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LONG TERM INVESTMENT CHARACTERISTICS OF CONVERTIBLE BONDS
An Analysis of Returns (1947 - 1979)

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I. INTRODUCTION. Driven by the need for and the virtues of diversification, institutional investors now require quantifiable historical measures of the many available investment alternatives. These measures become the basis for judging the appropriateness and the role that each alternative can play in an optimally constructed portfolio. Common stocks, for example, have been subjected to intensive examination and most fiduciaries believe they understand the nature and the characteristics of equities. Recently, this analysis has been carried forward, in varying degree, to fixed income securities, foreign securities, options and real estate.

We present here, we believe for the first time, a detailed examination of domestic convertible bonds in the period since 1947. Convertibles, nourished with a farrago of fact, fiction and fantasy by a small group of enthusiastic followers, have not until now been systematically measured over an extensive period of time. This paper examines the investment performance for a broad sample of convertible bonds over a twenty year period. These measures include return, volatility and correlation with common stock. In Section II we present findings for the ten years ending December 1967; in Section III for an eleven and one-half year period ending June 1979. In Section IV the behavior of convertible bond premiums is examined. We conclude with some observations in Section V.

II. CONVERTIBLE BONDS IN THE TEN YEAR PERIOD ENDING DECEMBER 1967. We rely mainly on data published by the Standard & Poor's Corporation for the period starting January 1947. In the early years of this period Standard and Poor's published a monthly *Convertible Statistics*. From these reports, published at varying days of the month, we selected for our sample those convertible bonds that were listed on the New York Stock Exchange, whose exercise terms did not require cash payment on conversion, and for which Standard & Poor's calculated an investment value. From January 1947 to December 1957 these criteria did not yield enough observations for a meaningful analysis. In fact, until September 1955, no more than four issues were available in any month. (American Telephone dominated the field in this period in dollar value. The Telephone bonds required cash payment on conversion. The other major issuers in these early years were Dow Chemical, Standard of Indiana, Consolidated Edison and Scott Paper.) By December 1957, the sample size grew to 43 issues with a total market value of $1.35 billion. We begin our analysis at this point examining first the decade ending December 1967. (Starting with January 1968 we shift to a more regularly published data base.)

For the 120 months ending December 1967, the number of observations that met the above criteria ranged between 43 and 140 per month, with a total market value that ranged between $1.3 and $5.0 billion. Using the published month-end prices without transaction costs we calculated the total return for all the bonds in the sample, their underlying stocks and the S & P 500. (Total return for bonds consists of paid and accrued interest plus capital appreciation; for stocks it consists of cash dividends plus capital appreciation. Bonds often trade in "thin" markets where the "last" price may not be a reasonable estimate of the price an investor can expect on a transaction of size. Nevertheless, we believe these published prices are unbiased estimates of what could have been achieved on average over time.)

We calculated performance statistics for the following five portfolios:

(1) All of the convertible bonds in our sample, equally weighted each month,

(2) An equally weighted subset of the bonds, which we call the *filtered set*. These are the bonds that are selling for (a) less than 1.25 times the bond's conversion value, i.e., the value of the common shares obtainable on conversion, and (b) less than 1.2 times the bond's investment value. (A convertible bond's investment value is the estimated value of the bond if it had no conversion privileges.)*,

(3) All of the common stocks, equally weighted, associated with the entire sample of convertible bonds,

(4) All of the common stocks, equally weighted, associated with the filtered set of convertible bonds defined in (2),

(5) The S & P universe of 500 stocks, value weighted.

** It has been known for some time that a convertible bond selling close to its conversion and investment values has superior investment characteristics. See* Evaluation of Convertible Securities, *S.T. Kassouf, 1962 and* Beat the Market, *E.O. Thorp and S.T. Kassouf, 1969. The specific criteria used to generate our filtered set have been suggested by Charles Lard.*

Figure 1 displays the annual average returns and standard deviations of these five portfolios. For the entire sample, the underlying stocks underperformed the S & P 500 with an average return of 12.15% versus 13.08% *and* were more volatile with an annual standard deviation of 13.58% versus 10.39%. The entire sample of convertible bonds exhibits less return and less volatility than both the underlying stocks and the S & P 500.

The filtered set of bonds, however, was superior to all of the other portfolios in both return and risk. It is interesting to note that this superiority was achieved in spite of the fact that the underlying stocks underperformed the S & P 500 in return and had more volatility. The relationship between the returns on portfolios (1) through (4) and the S & P 500 was measured by regressing the excess returns of the S & P 500 on the excess returns of each of the four portfolios. The annualized parameters of these regressions, plus the statistics underlying Figure 1 are presented in Table 1.

Table 1.

	Average Return	Standard Deviation	Equivalent Annual Compound Return	Alpha	Beta	R^2
(1) All convertible bonds in sample	9.25	7.83	8.88	0.43	0.60	.64
(2) Filtered bonds	16.49	7.66	16.09	7.09	0.55	.55
(3) Underlying common for all bonds in sample	12.15	13.58	11.06	−3.36	1.12	.55
(4) Underlying common for filtered bonds	6.55	12.61	5.72	5.40	0.91	.61
(5) S&P 500	13.08	10.39	12.48	0.00	1.00	1.00

Performance statistics for convertible bonds, their associated common stocks, and the S & P 500 for the ten year period ending December 1967.

Table 2.

Portfolio	Average Return	Standard Deviation	Equivalent Annual Compound Return	Alpha	Beta	R^2
(1) All convertible bonds in sample	6.44	15.10	5.26	0.08	0.78	.81
(2) Filtered bonds	13.36	14.78	12.10	1.67	0.74	.56
(3) Underlying common for all bonds in sample	7.35	25.95	3.92	0.28	1.33	.82
(4) Underlying common for filtered bonds	8.29	20.18	6.15	0.51	0.99	.74
(5) S & P 500	6.14	17.46	4.53	0.00	1.00	1.00

Performance statistics for convertible bonds, their associated common stocks, and the S & P 500 for the 11½ year period ending June 30, 1979.

III. CONVERTIBLE BONDS IN THE 11½ YEAR PERIOD ENDING JUNE, 1979. For this period, Standard and Poor's discontinued publication of *Convertible Statistics* but began to include the necessary data in their *Bond Guide*. We shift to this source using end of calendar-quarter prices for those convertible bonds listed on the New York Stock Exchange, with rating BB or better, with more than $5 million face value outstanding, and which did not require cash payment on conversion. For this eleven and one-half year period the number of observations that met the above criteria ranged between 98 and 164 per quarter with a value that ranged between $3.9 and $7.6 billion. Again, we consider the five portfolios as defined in Section II. Figure 2 and Table 2 summarize all of the performance statistics.

The relative performance of these five portfolios differed somewhat from the earlier period. However, once again the filtered set of convertible bonds (those selling close to their investment and convertible values) are distinctly superior investments. The following observations may be made:

1. The underlying stocks in the entire sample returned more than the S & P 500 and were more volatile.

2. The underlying stocks in the filtered set also returned more than the S & P 500 but were only slightly more volatile.

3. The filtered subset of bonds significantly outperformed all of the other portfolios, with an average annual return of 13.26% and an annual standard deviation of 14.78%.

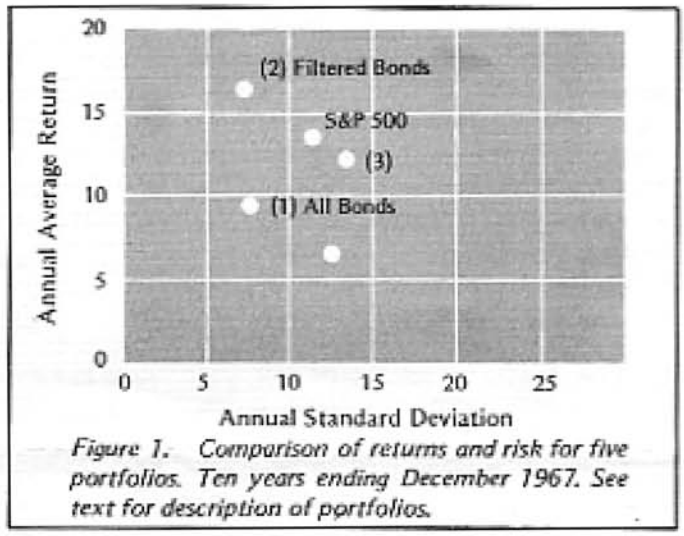

Figure 1. Comparison of returns and risk for five portfolios. Ten years ending December 1967. See text for description of portfolios.

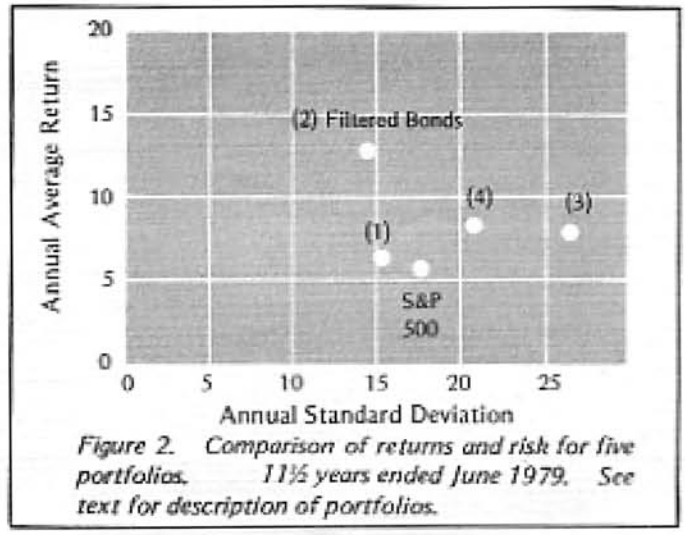

Figure 2. Comparison of returns and risk for five portfolios. 11½ years ended June 1979. See text for description of portfolios.

IV. THE BEHAVIOR OF CONVERTIBLE BOND PREMIUMS.

A convertible bond may be exchanged, at the option of the holder, into a specified number of common shares before a specified date. (Let us call the shares obtainable on conversion the *latent shares.*) If this conversion feature were absent, the price of the bond would be determined primarily by the size of the coupon, the maturity, and the bond's quality. Let us call the value of the bond without its conversion privilege, the bond's *investment value.* Similarly, the value of the latent shares may be called the *conversion value* of the bond. The criteria used for inclusion in the filtered sets were: (a) the bond's price was less than 1.25 times its conversion value, and (b) the bond's price was less than 1.20 times its investment value. It is well known that convertible bonds rarely sell at their conversion value. The amount over the conversion value is sometimes called the *conversion premium.* This premium varies with the relative yield on the bond versus the stock, the stock price, the volatility of the stock, and investors' risk-attitudes and expectations. In order to measure the way in which this premium varied over time, we ran the following regression for the forty-six calendar quarters ending June 1979:

$$\text{Premium} = a + b\,(\text{stock price/exercise price}) + c\,(\text{coupon} - \text{dividend}) + d\,\log(\text{stock high/stock low})$$

where

$$\text{Premium} = \frac{(\text{bond price} - \text{investment value})/\text{number of latent shares}}{\text{exercise price}}$$

$$= (\text{bond price} - \text{investment value})/\text{investment value}$$

$$\text{exercise price} = \text{investment value/number of latent shares}$$

$$\text{coupon yield} - \text{dividend yield} = \text{excess yield}$$

$$\log(\text{stock high/stock low}) = \text{volatility.}$$

After estimating the parameters of the regression for each of the forty-six quarters, we calculated an "average" premium for a convertible bond of fixed volatility, fixed excess yield, and for stock price equal to exercise price. This premium is charted in Figure 3 along with the level of the S & P 500. It can be seen that there is great variation in this premium level over time. We have observed the same great variability in the level of premiums in both the warrant and option markets. Unlike other studies, we have found no relationship between premium levels and the riskless rate of interest over the post World War II period. While this variability is not clearly understood, it is in part a reflection of the optimism and pessimism of investors along with their changing risk-attitudes.

V. CONCLUSIONS.

A properly selected portfolio of convertible bonds has investment characteristics that are distinct from common stock portfolios, straight bond portfolios, or any combination of stock and bond portfolios. Convertible bond portfolios, when properly constructed and maintained, fluctuate less than equities and return more than both stock or straight bond portfolios. The accompanying correlation matrix shows the relationship between all convertible bonds, the filtered set of bonds, high-grade long-term corporate bonds (as measured by the Salomon Brothers Index), and the S & P 500 stock average. These correlations clearly show that properly constructed portfolios of convertible bonds have unique characteristics. For the benefits of diversification alone they merit consideration. Since convertibles can also enhance long term return, they clearly can play a valuable role in all large portfolios with long term time horizons.

	Salomon	S & P 500	All Conv.	Filtered Conv.
Salomon	1	.68	.68	.73
S & P 500		1	.90	.87
All Conv.			1	.95
Filtered Conv.				1

Table 3. Correlation matrix for 11½ years ending June 1979.

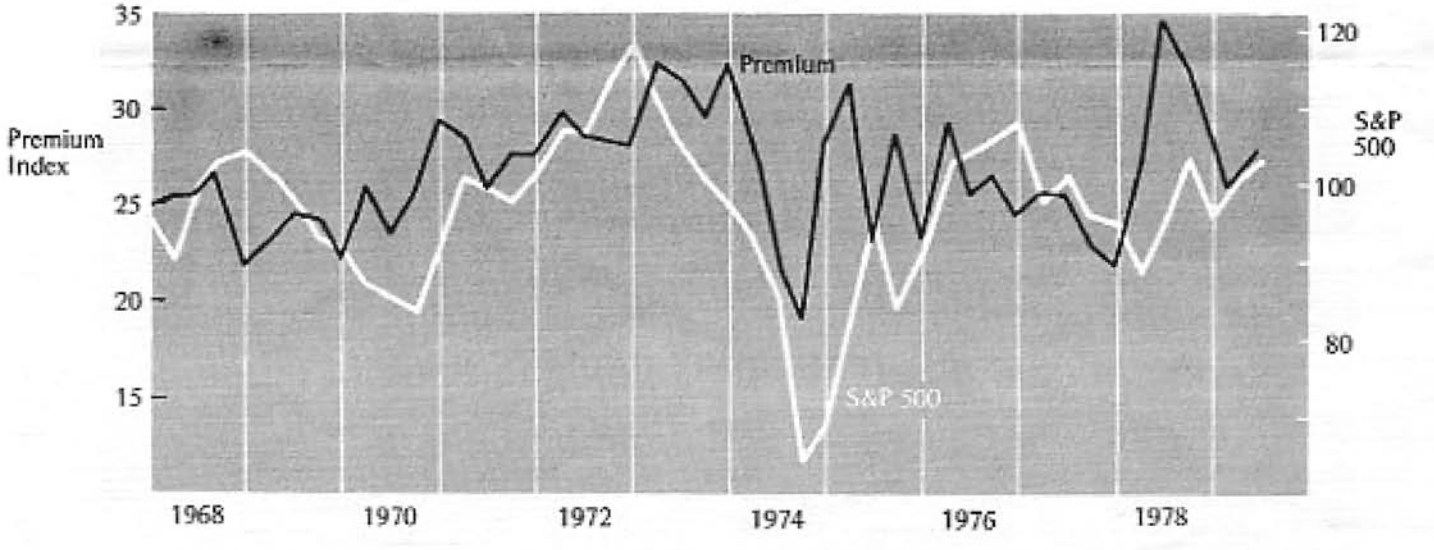

Figure 3. Convertible bond premium index and S & P 500, quarterly, 11½ years ending June 1979.

APPENDIX
TOTAL RETURNS, PERCENT

PERIOD		S & P 500	SALOMON	CONVERTS ALL	CONVERTS FIL
1968	I	- 5.73		- 4.13 (98)	- 0.44 (7)
	II	11.23		9.70 (101)	11.30 (11)
	III	3.86		2.83 (111)	- 0.46 (6)
	IV	1.97		2.67 (112)	4.27 (3)
1969	I	- 1.52	- 2.22	- 5.93 (120)	- 5.29 (3)
	II	- 2.98	1.37	- 6.66 (121)	- 0.47 (7)
	III	- 3.91	- 2.60	- 3.58 (135)	- 3.06 (15)
	IV	- 0.24	- 4.81	- 5.83 (134)	- 4.95 (13)
1970	I	- 1.79	5.02	1.85 (142)	5.20 (24)
	II	-17.98	- 4.08	-18.18 (152)	-12.66 (9)
	III	16.87	8.09	14.99 (157)	17.51 (19)
	IV	10.37	8.72	7.11 (150)	10.54 (13)
1971	I	9.67	4.07	15.25 (163)	15.23 (5)
	II	0.17	- 2.90	- 2.58 (158)	- 0.03 (2)
	III	- 0.59	4.21	2.14 (155)	- 9.01 (4)
	IV	4.60	5.42	2.76 (146)	8.99 (4)
1972	I	5.74	0.98	6.88 (159)	3.31 (3)
	II	0.67	1.29	- 2.59 (161)	4.86 (2)
	III	3.91	1.34	- 1.20 (161)	- 0.67 (4)
	IV	7.55	3.48	3.84 (163)	6.76 (11)
1973	I	- 4.88	0.15	- 5.68 (163)	- 3.61 (12)
	II	- 5.77	- 0.35	- 6.99 (164)	- 7.19 (19)
	III	4.80	2.14	7.32 (161)	10.04 (25)
	IV	- 9.16	- 0.78	- 8.67 (160)	- 5.91 (25)
1974	I	- 2.81	- 3.50	5.86 (153)	8.41 (15)
	II	- 7.54	- 5.16	- 9.33 (154)	- 7.68 (14)
	III	-25.05	- 3.07	-12.50 (155)	-13.89 (29)
	IV	9.41	9.29	5.12 (158)	4.37 (21)
1975	I	22.90	4.76	19.53 (156)	20.04 (12)
	II	15.31	3.59	7.38 (148)	5.96 (8)
	III	-10.93	- 3.28	- 4.96 (152)	- 5.03 (22)
	IV	8.64	9.22	6.32 (155)	11.20 (14)
1976	I	14.96	4.22	16.54 (156)	17.01 (17)
	II	2.46	0.30	2.07 (153)	1.50 (5)
	III	1.89	5.56	3.73 (155)	5.22 (18)
	IV	3.18	7.52	5.63 (152)	6.69 (15)
1977	I	- 7.44	- 2.31	- 0.44 (147)	1.99 (21)
	II	3.28	3.84	3.84 (144)	4.36 (22)
	III	- 2.80	1.09	- 0.04 (142)	- 0.21 (18)
	IV	- 0.14	- 0.82	1.00 (141)	2.27 (23)
1978	I	- 4.95	- 0.03	0.40 (139)	0.45 (24)
	II	8.52	- 1.10	6.20 (117)	4.65 (27)
	III	8.66	3.10	6.34 (112)	6.48 (4)
	IV	- 4.94	- 2.05	- 7.15 (120)	- 3.33 (4)
1979	I	6.97	1.61	7.28 (120)	8.10 (31)
	II	2.64	4.49	4.18 (120)	4.59 (12)

ANNUALIZED SUMMARY STATISTICS, PERCENT

Average Return	6.14	5.85	6.44	13.26
Standard Deviation	17.46	7.52	15.10	14.78
Alpha	0.00	1.16	.08	1.67
Beta	1.00	.30	.78	.74
Growth Rate	4.53	5.56	5.26	12.10

Salomon Index not available for 1968. The parenthetical numbers in the last two columns indicate the size of the sample for that quarter.