RISK AND RETURN CHARACTERISTICS OF LOWER-GRADE BONDS

by

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Particularly since the passage of ERISA, institutional investors have increasingly been willing to consider investments that traditionally have been considered highly speculative. Indeed, some institutional investors now routinely use options and futures, instruments that formerly were viewed as highly speculative and thus inappropriate investments. The rationale is that these instruments, although risky if viewed alone, provide, in combination with other assets, portfolios that overall are conservative (witness the writing of covered calls).

The purpose of this paper is to examine the risk and return characteristics of lower-grade corporate bonds. Institutional investors have frequently considered such bonds as inappropriate for a conservative portfolio. However, if diversification eliminates much of the risk of individual bonds, lower-grade bonds might have an appropriate place in a conservative portfolio. Whether they do or not depends upon their prospective risk and return characteristics. The usual starting point for judging the prospective characteristics of an investment is a detailed analysis of historical data, the subject of this paper.

The Market

The emergence of an active and broad market for lower-grade corporate bonds is a relatively recent phenomenon. Prior to the late seventies, the market for lower-grade corporate bonds was dominated by railroad issues and other "fallen angels" -- issues of formerly financially sound corporations that were downgraded by Standard & Poor's and Moody's rating services. In the late seventies, there developed a more active and considerably broader market than

in the past. 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."

Since the late seventies, 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, whereas in 1985 and 1986 such new issuances totaled $50 billion.[1] Drexel Burnham estimates that at the end of 1986 the size of the lower-grade market was $125 billion, a sizable percentage of the total market for straight corporate debt.[2]

The Basic Data

Our objective is to describe the risk and return characteristics of lower-grade bonds. A common approach is the analysis of 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,[3] some investors are critical of them because the indexes themselves are constructed from estimated prices, so-called matrix prices, and not prices at which trades could necessarily be executed. In contrast, Salomon Brothers calculates a high yield index using actual dealer quotes for a minimum trade of 500 bonds. Up until recently, however, the return on their index was derived from the average yield, average coupon, and average maturity of the bonds in their index and not the realized returns of the individual bonds. Consequently, it represented the return on a hypothetical bond and thus 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. This index more closely approximates the returns of an actual portfoio of such

bonds. Like Salomon Brothers, Drexel Burnham Lambert uses actual dealer quotes for its index.

A more serious problem with both the Drexel Burnham Lambert and Salomon Brothers indexes is that a bond is dropped from their indexes before it goes into default. If bond prices fall upon default, the return implied by these indexes may overstate the returns that an actual investor might obtain if such defaults are hard to predict. The indexes constructed in this paper address this problem.

For these reasons, we construct a new index for the lower-grade bond market. Both Drexel Burnham Lambert and Salomon Brothers provided us with copies of internal worksheets that contain quotes for month-end bid prices for the lower-grade bonds that they include in their indexes. The bonds in the indexes calculated in this paper have the following characteristics: (1) greater than $25 million outstanding; (2) greater than (or equal to) ten years to maturity; and (3) non-convertable. We use only those bonds from Drexel Burnham and Salomon Brothers that satisfy these criteria.

The time period covered by these data is from December 1981 through December 1986. Before actually constructing a new index of lower-grade bonds, we assess the quality of the prices in these two data sources. For bonds that appear in both data sources in common months, we compute two series of equal-weighted monthly indexes, one for Salomon Brothers and one for Drexel. If there were substantial differences between the monthly returns implied by these two indexes, one might question the accuracy the data in one or both of the data sources. A scatter plot of the corresponding monthly portfolio returns computed using the same bonds and the same time periods suggests, however, that the Drexel and Salomon price changes contain similar assessments of changes in value (Figure 1). The points plot quite closely to the 45° line, and the correlation between the returns for the two separate portfolios is 0.89.

To avoid the bias due to dropping a bond before it defaults, we augment the basic Drexel-Salomon data files with total returns derived from prices from the S&P Bond Guide for the two months following the deletion of a bond from either the Salomon or Drexel sample.[4] Salomon or Drexel will delete a bond for one of three reasons: 1) the bond defaulted; 2) the quality of the bond increased to investment grade; 3) there was no demand for the bond. Since none of these events is known until it actually happens, excluding the return for the month in which the event occurs requires hindsight, and thus may bias the index.

We construct the index as follows. In each month, we compute the total returns (coupon and capital appreciation) for all bonds in the Salomon and Drexel subsamples that have more than 10 years to maturity.[5] For those bonds that appear in both subsamples, the monthly return is computed using the average of the prices from both subsamples. We then combine the individual bond returns with equal weights to arrive at a monthly total index return. Appendix A contains the returns for the basic index.

The resulting index, which we shall 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 and in 1985 included 197 bonds of 146 companies representing a broad range of industries (Figure 2).

The Overall Results

Over the period from January 1982 through December 1986, lower-grade bonds had a geometric or compounded rate of return per month of 1.50%. The equivalent annual rate is 19.6%. The equivalent annual rate for high-grade long-term corporate bonds (rated AAA-AA) was 23.6% and for long-term government bonds was 21.8%.[6] During this same period, the S&P 500 had an annual return of 19.8% --

lower than two of these three segments of the bond market (Table 1 and Figure 3).

As measured by the standard deviation of monthly returns, the lower-grade bonds experienced less volatility or risk than the high-grade corporate bonds or equities. This result, at first glance, is somewhat surprising. One possible explanation is that lower-grade bonds, bearing higher coupons, have lower duration than high-grade bonds. In that case, lower-grade bonds will be less sensitive to interest rate movements than higher-grade bonds and, therefore, will have lower variability of price changes.

Another explanation for the relatively low volatility of the lower-grade index is that these lower-grade bonds are individually risky, but much of this risk is firm-specific and can be eliminated through diversification. If so, the returns on a portfolio of such lower-grade bonds may be considerably less volatile than the returns on 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 indicate 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 diversification 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 coefficient can be interpreted as the return in excess of

the return which would be 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, which is frequently taken to be the S&P 500. A positive alpha means that an investor who currently holds the reference portfolio of the S & P 500 could obtain a greater rate of return with no increase in risk by reducing the investment in the S & P 500 and shifting the proceeds to the investment under consideration.[8] The alpha coefficient by itself does not indicate how much to shift.

The beta coefficient for the lower-grade bonds is 0.30 and for the high-grade bonds 0.37, indicating that their volatility due to the market is about 30% to 40% 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 some bonds in a portfolio 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 paper.

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 seventies, and 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 thus provides a source for earlier data. However, some may express concern over the quality of these prices since each price represents the closing price on the New York Bond Exchange if listed and traded, or otherwise the average bid price from one or more market makers or a "matrix

price." Thus, a monthly return can reflect a price change using some combination of any of these three alternatives. The quality of these prices, from the perspective 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 first compare 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 compute two series of equal-weighted monthly indexes, one for S&P and one for our data but only for those bonds in both sets of data and only for common months.[9] A scatter plot of the corresponding monthly returns from these two indexes suggests that the prices from S&P may be adequate for constructing indexes (Figure 4). The correlation between the returns for the two indexes is 0.92. The portfolio returns based on the S&P prices behave quite similarly to the portfolio returns based on the Drexel-Salomon prices.

To extend our data back to 1977, we compute an S&P-based index return for each month as described above, but containing <u>all</u> bonds listed in the S&P Guide for that month, rated below BBB, with outstanding in excess of 25 million dollars and with more than 10 years to maturity. Mean returns for lower-grade bonds over this nine-year period are the highest of the fixed-income sector, but lower than equities (Tables 3 and 4 and Figure 5). Risk as measured by the standard deviation of monthly returns is less than that of 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 of the lower-grade returns with 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 will have a diversification effect. The beta coefficient for lower-grade bonds is still roughly the same as in the shorter period (0.34). 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 for the longer time period.

The Returns on Common Stock

The lower-grade bonds in the B-K index are all non-convertible. Nonetheless, it is possible that the returns of these bonds are closely related to the returns of 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 construct a subsample of those bonds in the B-K index for which the issuing companies have stocks trading on the New York or American Stock Exchange.[10] For the same firms for which bond returns are available, we construct an equal-weighted index of the total returns for the common stocks of these firms. The returns for a particular firm are included in the stock index only for the months for which there are returns for its bonds.

Over the four-year period, the compound annual rate of return of the stocks for the lower-grade issuers is less than that for their bonds--11.9 percent versus 21.1 percent, and the correlation between the returns is 0.43. The correlation of the stock returns of these firms with the S&P 500 is 0.836 over the period from January 1982 through December 1985. The correlation with the lower capitalized stock index of Ibbotson-Sinquefield is 0.944, suggesting not unsurprisingly that these stocks are more closely related to smaller companies than to the larger companies in the S&P 500. It is interesting to note that despite the high correlation of monthly returns, the realized return of the equity of those companies with lower grade bonds is less than the 21.5 percent annual return realized by the Ibbotson-Sinquefield lower capitalized stock index. Perhaps, there is some industry or other type of factor associated with companies that issue lower-grade bonds.

In sum, the returns of lower-grade bonds in the combined Drexel and

Salomon universes are not close substitutes for the common stock of firms issuing the bonds. Depending upon their expected returns, a diversified portfolio might well contain both the bonds and equity of these companies.

Conclusion

This study analyzed the returns of lower-grade bonds from January 1977 through December 1986. Over these nine years, 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. The accuracy of measures of expected return depend upon the length of the period analyzed, and nine years is a short period to estimate such statistics.

In the context of a well-diversified portfolio, we find that the risk of lower-grade bonds was no greater than the risk of higher-grade bonds and that lower-grade bonds are a good diversification vehicle to use with other risky assets. We are quite comfortable with this conclusion since the accuracy of risk measures depend more on the number of independent observations than on the overall length of the time period.

FOOTNOTES

[1] Drexel Burnham Lambert, The Case for High-Yield Securities, (Los Angeles), 1987, p.3.

[2] Ibid, p.4.

[3] Kuhn Loeb and Merrill Lynch publish some bond indexes (based on matrix pricing) which 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 data bases, 98 of which occurred in 1986. The S&P Bond Guide contains the needed price information for 177 of these bonds. For the years 1982-1985, a comparison of these added returns with the corresponding monthly returns for the Salomon data base shows that on average the added monthly returns are 1.2 percent 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 1982-1985 are approximated in any month by the average monthly returns of the continuing bonds less 1.2 percent. For 1986, the average return for the bonds that were dropped from the Drexel or Salomon universes and for which price information was available was -8.2 percent for the month following the drop and 0 percent for the second subsequent month. For the 30 bonds in 1986 for which price information was not available in the S&P Bond Guide, the return following the elimination of the bond from the Drexel or Salomon data base was assumed to be -8.2 percent and 0 percent for the second subsequent month.

[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 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 Marshall 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

$$r_t = \frac{p_t + (c/12)}{p_{t-1}} - 1 \quad ,$$

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

10 CUSIP numbers form the basis for determining a match. The stock return data are from the daily returns file of the Center for Research in Security Prices at the University of Chicago. The most recent file available to us contained data through December 1985.

TABLE 1

Summary Statistics of Monthly Returns
January 1982 to December 1986

Portfolio	Geometric Mean	Arithmetic Mean	Standard Deviation	First-Order Autocorrelation	Correlations Between Indexes Returns		
					High-Qual.	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			

TABLE 2

Characteristic Line Estimates
January 1982 to December 1986

$$\tilde{R}_{pt} - R_{Ft} = \alpha + \beta(\tilde{R}_{mt} - R_{Ft}) + \tilde{\varepsilon}_{pt}$$

Portfolio	α	(Standard Error)	β	(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

TABLE 3

Summary Statistics of Monthly Returns
January 1977 to December 1986

Portfolio	Geometric Mean	Arithmetic Mean	Standard Deviation	First-Order Autocorrelation	Correlations Between Indexes Returns		
					High-Qual.	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 4

Characteristic Line Estimates
January 1977 to December 1986

$$\tilde{R}_{pt} - R_{Ft} = \alpha + \beta(\bar{R}_{mt} - R_{Ft}) + \tilde{\varepsilon}_{pt}$$

Portfolio	α	(Standard Error)	β	(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

Figure 1

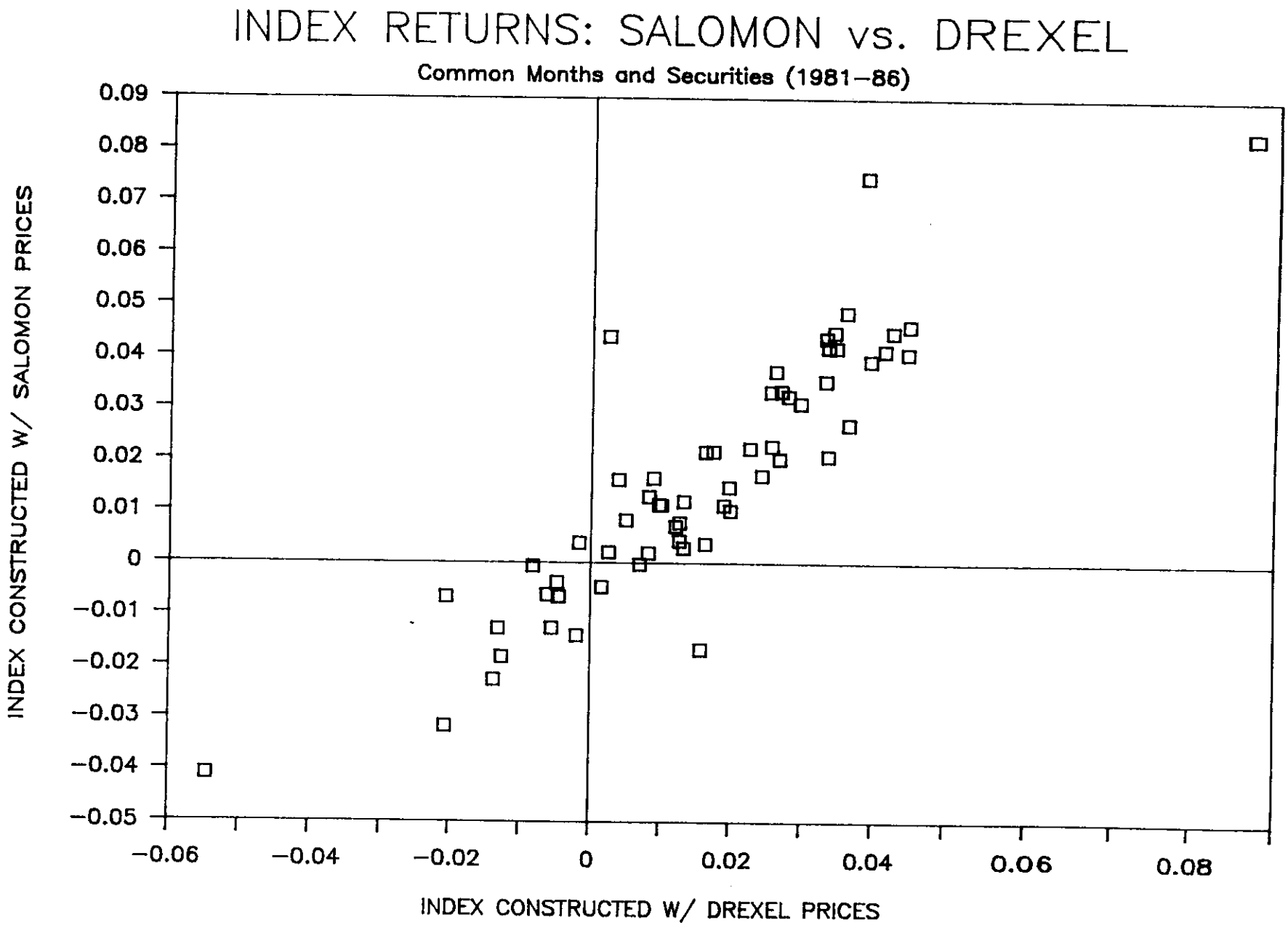

INDEX RETURNS: SALOMON vs. DREXEL
Common Months and Securities (1981–86)
INDEX CONSTRUCTED W/ SALOMON PRICES
INDEX CONSTRUCTED W/ DREXEL PRICES
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
−0.01
−0.02
−0.03
−0.04
−0.05
−0.06
−0.04
−0.02
0
0.02
0.04
0.06
0.08

Figure 2

Industry Breakdown of Lower-Grade Index (December 1985)

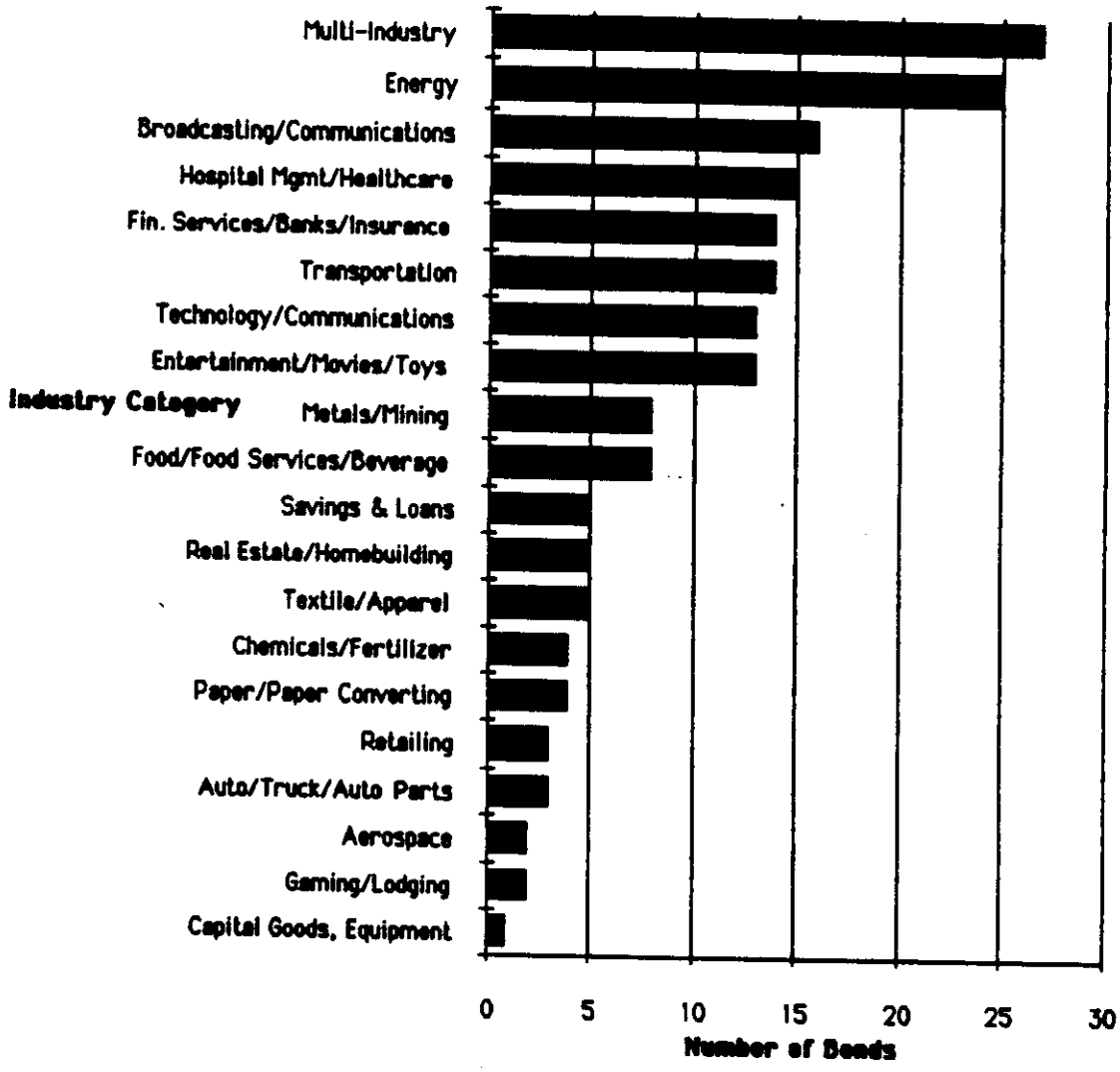


Figure 3

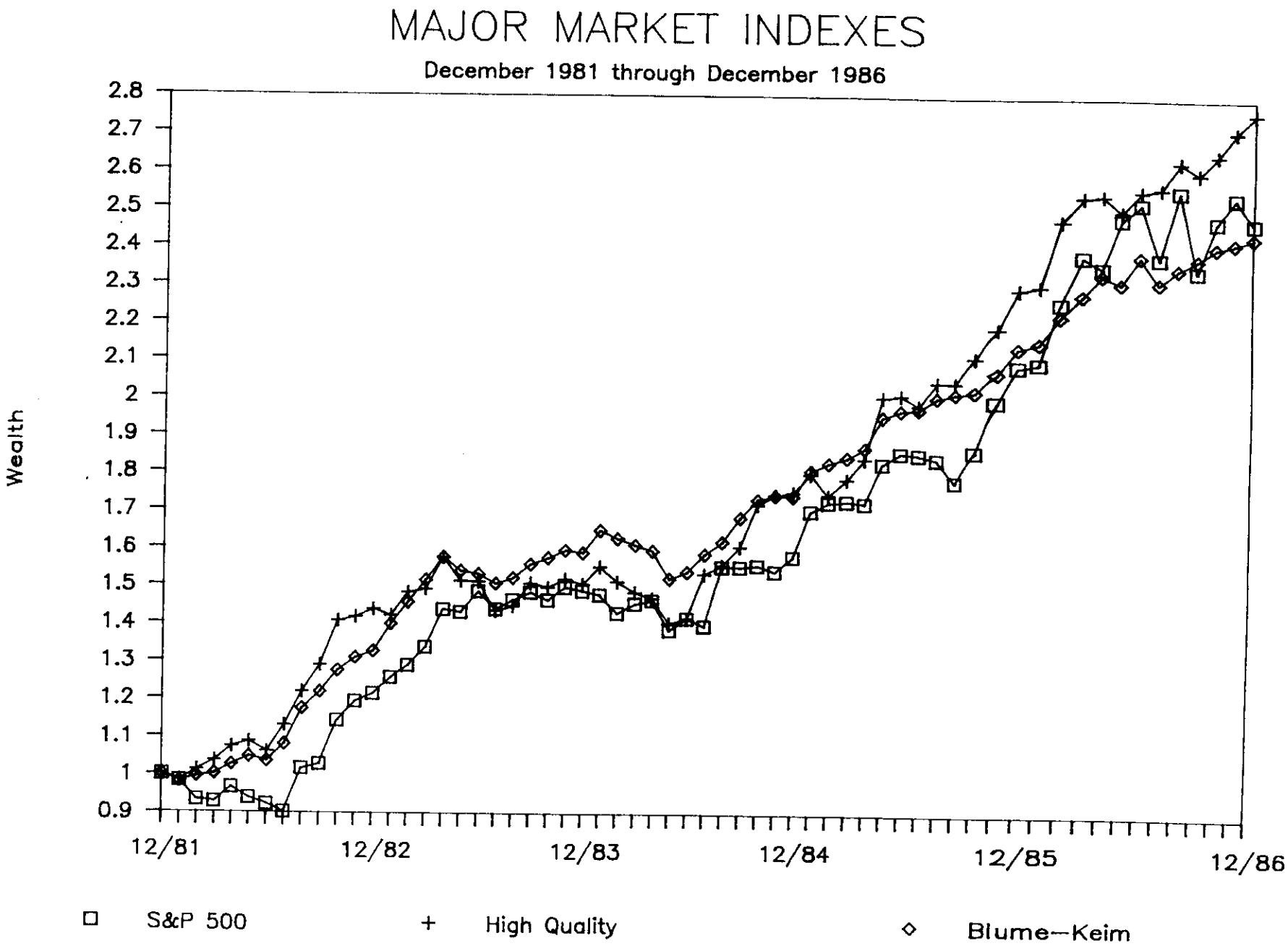

MAJOR MARKET INDEXES
December 1981 through December 1986
Wealth
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
12/81
12/82
12/83
12/84
12/85
12/86
S&P 500
High Quality
Blume–Keim

Figure 4

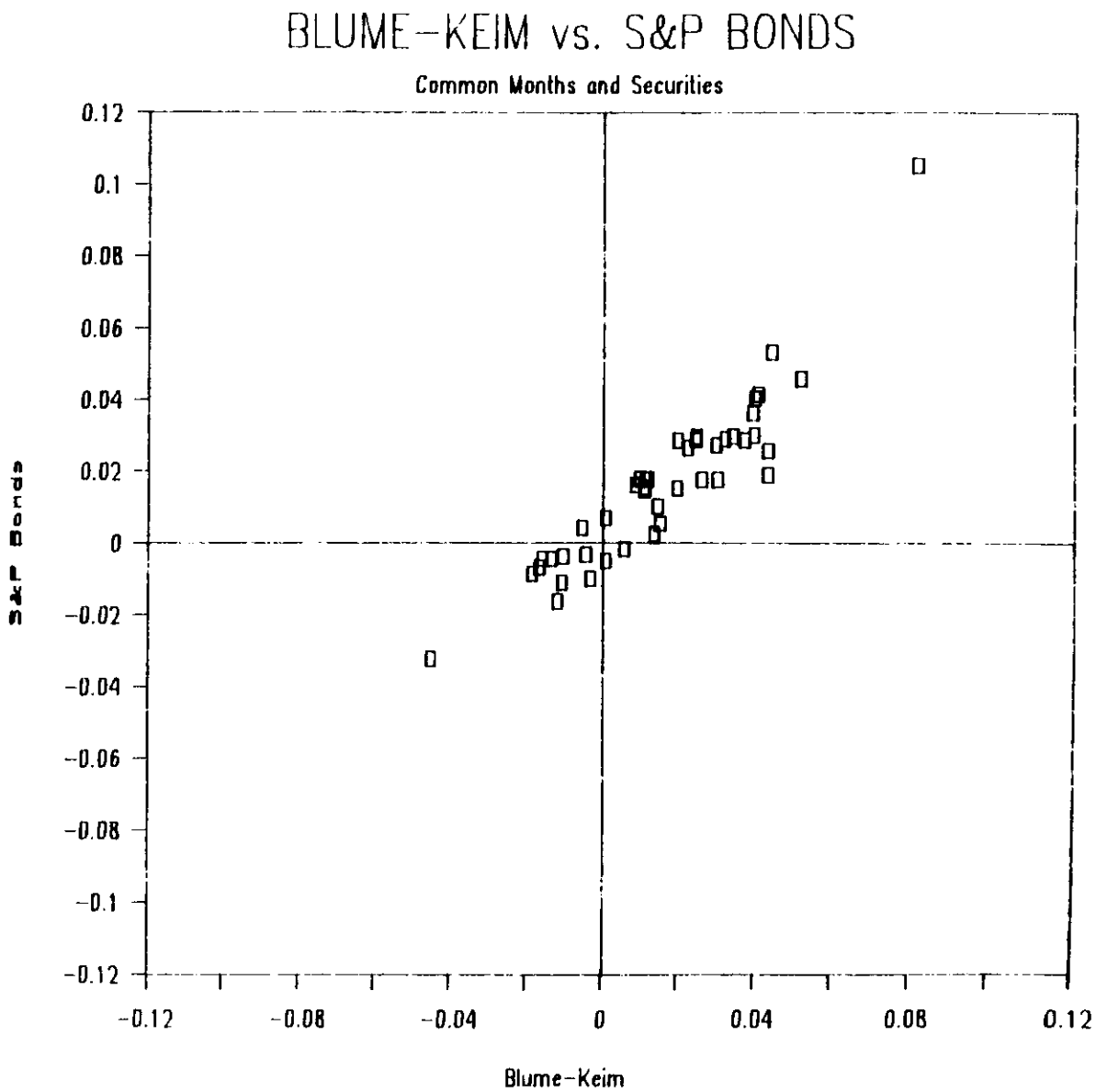
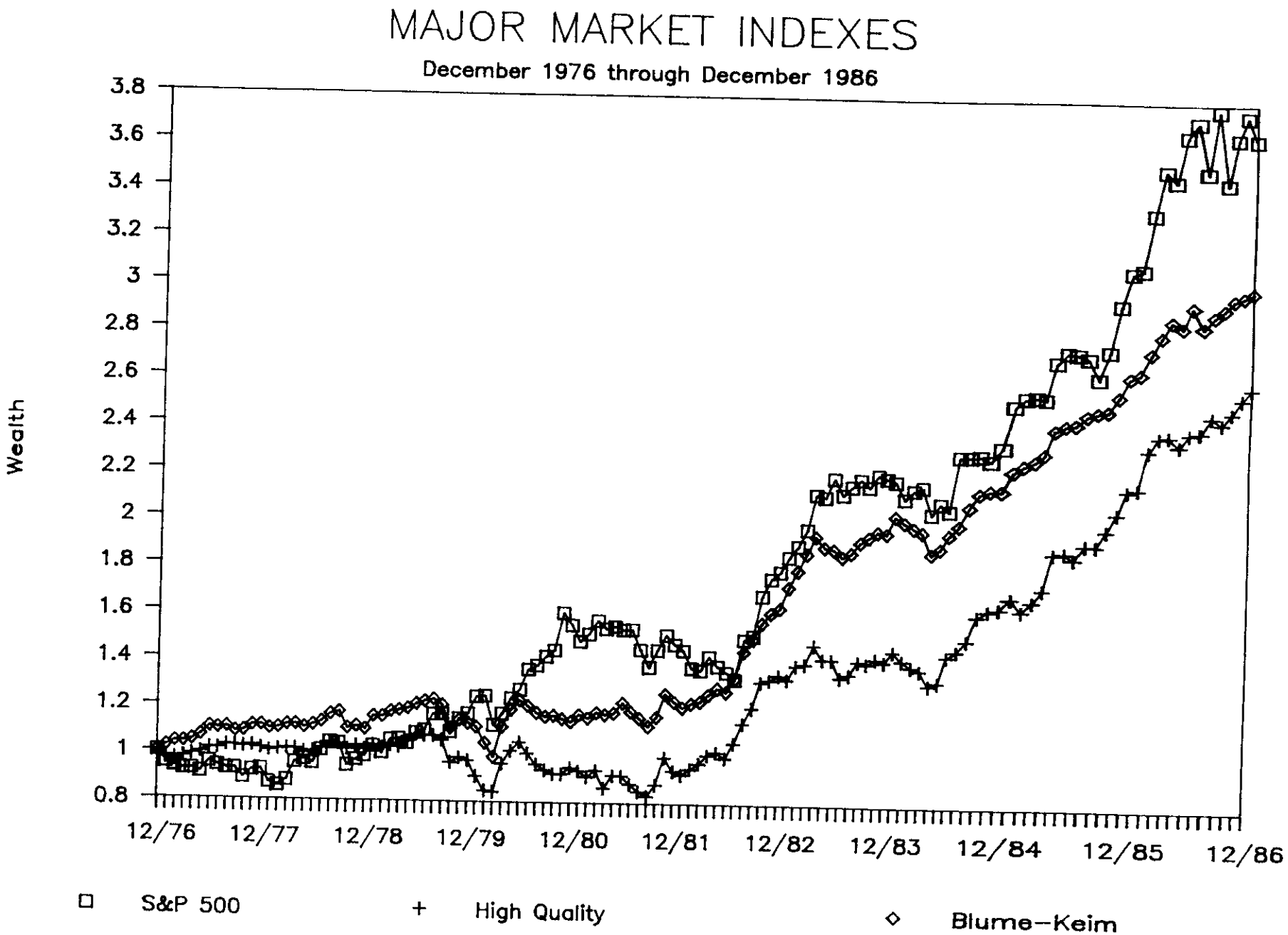

BLUME-KEIM vs. S&P BONDS
Common Months and Securities
S&P Bonds
Blume-Keim
0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
-0.12
-0.12
-0.08
-0.04
0
0.04
0.08
0.12

Figure 5


MAJOR MARKET INDEXES
December 1976 through December 1986
Wealth
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
12/76
12/77
12/78
12/79
12/80
12/81
12/82
12/83
12/84
12/85
12/86
S&P 500
High Quality
Blume–Keim

Appendix

B-K Lower-Grade Indexes

A. Returns in Percent

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
JAN.	2.2	-1.3	5.1	-1.3	2.8	-1.8	5.5	3.8	3.9	0.6
FEB.	1.9	0.3	-0.1	-6.0	-1.2	1.4	4.1	-1.3	1.2	3.3
MAR.	-0.0	1.3	2.0	-5.7	2.0	0.6	4.1	-1.0	0.8	2.6
APR.	0.9	0.0	0.5	13.0	-0.7	2.5	4.0	-0.9	1.4	2.4
MAY	1.8	-1.1	0.5	6.6	0.5	2.1	-2.3	-4.6	4.4	-0.9
JUNE	3.3	1.0	1.8	3.3	3.8	-1.1	-0.5	1.2	0.9	3.1
JULY	-0.3	1.2	0.9	-1.9	-3.1	4.3	-1.6	3.0	0.2	-2.9
AUG.	0.3	2.9	0.8	-2.3	-2.2	8.7	0.9	2.0	1.5	1.7
SEPT.	-1.6	0.7	-2.1	-1.3	-2.9	3.8	2.4	4.0	0.6	1.1
OCT.	0.2	-5.8	-8.1	0.4	3.5	4.6	1.1	2.8	0.3	1.4
NOV.	2.2	0.8	3.2	-1.2	8.4	2.7	1.3	0.7	2.4	0.5
DEC.	0.1	-1.2	-1.2	-1.0	-2.5	1.3	-0.4	-0.1	3.2	0.6

B. Index Values

A. Returns in Percent

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
JAN.	1.02	1.10	1.16	1.11	1.17	1.21	1.72	2.03	2.23	2.65
FEB.	1.04	1.10	1.16	1.05	1.16	1.23	1.80	2.01	2.26	2.74
MAR.	1.04	1.12	1.18	0.99	1.18	1.23	1.87	1.99	2.28	2.81
APR.	1.05	1.12	1.18	1.12	1.17	1.26	1.94	1.97	2.31	2.88
MAY	1.07	1.11	1.19	1.19	1.18	1.29	1.90	1.88	2.41	2.85
JUNE	1.10	1.12	1.21	1.23	1.23	1.28	1.89	1.90	2.43	2.94
JULY	1.10	1.13	1.22	1.21	1.19	1.33	1.86	1.96	2.44	2.86
AUG.	1.10	1.16	1.23	1.18	1.16	1.45	1.88	2.00	2.47	2.90
SEPT.	1.09	1.17	1.21	1.16	1.13	1.50	1.92	2.08	2.49	2.93
OCT.	1.09	1.10	1.11	1.17	1.17	1.57	1.94	2.13	2.49	2.97
NOV.	1.11	1.11	1.14	1.15	1.26	1.61	1.97	2.15	2.56	2.99
DEC.	1.12	1.10	1.13	1.14	1.23	1.64	1.96	2.15	2.64	3.01