4. GROWTH = Discretized Growth Rate where

   Growth Rate =

$$100 \times \frac{\text{(Current 10A Assets} - \text{Prior 10A Assets)}}{\text{Prior 10A Assets}}$$

and values are:

1 = Less than −5%	6 = 15% to less than 20%
2 = −5% to less than 0%	7 = 20% to less than 30%
3 = 0% to less than 5%	8 = 30% to less than 50%
4 = 5% to less than 10%	9 = 50% to less than 100%
5 = 10% to less than 15%	10 = Over 100%

Statistical Techniques Used in Analyses

1. T-tests were used to test for mean differences between junk and other companies on return variables (DV) and on the set of independent variables (IVs): average percent junk, log size assets, average bond percent assets, growth.
2. Pearson's correlation coefficients tested for linear relationships between pairs of variables, return with each IV, between IVs. (Nonparametric tests of both #1 and #2 were also conducted and results were similar to those presented).

3. Multiple Regression Analysis tested if there was a linear relationship between return and the set of IVs, (if return could be predicted from the set of IVS). R-squared measures the percent of variability of the companies' returns explained by the set of IVs. The F-test tests to see if R-squared is significantly greater than zero.
4. Analysis of Covariance was used to test for differences between junk and other return means adjusted for the set of IVs: average percent junk, log size assets, average bond percent assets, growth.