by Marshall E. Blume and Donald B. Keim

Lower-Grade Bonds: Their Risks and Returns

To reflect as realistically as possible the risks and returns of lower-grade bonds, the authors constructed an index from actual average returns used in the compilation of the Salomon Brothers and Drexel Burnham Lambert lower-grade indexes, supplementing these with month-end prices prior to 1982 from the S&P Bond Guide. The authors' index is adjusted to avoid any bias due to dropping a bond before it actually defaults.

Over the 10-year period from January 1977 through December 1986, the realized returns on a portfolio of lower-grade bonds exceeded those on high-grade bonds. Furthermore, the risk of lower-grade bonds was no greater than the risk of higher-grade bonds.

The covariances between lower-grade bonds and other risky assets indicate that lower-grade bonds can provide diversification when included in a portfolio of high-grade bonds or equities. Comparison of the returns on the lower-grade bond index with the returns of the common stock of the bonds' issuers also reveals that the bonds are not close substitutes for the equity; thus a diversified portfolio may contain both the debt and equity of the issuing companies.

SINCE THE PASSAGE of ERISA, institutional investors have been increasingly willing to consider investments that traditionally have been considered highly speculative. Indeed, some institutional investors now routinely use options and futures, instruments they formerly viewed as highly speculative and thus inappropriate investments. The new rationale is that these instruments, although risky if viewed alone, can produce conservative portfolios when combined with other assets (witness the writing of covered calls).

This article examines the risk and return characteristics of lower-grade corporate bonds. Institutional investors have generally considered such bonds inappropriate for a conservative portfolio. But if diversification eliminates much of the risk of individual bonds, lower-grade bonds might have a place in conservative portfolios. Whether they do or not depends upon their prospective risk and return characteristics.

The Market

An active and broad market for lower-grade corporate bonds emerged only relatively recently. Prior to the late '70s, the market for lower-grade corporate bonds was dominated by railroad issues and other "fallen angels"—issues of formerly financially sound corporations that had been downgraded by Standard & Poor's and Moody's rating services. A more active and considerably broader market developed only in the late '70s. The complexion of the market also changed considerably. For the first time, investment banking firms—notably Drexel Burnham Lambert—allowed firms of less than investment grade access to the (public) capital markets. No longer were high-yield bonds only those of "fallen angels."

Marshall Blume is Professor of Finance and Director of the Rodney L. White Center and Donald Keim is Assistant Professor of Finance at The Wharton School of The University of Pennsylvania.

The authors thank Robert Deming for his computational assistance and Drexel Burnham Lambert Incorporated, Salomon Brothers Inc and, especially, Delaware Investment Advisors, Inc. of Philadelphia for their cooperation.

Since the late '70s, the market has experienced considerable growth. According to estimates by Drexel Burnham, new issuances of lower-grade straight public debt amounted to $0.56 billion in 1977; in 1985 and 1986 combined, such new issuances totaled $50 billion.[1] Drexel Burnham estimates that at the end of 1986 the lower-grade market amounted to $125 billion—a sizable percentage of the total market for straight corporate debt.[2]

The Data

A common approach to describing the risk and return characteristics of asset classes is to analyze broad market indexes (e.g., Ibbotson and Sinquefield's *Stocks, Bonds and Inflation*). Unfortunately, there are no widely accepted indexes for lower-grade bonds as there are for the equities market or for investment-grade bonds. Although several such indexes do exist, some investors criticize them because the indexes themselves are constructed from estimated prices (so-called matrix prices) and not prices at which trades could necessarily be executed.[3]

Both Salomon Brothers and Drexel Burnham produce high-yield indexes using actual dealer quotes. Salomon uses dealer quotes for a minimum trade of 500 bonds. Until recently, however, the return on their index was derived from the average yield, average coupon and average maturity of the bonds in the index, not from the realized returns of the individual bonds; it thus represented the return on a hypothetical bond and only approximated the returns of a portfolio of lower-grade bonds. In 1986, Salomon introduced a new index based on the realized returns of individual bonds, which more closely approximates the returns of an actual portfolio.

A more serious problem with both the Drexel Burnham and Salomon indexes is that they drop a bond from their indexes if the bond is going to default, if the quality of the bond increases to investment grade, or if there is no demand for the bond. As none of these events is known in advance, excluding the bond return for the month in which the event occurs may bias the index. In particular, if bond prices fall upon default, the return implied by these indexes may overstate the returns an actual investor might obtain. The indexes constructed in this article address this problem.

Both Drexel Burnham and Salomon provided us with copies of internal worksheets that contained quotes for month-end bid prices for the lower-grade bonds included in their indexes. The bonds in the indexes calculated in this article have the following characteristics—(1) greater than $25 million outstanding; (2) greater than (or equal to) 10 years to maturity; and (3) non-convertible. We use only those bonds from Drexel Burnham and Salomon Brothers that satisfied these criteria. The data covered the period from December 1981 through December 1986.

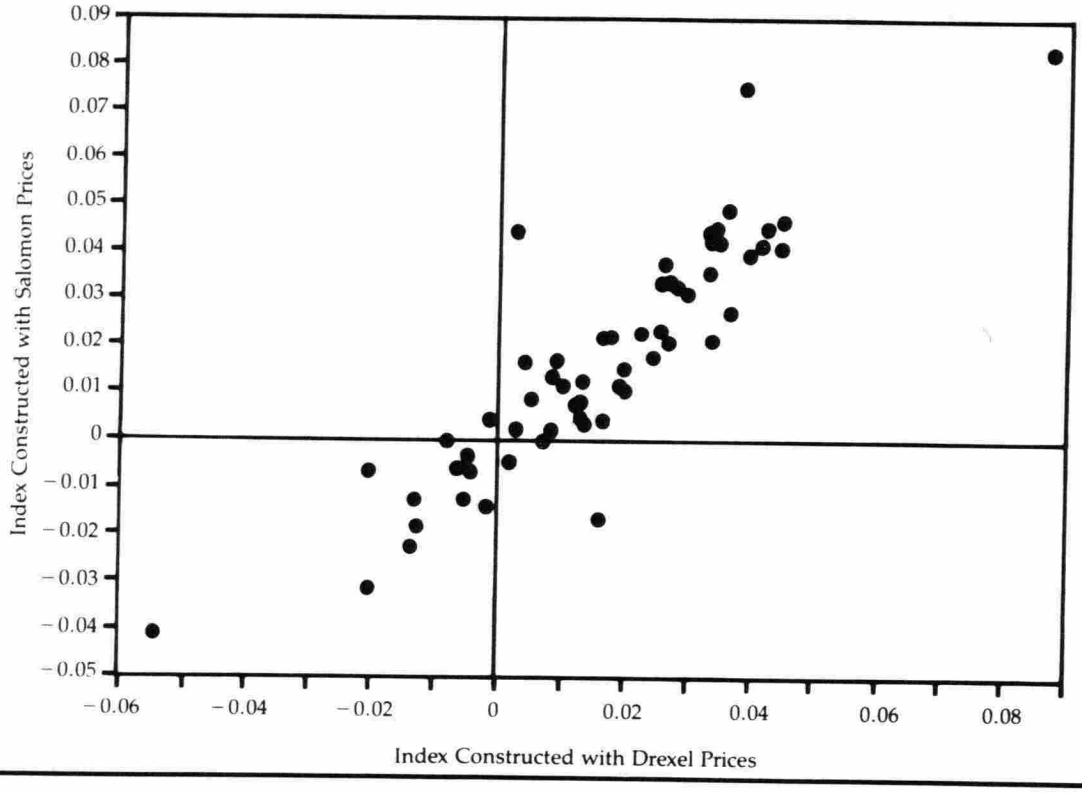
Before actually constructing a new index of lower-grade bonds, we assessed the quality of the prices in these two data sources. For bonds that appeared in both data sources in common months, we computed two series of equally weighted monthly indexes—one for Salomon Brothers and one for Drexel. Any substantial differences between the monthly returns implied by these two indexes would call into question the accuracy of the data in one or both of the sources. Figure A provides a scatter plot of the corresponding monthly portfolio returns computed using the same bonds and the same time periods; it suggests that the Drexel and Salomon data contain similar assessments of changes in value, as the points plot close to the 45-degree line, and the correlation between the returns for the two separate portfolios is 0.89.

To avoid any bias due to dropping a bond before it defaults, we augmented the basic Drexel-Salomon data files with total returns derived from prices in the S&P *Bond Guide* for the two months *following* the deletion of a bond from either the Salomon or Drexel sample.[4] We then constructed the index as follows. For each month, we computed the total returns (coupon and capital appreciation) for all bonds in the Salomon and Drexel subsamples with more than 10 years to maturity.[5] For those bonds that appeared in both subsamples, we computed the monthly return using the average of the prices from both subsamples. We then combined the individual bond returns with equal weights to arrive at a monthly total index return. The appendix gives the returns for this basic index.

The index (which we term the B-K index to differentiate it from Drexel and Salomon) represents a broadly diversified cross-section of the lower-grade market. For example, in December 1986 the index included 233 bonds issued by 146 companies. In 1985, the index included 197 bonds of 146 companies representing a broad range of industries (see Figure B).

1. Footnotes appear at end of article.

Figure A Index Returns: Salomon vs. Drexel (common months and securities, 1981–86)



Overall Results

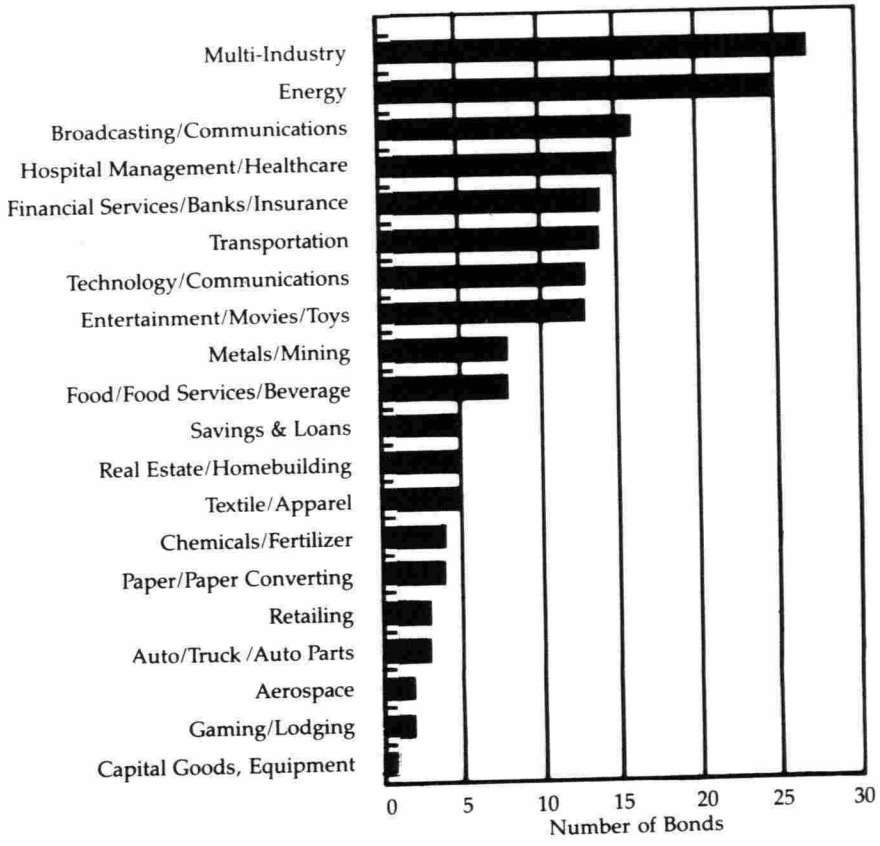
Table I and Figure C present data on the lower-grade bond index and investment alternatives over the period from January 1982 through December 1986. The lower-grade bonds had a geometric or compound rate of return per month of 1.50 per cent—19.6 per cent per year. By comparison, high-grade long-term corporate bonds (rated AAA-AA) returned 23.6 per cent yearly and long-term governments 21.8 per cent.[6] During this same period, the S&P 500 had an annual return of 19.8 per cent—lower than two of these three segments of the bond market.

Surprisingly, the lower-grade bonds experienced less volatility, or risk, than the high-grade corporates or equities, according to the standard deviations of monthly return. One possible explanation may be that lower-grade bonds, bearing higher coupons, have lower durations than high-grade bonds, hence are less sensitive to interest rate movements and have lower variability of price changes.

Another explanation may be that much of the risk of lower-grade bonds is firm-specific and can be eliminated through diversification. If so, the returns on a portfolio of lower-grade bonds may be considerably less volatile than the returns on the individual bonds. It is also possible that the prices quoted in this market do not adjust as rapidly to new information as prices in other markets.[7]

Of importance for diversification are the correlation coefficients of the returns in different markets. These coefficients suggest that lower-grade, high-grade or government bonds would be effective diversification vehicles in combination with equities. Within the bond market, the relatively low correlation of lower-grade bonds with either high-grade or government bonds indicates that the inclusion of lower-grade bonds with high-grade or government bonds would result in the further diversification of a bond portfolio. Exactly how much, if any, of a bond portfolio should be invested in lower-grade bonds hinges not only upon the diversifi-

Figure B Industry Breakdown of Lower-Grade Index (December 1985)



cation effect, but also upon the expected returns of bonds of different qualities.

A commonly used measure of investment performance is the so-called "alpha coefficient." This can be interpreted as the return in excess of the return warranted by the beta risk of the investment. Beta is a measure of how the return on an investment tends to fluctuate with the return on some reference portfolio (frequently taken to be the S&P 500). A positive alpha for a particular investment vehicle means that an investor who currently holds the S&P 500 could obtain a higher rate of return with no increase in risk by reducing his investment in the index and shifting the proceeds to the investment under consideration.[8] (The alpha coefficient by itself does not indicate what proportion of the portfolio to shift.)

Table I Monthly Returns (January 1982 to December 1986)

Portfolio	*Geometric Mean (per cent)*	*Arithmetic Mean (per cent)*	*Standard Deviation (per cent)*	*First-Order Autocorrelation*	*Correlations Between Index Returns*		
					High-Grade	*Long-Term Govt.*	*S&P 500*
B-K Lower-Grade Bonds	1.50	1.52	2.25	0.25	0.75	0.65	0.56
High-Grade Bonds	1.71	1.76	3.26	0.10		0.91	0.48
Long-Term Government	1.66	1.72	3.71	−0.01			0.53
Treasury Bills	0.69	0.69	—	—			
S & P 500	1.52	1.61	4.23	−0.13			

Figure C Major Market Indexes
(December 1981 through December 1986)

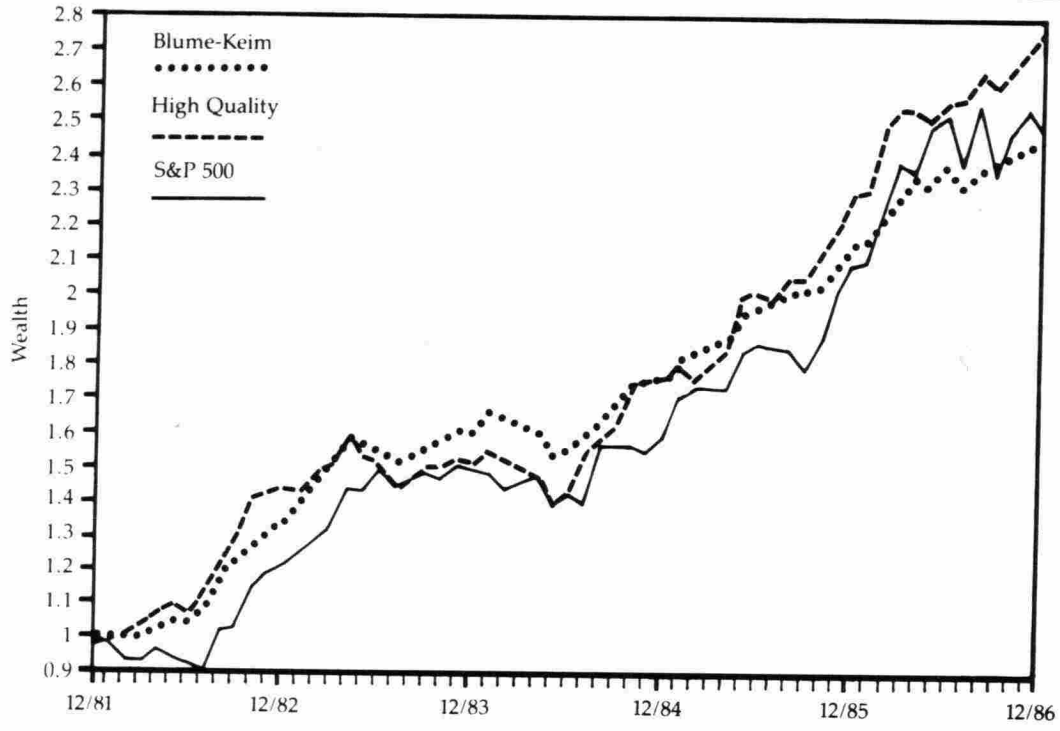


Table II shows that the beta coefficient is 0.30 for the lower-grade bonds and 0.37 for the high-grade bonds, indicating that their market volatility is about 30 to 40 per cent of that of the stock market. The alpha coefficients for both classes of bonds are positive. Although the alpha for the high-grade bonds is greater than that for the lower-grade bonds, only the alpha for the lower-grade bonds is significantly different from zero. If these results are taken at face value, then an investor should find the inclusion of bonds in a portfolio to be beneficial; exactly what proportion of a total portfolio should be invested in bonds, and over what types of bonds, requires more analysis than contained in this article.

A Longer Time Period

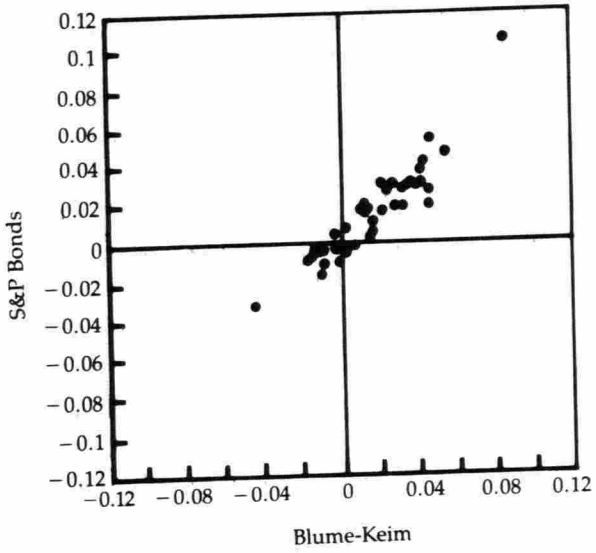
The period analyzed above is relatively short by usual standards. Since the market for lower-grade bonds in its current form began in the late '70s (some would pinpoint 1977 as its birth), it would be useful to have data back to that time. The S&P *Bond Guide* contains month-end prices for bonds prior to 1982, and these provide a source for earlier data. However, each price represents the closing price on the New York Bond Exchange (if listed and traded) or the average bid price from one or more market makers or a "matrix price." Thus a monthly return may reflect a price change using some combination of any of these three alternatives. The quality of these prices, from the perspective

Table II Characteristic Line Estimates* (January 1982 to December 1986)

Portfolio	*Alpha (per cent)*	*(Standard Error)*	*Beta*	*(Standard Error)*	R^2
B-K Lower-Grade Bonds	0.56	(0.25)	0.30	(0.06)	0.32
High-Grade Bonds	0.73	(0.38)	0.37	(0.09)	0.23

* Computed from: $\tilde{R}_{pt} - R_{Ft} = \alpha + \beta(\tilde{R}_{mt} - R_{Ft}) + \tilde{\varepsilon}_{pt}$.

Figure D Blume-Keim vs. S&P Bonds (common months and securities)



of constructing an index, can be evaluated directly against the data from Drexel and Salomon.

To assess the adequacy of the S&P prices for constructing indexes, we compared an index based upon S&P prices to an index based on Salomon and Drexel prices for common bonds and common time periods. As before, we computed two series of equally weighted monthly indexes, one for the S&P and one for our data, using only those bonds included in both sets of data and only common months.[9] A scatter plot of the corresponding monthly returns from these two indexes (Figure D) suggests that the prices from S&P may be adequate for constructing indexes; the correlation between the returns for the two indexes is 0.92. The portfolio returns based on the S&P prices behave similarly to the portfolio returns based on the Drexel-Salomon prices.

To extend our data back to 1977, we computed an S&P-based index return for each month (as described above) using *all* bonds listed in the S&P guide for that month that were rated below BBB, had an outstanding value in excess of $25 million, and had more than 10 years to maturity. As Tables III and IV and Figure E show, mean returns for lower-grade bonds over this extended 10-year period exceeded returns on the rest of the fixed income sector, but were lower than equity returns. Risk, as measured by the standard deviation of monthly returns, continued to be lower for the lower-grade bonds than for equities and high-grade corporate bonds, but not by nearly as large a magnitude as in the shorter time period of more volatile interest rates.

The correlations between the lower-grade returns and the returns on high-grade bonds and the S&P 500 still suggest that the inclusion of lower-grade bonds in a bond (or stock) portfolio can improve diversification. The beta coefficient for lower-grade bonds is still roughly 0.30. Although considerably smaller than it was, the alpha coefficient for lower-grade bonds is still positive and now exceeds the alpha for higher-grade bonds, which is negative over the longer time period.

The Returns on Common Stock

The lower-grade bonds in the B-K index are all nonconvertible. Nonetheless, the returns on these bonds may be closely related to the returns on the common stock of the issuers if both bond and equity returns are related to the credit risk of the company. To examine this possibility, we constructed a subsample of those bonds in the B-K index for which the issuing companies had stocks trading on the New York or American stock exchange.[10] For the same firms

Table III Monthly Returns (January 1977 to December 1986)

Portfolio	Geometric Mean (per cent)	Arithmetic Mean (per cent)	Standard Deviation (per cent)	First-Order Autocorrelation	Correlations Between Index Returns		
					High Grade	Long-Term Govt.	S&P 500
B-K Lower-Grade Bonds	0.92	0.96	2.86	0.18	0.79	0.74	0.50
High-Grade Bonds	0.80	0.87	3.73	0.16		0.95	0.41
Long-Term Government	0.78	0.86	4.02	0.06			0.46
Treasury Bills	0.73	0.73	—	—			
S & P 500	1.09	1.17	4.22	−0.06			

Table IV Characteristic Line Estimates (January 1977 to December 1986)

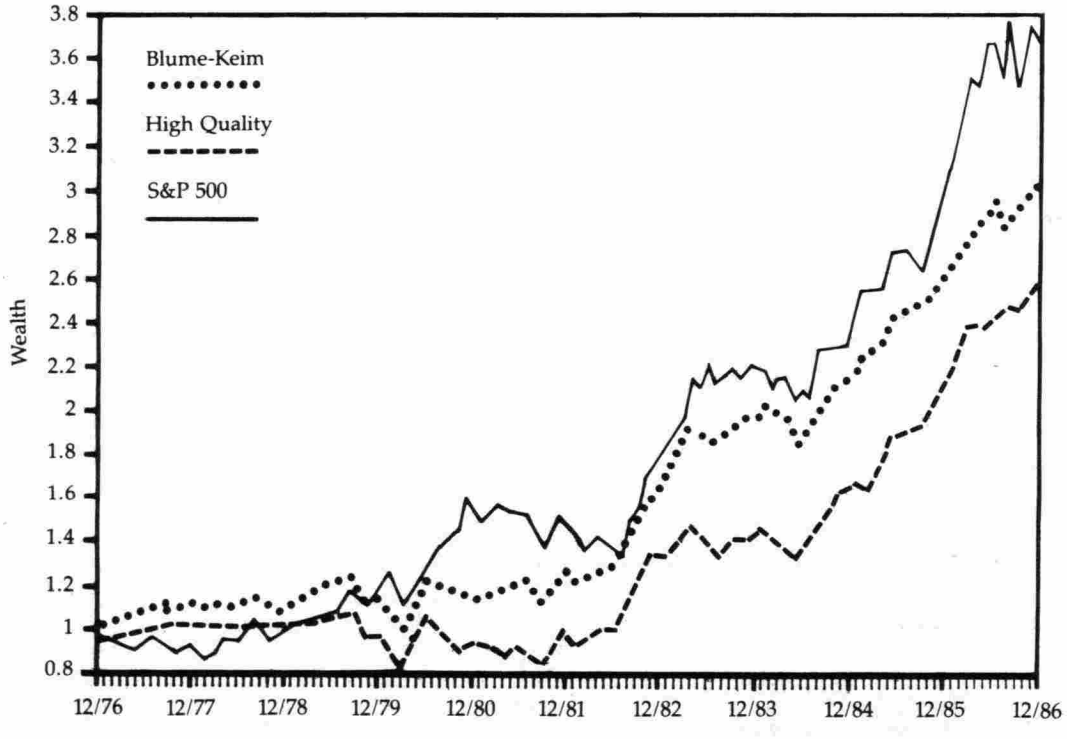
Portfolio	*Alpha (per cent)*	*(Standard Error)*	*Beta*	*(Standard Error)*	R^2
B-K Lower-Grade Bonds	0.08	(0.22)	0.34	(0.05)	0.26
High-Grade Bonds	−0.03	(0.31)	0.36	(0.07)	0.17

for which bond returns were available, we constructed an equally weighted index of the total returns on the common stocks. The returns for a particular firm were included in the stock index only for the months in which there were returns for its bonds.

Over the four-year period, the compound annual rate of return on the stocks for the lower-grade issuers was less than that for their bonds—11.9 per cent versus 21.1 per cent; the correlation between the returns was 0.43. The correlation between the stock returns and the S&P 500 was 0.836 from January 1982 through December 1985. The correlation with the small-stock (lower capitalization) index of Ibbotson-Sinquefield was 0.944, suggesting that these stocks were more closely related to smaller companies than to the larger companies in the S&P 500. Despite the high correlation of monthly returns, the realized equity return of those companies with lower-grade bonds was less than the 21.5 per cent annual return realized by the Ibbotson-Sinquefield small-stock index. Perhaps there is some industry or other factor associated with companies that issue lower-grade bonds.

In sum, the returns on lower-grade bonds in the combined Drexel and Salomon universes are not perfect substitutes for the common stock of firms issuing the bonds. Depending upon their

Figure E Major Market Indexes
(December 1976 through December 1986)



expected returns, a diversified portfolio might well contain both the bonds and equity of these companies.

Concluding Remarks

Over the 10 years from January 1977 through December 1986, the realized returns on a portfolio of lower-grade bonds exceeded those of high-grade bonds. One should be very cautious in predicting the same result for the future, however. The accuracy of measures of expected return depends upon the length of the period analyzed, and 10 years is a short period to estimate such statistics.

In the context of a well-diversified portfolio, we find the risk of lower-grade bonds to be no greater than the risk of high-grade bonds. Furthermore, lower-grade bonds provide good diversification when used with other risky assets. We are quite comfortable with this conclusion, as the accuracy of risk measures depends more on the number of independent observations than on the length of the time period under observation. ■

Footnotes

1. Drexel Burnham Lambert, *The Case for High-Yield Securities* (Los Angeles: Drexel Burnham Lambert, 1987), p. 3.
2. Ibid., p. 4.
3. Kuhn Loeb and Merrill Lynch publish some bond indexes (based on matrix pricing) that would apply to the lower-grade bond market.
4. There are 226 bonds used in the construction of our indexes which Drexel or Salomon dropped from their databases, 98 of which were dropped in 1986. The S&P *Bond Guide* contains the needed price information for 177 of these bonds. A comparison of these added returns with the corresponding monthly returns for the Salomon database over 1982–85 shows that on average the added monthly returns are 1.2 per cent less than the continuing returns in each of the two subsequent months. The returns of the 19 bonds not quoted in the S&P *Bond Guide* for 1982–85 are approximated in any month by the average monthly returns of the continuing bonds less 1.2 per cent. For 1986, the average return for the dropped bonds for which price information was available was −8.2 per cent for the month following the drop and zero for the subsequent month. For the 30 bonds in 1986 for which price information was not available in the *Bond Guide*, the returns for the first and second months following their elimination were assumed to be −8.2 per cent and zero, respectively.
5. The return for each bond was calculated from the ratio of the monthly closing price of the bond plus accrued interest to the closing price of the bond in the previous month plus accrued interest.
6. The high-grade, long-term bond returns were provided by Salomon Brothers, and the long-term government bond returns were provided by R. G. Ibbotson Associates.
7. The reported autocorrelation coefficients are consistent with this explanation. The autocorrelation coefficient measure is the correlation between today's return and tomorrow's return. Whether profits can be made with a trading strategy designed to take advantage of such a slow adjustment hinges on the number of bonds that can be traded at these quoted prices without affecting the quoted price.
8. See M. E. Blume, "The Use of Alpha to Improve Performance," *Journal of Portfolio Management*, Fall 1984, for a further discussion of alpha and how it can be used in portfolio analysis.
9. Bond returns in month t are computed from S&P prices as:

$$r_t = \frac{P_t + (c/12)}{P_{t-1}} - 1,$$

where c is the annual coupon. This approximation will slightly overstate the true return.

10. CUSIP numbers form the basis for determining a match. Stock return data are from the CRSP files of the University of Chicago; the most recent available file contained data through December 1985.

For Appendix, please turn to page 66.