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ABSTRACT

CORPORATE EXPERIENCE
WITH CONVERTIBLE DEBT

By

John Hagerty Burns

Overall corporate experience with convertible debt was examined by compiling aggregate data on all forms of convertibles and their issuers over the period 1950-1969. U. S. firms that issued convertible subordinated debentures larger than $10 million during the period were then selected to study individual firm performance. The effects of convertible subordinated debentures on earnings per share, incremental cash flow and rate of return were initial variables. Conversion rate, call policy, capital structure and conversion value were also examined to complete the experience. Finally, the trade-off between interest rates and conversion prices was investigated.

The hypothesis was that financing with convertible subordinated debentures, instead of subordinated debentures, should positively improve the company's subsequent performance. Simulation was the technique employed in this study. Firm performance as reflected by the variables mentioned above was simulated assuming the substitution of a pure debt issue for the actual convertible debt outstanding. Actual performance was then compared to simulated performance and tested using non-parametric statistical techniques.

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Analysis results showed significant differences between actual and simulated performance due to non-random influences. However, the data showed that convertible issuers were at a significant earnings per share disadvantage relative to the use of straight debt which was later replaced with common equity. The ratio of actual earnings per share to simulated earnings per share was consistently below one and deteriorated the longer an issue remained outstanding. Time adjusted incremental cash benefits were related to the length of time from issue. The longer an issue was outstanding, the greater the probability that net present value would be negative. Rates of return were positively influenced by convertible usage but only minimally. Combined results indicated rejection of hypothesis.

Capital structure analysis indicated that convertible issuers tend to use debt more heavily than the average for all manufacturing companies. Examination of conversion values, however, showed that many convertible issuers expect early conversion from debt to equity. Conversion rate data revealed that convertibles tend to be converted quickly or remain outstanding for relatively long periods. These results explain, in some degree, the earnings per share data. Convertible issuers enjoyed better relative earnings performance in the early life of a convertible and when it was converted quickly

Curves were developed which reflected the tradeoff between interest rates and conversion prices. Simple curvilinear regression was used with the data classified by time period,

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industry and growth. A further test employed data taken at issue date and market data observed one year after issue. The correlation coefficients observed were generally low for issue date categories. The lagged market data produced better results with correlations of a magnitude of 0.8 for industrial categories.

CORPORATE EXPERIENCE WITH CONVERTIBLE DEBT

By

JOHN HAGERTY BURNS

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Accounting and Financial Administration

1972

To Mary, wh
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To Mary, whose joint venture with the author has resulted in three lively subsidiaries.

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ACKNOWLEDGMENTS

A thesis writer relies on many people for aid in the completion of his work. Among those I would like to acknowledge are my committee composed of Dr. Alan Grunewald, Dr. Bruce Coleman and especially my chairman, Dr. Myles Delano. Also deserving recognition are Mrs. Lillyan Fahy who cheerfully typed and retyped the rough draft and Miss Susan Roy for typing the final copy.

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CHAPTER I

INTRODUCTION

In the United States' economy, the corporate business form enjoys a predominant position. Dewing said:

> This book...looks upon the corporation as preeminently an ingenious creation of man's reflective imagination to which our modern world has delegated a large part -- an increasingly large part, as time goes on -- of those economic activities of society requiring a considerable amount of capital.[1]

The capital referred to is typically raised by using a wide variety of instruments which fall broadly into the categories of debt or equity. Familiar forms are bonds, preferred stock, common stock and retained earnings. These basic forms have been modified to produce a number of hybrid securities designed to meet the needs of the issuing corporation. Of these, convertible bonds appear to have found increasing favor in the corporate quest for additional capital. This study examined the financial effects on the issuing corporation that arose from the use of convertible debt in general and convertible subordinated debentures in particular.

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[1] Arthur Stone Dewing, A Study of Corporation Securities: Their Nature and Uses in Finance (New York: Ronald Press, 1934), p.v.

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In this chapter the nature of convertible bonds is presented as a foundation for later development. Next, the problem that was investigated is discussed in the context of convertible bond theory. This historical importance of convertibles and the study's significance are offered as motivation for the research. Finally, the hypothesis and unverlying assumptions are presented along with a statement of basic methodology.

Convertible Securities

Convertible securities reflect an attempt to combine the attractions of debt and equity in one security form in an appeal to several classes of capital suppliers. In a broad sense, the convertible security has been defined as a bond or preferred stock, exchangeable at the option of the holder, under specified terms or conditions for the common shares of the same corporation.[2] This is not an all inclusive definition. The option to convert is sometimes withheld by the issuer. Also, the conversion security, in rara situations, can be senior to the convertible, or be securities representing more than one firm. These cases are deviations from the mainstream of convertible issuers which will be eigher

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[2]Montgomery Rollins, "Convertible Bonds and Stock," Annals of American Academy of Political and Social Science, XXXV, No. 3 (1910), 97.

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bonds or preferred stocks convertible into the issuing firm's common stock.

Convertible Bonds

This study focused on convertible bond usage from the issuer's viewpoint and did not consider convertible preferred stock. Convertible debt can, and usually does, exhibit many of the characteristics of pure debt. The convertible debt ordinarily will be some form of bond or note. Issuing of a convertible can be publicly on an underwritten or non-underwritten basis, and rights can be employed. Alternatively, a considerable amount of convertible debt is placed privately. In addition, convertibles are sometimes offered in exchange for other securities. Convertible bonds can be of a serial nature but most are straight bonds.[3] Debenture bonds and secured issues are used, as is the technique of subordination. Call features are also employed. As will be seen, most modern publicly offered convertible debt issues are subordinated and are callable.

Making a bond convertible alters a fixed income security to one that also possesses equity characteristics. Unless otherwise noted, in this paper the term convertible means

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[3] Thomas R. Atkinson, Trends in Corporate Bond Quality, National Bureau of Economic Research (New York: Columbia University Press, 1967), p. 104.

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exchangeable for the common stock of the same corporation. Thus, the convertible security will be a bond or debenture and the conversion security will be common stock.

A convertible bond is similar to a "pure" bond in that is pays a fixed amount of income on a given face value. The hybrid nature of the security is due to the fact that it may be converted into shares of common stock. Conversion terms may be either fixed or variable and the conversion period may be some time span other than that covered by the bond's life.

A typical convertible bond would be a $1,000, 4 per cent, 25 year, subordinated debenture, callable at 104 at any time, and convertible into 20 shares of common stock at any time before call or maturity. A variation on this would have the number of shares of the conversion security obtainable, changing from 20 to 18 after 5 years and decreasing by 2 shares every 5 years up to 20 years at which time the conversion option would expire. This bond would be said to have a variable conversion ratio. The conversion ratio is the number of conversion security shares obtained when the bond is converted. Once the conversion ratio is stated, the effective price per share is determined. Thus, investing in a $1,000 convertible bond with a conversion ratio of 20 would be equivalent to buyint 20 shares of the firm's common at $50 per share, ignoring

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transaction costs. A change in the conversion ratio from 20 to 18 would increase the common's conversion price from $50 to $55.56 per share.

It is helpful to maintain the investor viewpoint to acquire an understanding of the convertible's dual nature. Recent work examining the theoretical aspects of convertible securities divides the security's value into two parts.[4]

The first is the security's present value which can be found be discounting the fixed stream of interest payments and the security's expected value at the end of a given horizon. The security's expected value at the horizon's end will depend on the firm's profitability and on outside market forces which influence security values. If the firm is successful in generating profits and a favorable rate of return in a healthy economic climate, the convertible's terminal value may exceed its debt value and be determined primarily by equity considerations.

The second part emphasizes the security's dual nature which allows the investor to treat it as either a stock or a bond. Thus the investor has both the insurance of a relatively stable debt value and a call or option on the

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[4] Otto H. Poensgen, "The Valuation of Convertible Bonds: Part I," The Industrial Management Review, VII (Fall, 1965), 78-79; and William J. Baumol, Burton G. Malkiel, and Richard E. Quandt, "The Valuation of Convertible Securities," Quarterly Journal of Economics, LXXX (February, 1966), 48-59.

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firm's common stock. Assume that an investor brought the hypothetical bond referred to earlier and the company's stock rose to sell at $60 per share. The bond's value in conversion would be $1,200 (20 shares X $60 per share). If the investor cashed out at that point, his final value would be determined by the bond's stock equivalent. This option is worth something to the investor in and of itself. On the other hand, if the market for the firm's stock does not develop as predicted this capital gain element will not be realizable. However, the investor is protected by the bond's basic nature and may dispose of his investment at a price that is determined by the bond value of the convertible or he may hold the bond and receive face value at maturity. Thus, he has the insurance of limiting his risk in the market vis-a-vis the purchaser of common stock. For an investor, then, a convertible can be viewed as two separate elements -- a fixed income portion and an equity portion.

Historical Importance

Convertible bonds are not a new financing tool. Pilcher cites a situation in which King Charles I of England was allowed to convert his stock of an early London Water Company into bonds during his reign of 1625-1649.[5] Taylor relates

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[5] C. James Pilcher, Raising Capital With Convertible Securities (Ann Arbor: Bureau of Business Research, University of Michigan, 1955), p.2.

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9 Ibid.

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that, "This practice is recorded in the literature of corporation finance as early as the first part of the eighteenth century."[6] However, he adds a colorful sidelight that convertibles were used mainly by financial manipulators in shady deals.

Convertible bonds are mentioned in the history of American finance.[7] Daniel Drew used them in the late 1850's. Jay Gould employed convertibles in covering himself when caught short of Erie.[8] Later, convertible bonds were a tool of E. H. Harriman in building up the Union Pacific system.[9] In this century, Hickman reports a total of 1,989 convertible bond offerings representing $9,128.3 million of par value during the period 1900-1943.[10] Convertibles have ranged from a low of zero per cent of all bond offerings in 1943 to a high of 40 per cent of all bond offerings in 1929, as shown

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6 W. Bayard Taylor, Financial Policies of Business Enterprise (New York: D. Appleton-Century, 1924), p. 292.

7 Arthur Stone Dewing, Financial Policy of Corporations, Vol. I: Corporate Securities (New York: Ronald Press, 1920), p. 137.

8 Ibid.

9 Ibid., p. 138.

10 W. Braddock Hickman, Statistical Measures of Corporate Bond Financing Since 1900, National Bureau of Economic Research (Princeton, N. J.: Princeton University Press, 1960), p. 210.

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by a study covering the years 1900-1965.[11]

In the 20 year period 1950-1969, American business increased its net working capital by approximately $134 billion and spent over $861 billion on new plant and equipment.[12] One source for financing this expansion was the new securities market. The importance of this sector can be seen in Table 1.1. The use of preferred stock has dropped steadily in importance, indeed preferreds comprised 10.9 per cent of total financing in the period 1945-1949. Both bond and common stock financing increased slightly on a relative basis while total financing multiplied by a factor of two and a half, in dollar terms, between the first and last quarters of this twenty year period.

The figures shown in Table 1.2 reflect the relative importance of convertible bonds in the years 1956-1969. Convertible bonds, as a per cent of total bonds, drop to a bottom of 3.3 per cent in 1963 before beginning a rapid rise to a level of approximately 20 per cent over the last 3 years. It should be noted that the figures in the SEC series differ from those of the Investment Dealers' Digest series of new

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[11] Atkinson, op. cit., p. 78.

[12] U. S., Board of Governors, Federal Reserve System, Federal Reserve Bulletin, XLIII (December, 1957), 1396; L (December, 1964), 1578; LVI (March, 1970), A49.

TABLE 1.1

NEW CORPORATE SECURITIES OFFERED
FOR CASH IN THE UNITED STATES,
1950-1969
(Millions of Dollars)

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NEW CORPORATE SECURITIES OFFERED
FOR CASH IN THE UNITED STATES,
1950-1969
(Millions of Dollars)

Years	Total Corporate Dollars	Type of Security					
		Preferred Stock		Common Stock		Bonds	
		Dollars	Per Cent	Dollars	Per Cent	Dollars	Per Cent
1950-1954	42,050	3,338	7.9	5,931	14.1	32,783	78.0
1955-1959	55,469	2,784	5.0	10,363	18.7	42,222	76.3
1960-1964	60,192	2,036	3.4	9,962	16.5	48,191	80.2
1965-1969	107,574	3,503	3.3	17,105	15.9	86,966	80.9
1950-1969	265,185	11,661	4.4	43,361	16.3	210,162	79.4

Source: U.S., Board of Governors, Federal Reserve System, Federal Reserve Bulletin, XLI (January, 1955), 54.
U.S., Board of Governors, Federal Reserve System, Federal Reserve Bulletin, XLIX (January, 1963), 58.
U.S., Board of Governors, Federal Reserve System, Federal Reserve Bulletin, LV (October, 1969), A46.
U.S., Securities and Exchange Commission, Statistical Bulletin, XXIX (March, 1970), 16.

TABLE 1.2

NEW CORPORATE BONDS OFFERED FOR CASH IN THE UNITED STATES, 1956-1969 (Millions of Dollars)

Year	Total Bonds	Convertible Bonds	
	Dollars	Dollars	Per Cent
1956	8,002	925	11.6
1957	9,957	1,064	11.7
1958	9,653	1,147	11.9
1959	7,190	628	8.7
1960	8,081	462	5.7
1961	9,420	710	7.5
1962	8,969	445	5.0
1963	10,856	357	3.3
1964	10,865	425	3.9
1965	13,720	1,264	9.2
1966	15,561	1,872	12.0
1967	21,954	4,475	20.4
1968	17,383	3,281	18.9
1969	18,348	4,041	22.0
1956-1969	169,959	21,096	12.4

Note: SEC series on convertibles not available prior to 1956.

Source: Total Bonds: Table 1.1
Convertible Bonds: U.S., Securities and Exchange Commission, Statistical Bulletin, XXIX (March, 1970), 19.

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offerings. The basic reason for this difference is that the SEC series covers all new issues offered for cash while the Digest reports primarily on underwritten issues. As a final indication of recent activity in convertible bonds, 41 per cent of the number of bonds quoted on the New York Stock Exchange for Friday, March 13, 1970, were convertible.[13]

Problem

Theoretical Model

The purpose of this study was to investigate convertible bond usage from the issuing corporation's viewpoint. In order to get a clearer picture of the convertible's effect on the firm it is helpful to examine a model developed by Brigham.[14] The line of development is similar to that of Poensgen and Baumol, Malkiel and Quandt referred to earlier.

A graphic presentation of the model is given in Figure 1.1 where IP=issue price of bond, M=maturity, CP=call price

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[13] The Wall Street Journal, March 13, 1970, p. 23.

[14] Eugene F. Brigham, "An Analysis of Convertible Debentures: Theory and Some Empirical Evidence," Journal of Finance, XXI (March, 1966), 35-54. While Brigham first published the model, it was presented in lecture by Myron J. Gordon as early as 1963.

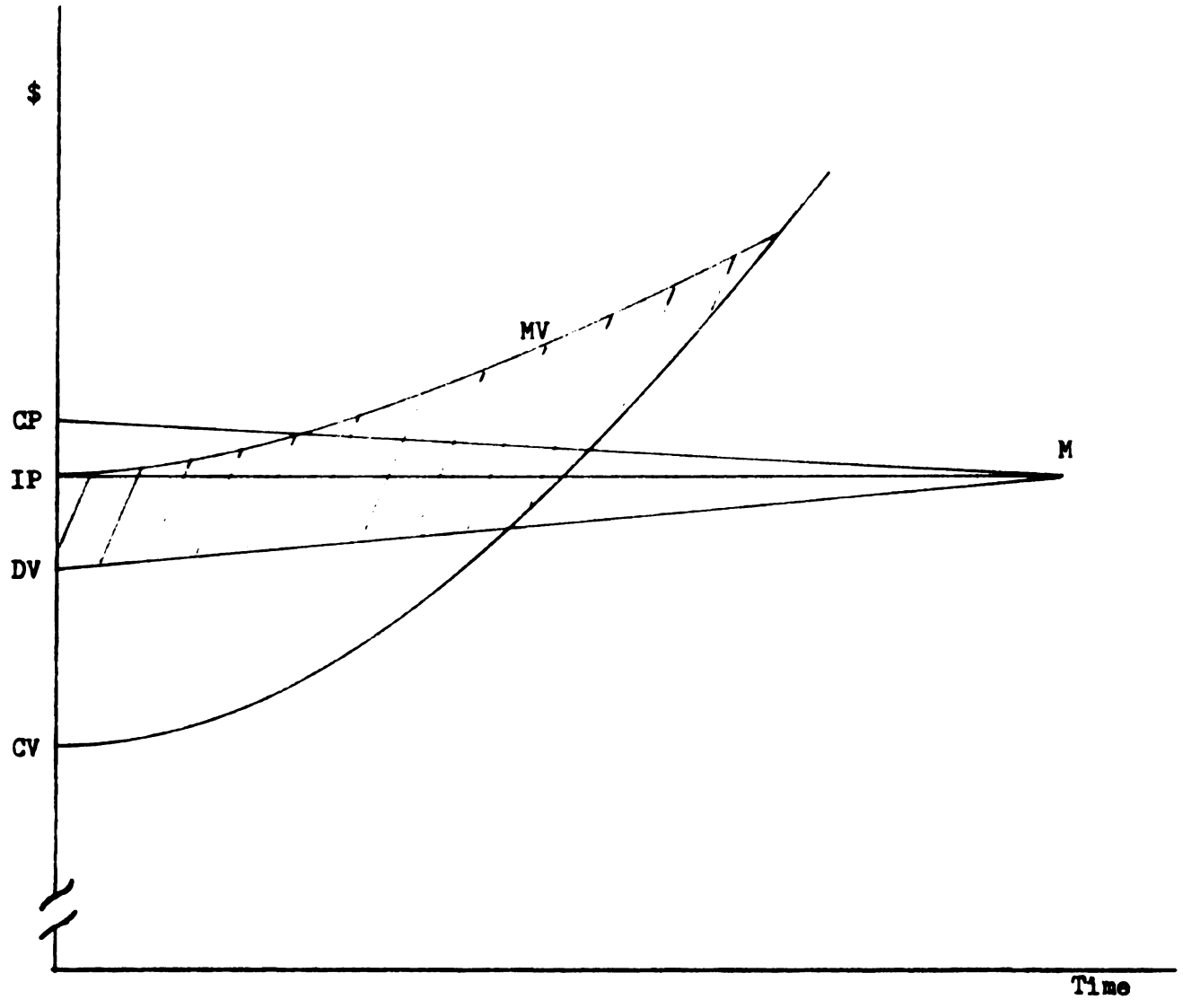

Figure 1.1 Hypothetical Model of a Convertible Bond Issue. The shaded area shows the premium above theoretical value. Adapted from Brigham.

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of bond, and DV=pure debt value of bond, CV=conversion value of bond, and MV=market value of bond. As pictured, the initial market value is the same as the issue price which is equal to par value. Without the conversion feature, the bond investment value is DV since convertibles typically carry a lower coupon interest rate than that of corresponding pure debt issues. As maturity approaches, the DV value approaches par. Also, the call price typically decreases to par as maturity nears. If a constant conversion rate of 20 is assumed, the initial conversion value will be below IP since the conversion price, assumed at $50 per share, will ordinarily be above the prevailing market price of the common at time of issue. The conversion value being equal to the common's market price multiplied by the conversion rate at any point in time. Assuming growth in the company's earnings and therefore growth in the common's market price, CV will increase as shown. The market value will first be influenced by the debt only value since initially it is higher than the conversion value and then by the conversion value as growth in the common's price makes the convertible more valuable as an equity instrument than as a bond. Note that for a convertible bond to react as shown, it is assumed that the market rate of interest is constant as is the market's attitude toward risk and that earnings are growing.

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15 Ibid.

theoretical value for several reasons. First, if the company is successful and the stock price rises, the positive value of the conversion option will result in a premium. Second, in buying convertibles, the investor is able to reduce his risk exposure. For example, if the price of the common associated with the convertible referred to above rises to $60, the CV is $1,200 ($60 X 20). Then, if the stock market drops sharply and the common falls to $25, the CV is $500 and a common stock investor suffers a bad loss. However, the convertible's price will, at a minimum, hit the floor established by the bond's debt only value. A convertible bond investor would encounter a relatively smaller loss and so convertibles tend to sell at a premium. Naturally, changes in general market interest rates will also influence the floor level. Third, it has been argued that institutions restricted from holding pure equities bid up the price on convertibles in order to acquire the equity characteristics of convertible bonds . Fourth, margin requirements on convertibles are more lenient than on common stock and this may also increase demand for convertible bonds.[15]

There are three reasons why the MV approaches the CV. First, the issue is callable and if called, the investor will receive either the conversion value or the call price both of which are

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[15] Ibid., pp. 36, 53.

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generally below the market price for a "successful" issue. Second, due to the loss potential for an investor buying the convertible at a price that is high relative to the CV or DV. Third, the stock's current dividend income may increase to a point above the bond's current interest income.[16]

Factors Influencing Convertible Bond Usage

An examination of the model and consideration of investor action in the market place reveals several reasons why convertible bonds have become a popular financing instrument.

First, convertibles allow the firm to conditionally "sell" common stock at a price higher than that prevailing on the stock market at the time financing is undertaken. This is possible since the conversion price is ordinarily set above the market price of the common at the time of issue.[17] Thus, if management feels the company's stock is undervalued and doesn't want to float pure debt for one reason or another, convertible bonds are a convenient way to market equity. Then, if the company's and not the market's expectations are borne out, management can force conversion by calling the bond or encourage conversion by raising the dividend rate on the common stock. Naturally, if the common's price does not rise as anticipated

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[16] Ibid., p. 37.

[17] ATT's post World War II convertible bonds are an exception.

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by the issuer, call or conversion may not be feasible and the company would be saddled with unwanted debt. It can also be argued that if the common's price is expected to rise in the near future, management should wait and sell pure equity at the higher prices instead of that fixed in the convertible contract. However, in the case of unpostponable financing, convertibles present a solution when other forms cannot be marketed.

Second, the conversion option provides a sweetener for a debt issue. If the firm desires to sell debt but its leverage ratio is already comparatively high or plain debt would be too expensive, the added enticement of conversion may be enough to attract investors.

Third, convertible bonds carry an interest rate that is lower than the rate on equivalent pure debt issues. Potential purchasers are willing to give up current interest income in order to acquire the conversion option. Convertibles mean a relatively low interest cost with a given amount of leverage. Management seeking debt money, then, can hold out the carrot of convertibility in order to float a low interest issue. This can be done even though management has a very low level of expectation that the common stock price will rise appreciably in the near future. If this is the case, management will have achieved a desired low interest cost debt issue to the detriment of those who bought the convertible hoping for capital gains.

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Naturally, in a situation like this, the company is probably in the doldrums and not prospering. The attraction of convertible bonds in this sense, though, is that relatively cheap financing is available when a firm is first starting a project and that project is likely to be generating little or no return. Later, assuming the firm's investment pays off, the stock price will rise, conversion will take place, and the more "expensive" equity will become outstanding.

Fourth, convertible bonds introduce a dimension of flexibility to the capital structure since conversion automatically scales down long term debt turning it into equity. To the firm, conversion can represent the redemption of a senior securitt without the disbursement of cash. At the same time the equity base is built up preparatory to new borrowing, assuming wise investment by the firm.

Fifth, related to the convertible's marketability, is an appeal to a broad spectrum of investors. Dewing said that "broadly speaking, the demand for any security comes from three groups of human beings -- and the groups shade imperceptibly into one another."[18] There is the person who invests for security and assured income. There is the large scale investor looking for income and enhancement of principal. Last,

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[18] Arthur Stone Dewing, Financial Policy of Corporations, Vol. I (5th ed.; New York: Ronald Press, 1953), p. 269.

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there is the speculator looking for capital gains. By looking in two directions at the same time, the convertible can appeal to all three classes. The individuals in these three groups bid against each other and may increase the demand for convertible bonds. Large institutions, legally restricted from investing in equities but eligible for convertibles, may also increase demand.

Sixth, the possibility of the firm receiving better overall terms on a convertible than on alternative security issues is another attractions. Depending on current margin requirements, the risk posture of the market and the market's ability to absorb debt or equity issues, convertible bonds may be the best solution for a firm in need of funds.

Seventh, avoidance or postponement of earnings per share dilution may have been an incentive to employ convertible bonds. Earnings per share have traditionally been calculated by dividing the number of common shares outstanding into the net income figure. A firm using convertibles was able to generate a return from the convertible's proceeds which, when translated to per share figures, did not reflect the potential dilution built into the hybrid security. This, because the incremental shares to be issued on conversion did not appear in the earnings per share calculation. If management wished to avoid or postpone showing any possible drop in earnings per share due to an increase in the number of shares, it could issue convertibles and the earnings per share would not reflect

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the security's equity portion. However, this alleged abuse has been attacked by the accounting profession in recent action. The Accounting Principles Board first moved on this matter in December, 1966 and again in May, 1969.[19] Essentially, these pronouncements mean that a firm employing convertible bonds that qualify as common stock equivalents must reflect in the primary earnings per share figure, the number of shares that would be issued due to the convertible, assuming conversion took place at the start of the period in question. If the convertible bonds do not qualify as common stock equivalents they should not enter into the calculations of the primary earnings per share until actual conversion takes place but should appear in a companion figure called fully diluted earnings per share. Therefore, the incentive of using convertible bonds for the purpose of deferring earnings per share dilution and confusing investors should have been eliminated by the Accounting Principles Board. The dilution referred to here is the initial short-run depression of earnings per share which may or may not translate into a loss of stockholder wealth.

Whether these rules have discouraged any firms issuing convertibles cannot be answered here. However, consideration

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[19] American Institute of Certified Public Accountants, Opinion No. 9 Reporting the Results of Operations, December, 1966; and Opinion No. 15 Earnings Per Share, May, 1969.

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of the pace of convertible bond financing, as reflected in Table 1.2, indicates that there must be other compelling reasons for employing convertible bonds.

Statement of the Problem

The basic problem was twofold:

1- to investigate overall corporate experience with convertible debt, and

2- to determine the financial impact on firms issuing convertible subordinated debentures.

A priori convertible financing should not be employed unless the expected results benefit the issuing firm. Given this premise, was the issuing firm and its residual owners benefited by the use of convertible bonds? The problem is developed more fully in later sections.

Significance Of The Study

Absence of Comparable Studies

Research indicated that scholarly work in the convertible bond area tends to fall into two categories. The first category can be termed theoretical, or model building since the writers were primarily concerned with the predicted valuation of the security in the market place. Recent works here are those by Brigham, Poensgen, and Baumol, Malkiel and Quandt mentioned earlier. The second category leans more to the

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empirical side and has been concerned mainly with fact gathering and analysis. The first modern study of this type was Hickman's[20] which was updated by the Atkinson work mentioned earlier. Both Hickman and Atkinson include convertible bonds as part of a larger study encompassing all corporate bond financing. Also in this category are the previously cited Pilcher study and those by Broman and McKenzie.[21] There are several other studies relating to convertible bonds but these appear to be the most outstanding. Each of these studies presents figures documenting convertible bond financing and analyzes the statistics to some degree. Both categories of studies shade into one another. For example, Brigham gives the results of a survey of large corporations as to why they issued convertible bonds.

Research did not reveal any studies assessing the impact of convertible bonds on the issuing firm's performance. Further, those studies tracing the volume of convertible bond financing tend to restrict themselves to aggregate figures

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20 W. Braddock Hickman, Statistical Measures of Corporate Bond Financing, National Bureau of Economic Research (Princeton, N. J.: Princeton University Press, 1960), pp. 210-215.

21 Keith L. Broman, "The Use of Convertible Subordinated Debentures by Industrial Firms 1949-1959," Quarterly Review of Economics and Business, III (Spring, 1963), 65-74; and Robert R. McKenzie, "Convertible Securities, 1956-1965," Quarterly Review of Economics and Business, VI (Winter, 1966), 41-48.

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on volume with little consideration to attendant circumstances. This study attempted a deeper analysis of these factors and sought to determine the financial consequences to the issuing firm.

Implications For Policy

In addition to academic merit a study of this nature should have practical significance. Generally, this study should: (1) aid management decision-making regarding capital structure formulation and (2) help the investment community evaluate performance.

A recent paper discussing the finance function states:

> Although the firm can and often does hold any number of preferences simultaneously...under the conditions of economic rationality these preferences are assumed to be organized under one of two metavalues: maximum current profit or maximum shareholder wealth. If maximum shareholder wealth is, in fact, the major preference of the firm, then the principal task of the finance officer is to build and implement models which best lead to such a goal.[22]

An understanding of the consequences resulting from convertible bond financing would help management achieve this goal.

Assume a firm has the alternatives of financing with (1) a pure debt issue carrying a face interest rate of 9 per cent, or (2) a convertible debt issue carrying a 5 per cent interest rate and exchangeable for 40 shares of common stock. The

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[22] Joseph S. Moag, Willard T. Carleton and Eugene M. Lerner, "Defining The Finance Function: A Model Systems Approach," Journal of Finance, XXII (December, 1967), 549.

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rational firm will choose the issue that generates the greatest amount of wealth for a given amount of risk. The correct choice depends upon probabilistic expectations. Since management seems to be opting more and more for convertible bonds they should have a set of guidelines to aid in the deliberations pertaining to the financing decision. This study, covering a relatively long period of time, delved into overall corporate experience with convertibles and then concentrated on specific financial results for a selected group of issuing firms.

Investor experience is the opposite side of the coin from corporate experience. Present and prospective investors should be aware of the convertible's effects on residual equity as well as what might be expected by convertible bondholders themselves. A company's relative success in floating a convertible bond will have an important impact on the wealth of its investors. The results of this study should aid investors in evaluating a firm using convertible bonds.

Hypothesis

The Basic Hypothesis

The hypothesis was that financing with convertible subordinated debentures, instead of subordinated debentures, should positively improve the company's subsequent performance. Therefore, the null hypothesis would be that there was no difference in subsequent performance.

The intent of the research was to determine the financial effects on the firm from using convertible bonds. This goal was

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accomplished in two stages. The initial, macro phase of the investigation was concerned with overall corporate experience. An analysis of general data provided a perspective for consideration of the study's second stage.

The study then concentrated on convertible subordinated debentures. The study group consisted of all new convertible subordinated debentures of size greater than $10 million dollars excluding foreign and financial corporation issues such as those of banks and credit companies. These issues numbered 141 and were floated by 90 companies. In order to insure a minimum of 5 years operating experience, bonds issued in the years 1950-1965 were studied. The variables examined were: (1) earnings per share, (2) rate of return on equity, (3) cash flow costs and benefits, (4) capital structure, (5) rate of conversion, (6) tradeoff terms. A detailed statement of study group selection, variables, and the specific analytical methods employed is presented in Chapter Three.

Assumptions

Several assumptions were made in this study. First, it was assumed that managers are wealth maximizers and that firms issuing convertible bonds have done so on a rational basis. Maximizing behavior may not have been the motivation for firms seeking to defer the dilution of reported earnings per share. To the extent that this is a factor, bias would be introduced in the study results.

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Second, in designing the study it was decided to include only subordinated convertible debenture issues larger than $10 million floated by domestic non-financial firms and sold in the United States. This limitation was introduced to: (1) restrict the study group size to manageable proportions, and (2) insure the availability of data. Stratification of the issue population ran the risk that directional bias was introduced that would affect the study results.

Third, it was assumed that the financing options available to the firm were: (1) subordinated convertible debentures, or (2) subordinated debentures whose quality and maturity were comparable to the subordinated convertible debentures. This implies that either of these forms could have been marketed with equal facility. The straight debt would naturally bear a correspondingly higher face interest rate. To the extent that this assumption did not hold, the study results would not be as general.

Fourth, it was assumed that a study rooted in the past would have relevance for future decision making.

Methodology

By providing a design within which to perform the study, scope is limited and it is more probable that the research will bear fruit. This empirical study followed positive theory. Weston states: "Positive theory seeks to describe and understand how the object of the study or description behaves.

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To describe is to help understand."[23] This study's purpose was not merely to describe. Weston's use of the word "understand" implies an additional, more productive benefit. He also says:

> The important point about explanation is not explanation itself. It is control. The reason we cannot accept the purist position that prediction is the end of science is because man chooses to alter his environment. He seeks explanation for control or policy purposes so he can influence outcomes and not as an end in itself.[24]

Thus, the present study, while positive in nature, first, described overall convertible debt financing and second, analyzed its effect for a selected issue group. Simulation was the technique employed in this study. Firm performance for several variables was statistically analyzed assuming the substitution of a pure debt issue for the actual convertible debt outstanding. The general questions of optimum form size, optimum cost of capital and efficient asset portfolio structure were not considered per se. The study was not intended to result in a general theory. What did come under examination was the financial decision to employ convertible subordinated debentures and the subsequent performance of the firm. This approach, investigating individual firm performance of the firm. This approach, investigating individual firm performance combined with a consideration of the convertible debt market over time

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[23] J. Fred Weston, The Scope and Methodology of Finance (Englewood Cliffs, N.J.: Prentice-Hall, 1966), p. 43.

[24] Ibid., p. 41.

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should allow a judgement as to the wisdom of using convertible bonds.

The Theory Revisited

An empirical study of this nature is based on convertible bond theory and the predictions that can be derived from the theory. Keynes states:

> Even when we are engaged in the mere collection and registration of events, it is often advantageous, as Jevons pointed out in the case of the physical observer, that our attention should be guided by theoretical anticipations. Industrial phenomena are exceedingly complex, and unless we know what special facts to look for, it is quite possible that some of the most vital circumstances may fail to attract our notice.[25]

With this and the study's purpose in mind, convertible bond theory can be examined.

First, compared to issuing pure equity, the use of convertible bonds will result in fewer shares of common stock ultimately outstanding. Even if a bond issue is fully converted, the fact that the conversion price is set higher than the market price at time of issue will mean a savings in the number of shares issued. Assuming that $1 million is to be raised and that the common is currently selling at $80 per share, 12,500 shares will be required if they can be sold at the market. Using a convertible bond with the conversion price set at $100 means that 10,000 shares will eventually be needed. This argument

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[25] John Neville Keynes, The Scope and Method of Political Economy (London: Macmillan & Company, Ltd., 1890, reprinted 1930), p. 3.

should be combined with the evidence that many convertible bond issues are never fully converted and so even more shares are saved. Therefore, whether earnings per share are calculated in the traditional manner or following APB No. 15 they should be higher for the firm issuing convertibles as opposed to common stock. This ignores the inescapable conclusion that even fewer shares may have been necessary if the financing were postponed and equity sold at a time when the market for the common stock was above $100 per share.

Second, risk should be considered when evaluating alternative financing forms. Comparing a convertible issue to a pure debt issue the degree of financial risk as measured by the leverage ratio will be the same under either alternative at the time of flotation for issues of equal size. If it is assumed that the proceeds are to be used for the same investment regardless of their source then business risk is fixed. However, the fixed charge inserted in the stream of earnings will be less for the convertible issue than for the pure bond. Therefore, the total earnings available for common and the total return on residual equity should be greater for the firm using convertibles than for the simulated pure debt issue since the firm actively chose the convertible. The effect on earnings per share will depend on whether they are calculated in the traditional manner or following APB No. 15 as well as on the rate of conversion.

Finally, Brigham and others have pointed out that a trade-off exists between the level of interest on a convertible and

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the conversion price.[26] If the return on a convertible is determined by the bond's fixed income aspect and by its equity nature, management can influence themakeup of this return when it sets the coupon rate and conversion price in the bond indenture. Theoretically, iso-yield curves can be drawn, for given growth rates and terminal values, which should describe tradeoff opportunities. This is done by plotting the ratio of straight debt interest (i_S) to the corresponding convertible coupon rate of conversion price (CP) to the stock's initial market price (MP_o) is plotted on the horizontal axis. In this manner hypothetical tradeoff curves can be developed as shown in Figure 1.2.

If the iso-yield curves are indeed the tradeoff curves, it means convertible bond investors are indifferent between interest and capital gains. Investors buying a bond priced to yield 6-1/2 per cent would be indifferent to one with a low coupon (point A) and one with a high coupon (point B) relative to corresponding straight debt interest. The prospective capital gains component would be high for point A and low for point B. Logically, this means that investors would be equally happy with investments of the same return but unequal risk. Assuming investors would not be satisfied with this situation, it appears

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[26] Brigham, op. cit. pp. 42-48.

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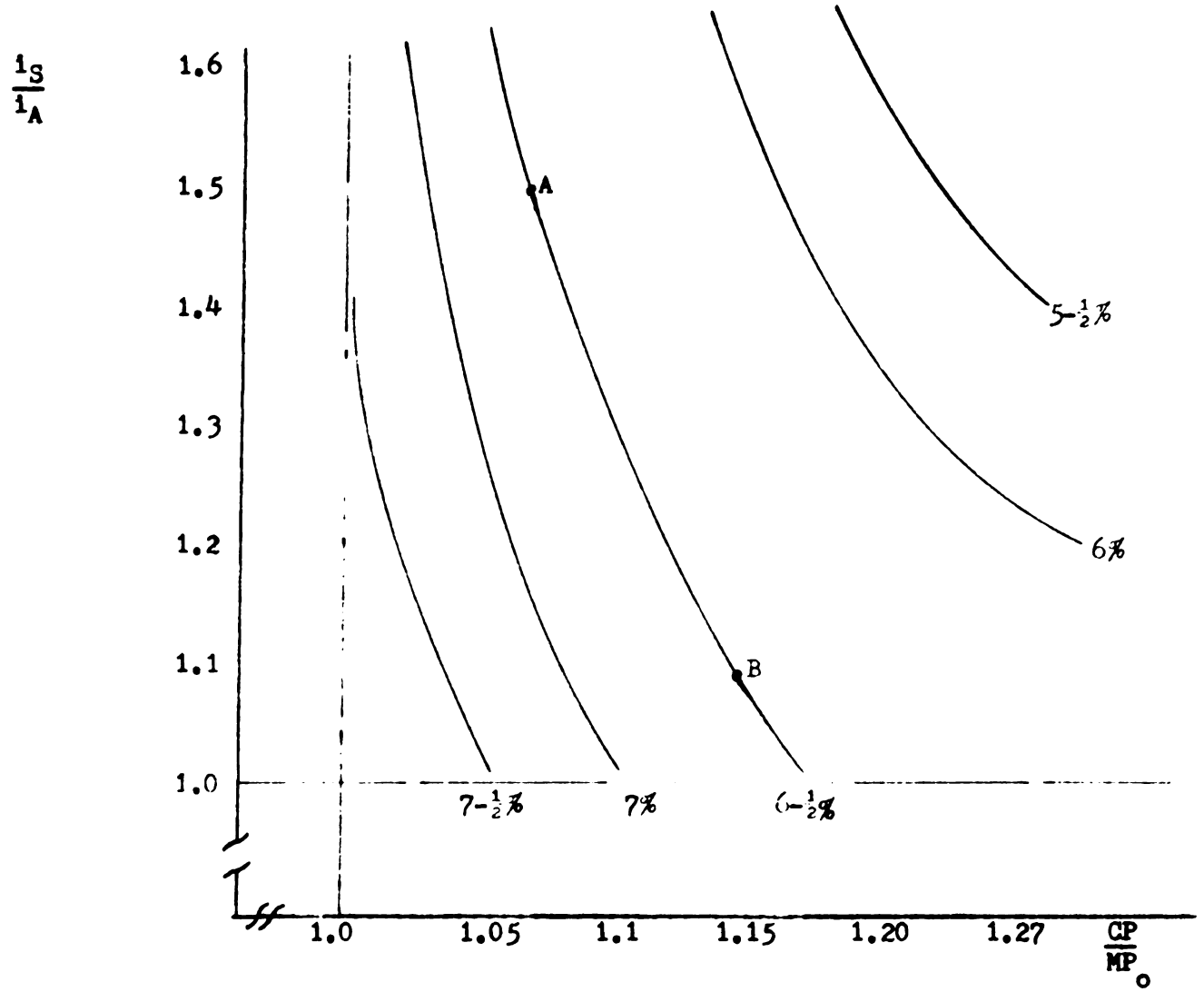

Figure 1.2 Hypothetical Tradeoff Opportunities adapted from Brigham, op. cit. p. 44.

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that the tradeoff curve is something other than the iso-yield curve. In particular, the tradeoff curve should be flatter than the iso-yield curve to maintain a balance in the tradeoff of interest versus capital gains. Brigham's rather rough, preliminary data indicates flatness.

The ideas discussed above provided the basis for analyzing the effects of convertible bonds on firm performance.

Plan Of The Dissertation

In this Chapter, introductory material was presented on convertible bond theory and on the specific problem investigated here. Chapter II contains an analysis of overall corporate financing with convertible subordinated debentures emphasizing their relation to total corporate financing. Chapter III comprises a detailed discussion of the method applied to the study group. Chapter IV is a presentation of the study results. Tradeoff curves are developed in Chapter V. Finally, Chapter VI offers a discussion of the results and suggestions for future research.

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CHAPTER II

THE VOLUME OF CONVERTIBLE DEBT FINANCING

Introduction

The use of convertible debt in financing American business has varied considerable over time. Both the volume of debt and its characteristics have changed as the requirements for funds sources have changed. Convertible debt has been enjoying a period of relative popularity over the last four to five years. In order to evaluate the effect convertible debt has had on the American corporation it is necessary to first answer some basic questions. In this chapter the importance of convertible debt in American corporate financing is examined for the period 1950-1969. First, convertible debt volume and its characteristics are reviewed. Next, convertibles are placed in the perspective of total corporate financing and also related to the firms using this hybrid security. Finally, the retirement of convertibles via the call provision is considered for underwritten and non-underwritten calls.

Data Sources

Primary data sources used were various Moody's publications. Specifically, Moody's Industrial Manual, Moody's Utilities Manual, and Moody's Transportation Manual were

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examined for each year of the study. The blue page inserts contain a list of convertible debt securities outstanding at the publication date. These lists were compared year by year to establish a population of new public issues for domestic nonfinancial firms. The characteristics of these issues and the firms involved were then compiled from Moody's. Data obtained in this way was verified and supplemented (where necessary) by consulting Moody's Convertible Bond Survey and the semi-annual Corporate Financing Directory of the Investment Dealer's Digest. Other sources reviewed from time to time were prospectuses, listing statements and annual reports. Data relating to calls and retirements was also taken from Moody's.

Overall corporate financing activity was compiled from several sources. Both the Securities and Exchange Commission in its Statistical Bulletin and the Investment Dealer's Digest publish a continuing series covering macro financing data. These were compared with figures from Moody's Convertible Bond Survey and with the author's data.

It should be noted that unless specific source citations are required for clarity, the sources for the following tables compiled by the author are the publicly available records referred to above.

Volume and Character of Convertible Debt 1950-1969

Overall Financing Activity

Moody's data.--Concentrating first of all on convertible debt issues reported by Moody's Investors Service it is evident that on an absolute basis a considerable amount of convertible debt financing has taken place in the period 1950-1969. The recent popularity of convertible debt is revealed by an examination of new total public convertible debt (Table 2.1) which shows 40 per cent of the 1,350 issues floated came in the years 1966-1969. In dollar volume 54 per cent of the approximately $21 billion total was brought to the market during the same four years. The average issue size fluctuated widely during the fifties, reached a low level of $4-$7 million in the first half of the sixties and then jumped to an average of $19 million per year in the last half of the sixties. This data is limited to new, domestically offered issues of American firms and excludes finance corporation issues such as those of banks and credit companies.

The debt instruments employed varied but the most popular was the subordinated convertible debenture (Table 2.2). The "Other" classification includes all forms not covered by the specific categories and is made up primarily of secured issues. Subordinated convertible debentures emerged as practically the exclusive form of public convertible debt in the later years.

TABLE 2.1

NEW TOTAL PUBLIC CONVERTIBLE DEBT, 1950-1969
(Millions of Dollars)

Year	Dollars	Number of Issues	Mean Issue Size	Year	Dollars	Number of Issues	Mean Issue Size
1950	125.8	7	18.0	1960	314.6	80	3.9
1951	244.5	14	17.5	1961	642.6	100	6.4
1952	926.5	27	34.3	1962	331.9	62	5.4
1953	950.8	23	41.3	1963	263.8	47	5.6
1954	139.9	21	6.7	1964	274.0	39	7.0
1955	1,373.2	58	23.7	1965	919.3	61	15.1
1956	809.4	61	13.3	1966	1,650.0	83	19.9
1957	947.4	64	14.8	1967	3,749.8	209	17.9
1958	1,055.8	48	22.0	1968	2,793.8	143	19.5
1959	537.4	84	6.4	1969	3,243.3	119	27.2
				Totals	21,294.0	1,350	15.8

Source: Moody's Manuals.

TABLE 2.2

NEW PUBLIC CONVERTIBLE DEBT FORMS, 1950-1969
(Number of Issues)

Industry	Total	Subordinated Convertible Debentures	Convertible Debentures	Subordinated Conv. Notes and Conv. Notes	Others
Industrial	1,148	989	114	39	6
Utility	94	30	57	6	1
Transportation	108	91	11	1	5
Totals	1,350	1,110	182	46	12

Source: Moody's Manuals.

Comparing the data in Table 2.2 with that compiled by Pilcher in his study covering 1933-1952 reveals a shift in the use of convertibles among industry groups (Table 2.3).[1] It should be noted that Pilcher's data includes a small number of bank issues. The shift in usage is rather pronounced in the decreased popularity of the conversion option for utility issues. Industrial firms continued to be the heaviest employers of conversion and increased their proportion over the earlier period. Comparing the two periods, the difference in the industrial category is reinforced by the fact that as of 1952 airlines were transferred

[1] Pilcher, op. cit., p. 19.

TABLE 2.3

INDUSTRY USE OF CONVERTIBLE DEBT

	1933-1952 Percentage of Total Offerings	1950-1969 Percentage of Total Offerings
Industrials	73.7	85.1
Utilities	22.0	6.9
Railroads	3.8	8.0
Banks	0.5	-
	100.0	100.0

Source: 1933-1952: Pilcher
1950-1969: Table 2.2

from industrials to transportation. The rails classification was changed to transportation at the time.

A more detailed breakdown of convertible debt usage by industry is shown in Table 2.4. It is interesting to note the relatively high dollar volume in the transportation category in the last five years. This reflects the considerable amount of financing being pursued by the airlines for jet aircraft. It is also illuminating to examine the effect of the American Telephone and Telegraph Company on this data. Removing ATT's 5 convertible debenture issues lowers the mean size of all public utility issues from $44.8 million to $17.4 million. On a total basis the mean of all public convertible debt issues drops from $15.8 million

TABLE 2.4

NEW PUBLIC CONVERTIBLE DEBT BY INDUSTRY, 1950-1969
(Millions of Dollars)

Year	Industrials			Utilities			Transportation		
	Dollars	Number of Issues	Mean Issue Size	Dollars	Number of Issues	Mean Issue Size	Dollars	Number of Issues	Mean Issue Size
1950	84.1	5	16.8	4.0	1	4.0	37.7	1	37.7
1951	40.4	10	4.0	201.8	2	100.9	2.3	2	1.2
1952	381.7	20	19.1	540.9	4	135.2	4.1	3	1.4
1953	298.7	15	19.9	638.9	5	127.8	13.2	3	4.4
1954	38.4	12	3.2	101.3	8	12.7	.2	1	.2
1955	684.2	49	14.0	679.8	7	97.1	9.2	2	4.6
1956	618.0	50	12.4	112.8	5	22.6	78.6	6	13.1
1957	686.5	52	13.2	260.6	11	23.7	.3	1	.3
1958	291.7	39	7.5	749.2	6	124.9	14.9	3	5.0
1959	381.4	75	5.1	103.4	6	17.2	52.6	3	17.5
1960	222.3	70	3.2	47.3	5	9.5	45.0	5	9.0
1961	539.9	89	6.1	48.3	6	8.1	54.4	5	10.9
1962	322.9	57	5.7	.8	1	.8	8.2	4	2.1
1963	186.5	38	4.9	11.0	2	5.5	66.3	7	9.5
1964	194.0	31	6.3	2.5	1	2.5	77.5	7	11.1
1965	546.5	52	10.5	225.0	3	75.0	147.8	6	24.6
1966	1,138.4	67	17.0	56.3	4	14.1	455.3	12	37.9
1967	2,955.2	190	15.6	234.5	7	33.5	560.1	12	46.7
1968	2,331.8	123	19.0	138.1	4	34.5	323.9	16	20.2
1969	2,732.1	104	26.3	51.6	6	8.6	459.6	9	51.1
Totals	14,674.7	1,148	12.8	4,208.1	94	44.8	2,411.2	108	22.3

Source: Moody's Manuals.

to $13.9 million.

In order to obtain a picture of the amount of convertible debt outstanding at a given time, Moody's Convertible Bond Survey was consulted. Beginning with September, 1955, Moody's has published a monthly supplement to its Bond Survey which tabulates widely traded convertible bond issues. The total amount of convertible debt outstanding in the January issue of each year was compiled to arrive at the figures in Table 2.5. These figures include only industrial, utility and transportation issues, excluding issues of foreign corporations, foreign offered issues of American firms and finance corporations issues. Further, this data should not be interpreted to be the absolute total outstanding since the Convertible Bond Survey does not include many small issues or those in which there is not a relatively active market. Thus, a convertible given in an exchange offer and for which a market does not develop will not be included in the list until active trading develops. In the same sense, a "hung" convertible as well as those that have been substantially converted may be removed from the list. Therefore, the Convertible Bond Survey cannot be considered a universe of issues or a completely accurate gage of new issues in the same way as the previous Moody's data. However, since it does include the bulk of the major issues it represents the convertible bond market to a reasonable degree.

TABLE 2.5

MOODY'S CONVERTIBLE BOND SURVEY TOTAL AMOUNTS OUTSTANDING FOR INDUSTRIALS, UTILITIES AND TRANSPORTATION (Millions of Dollars)

Year	Dollars	Number of Issues	Year	Dollars	Number of Issues
1955	1,717.0	52	1963	2,668.5	211
1956	1,572.4	53	1964	2,740.5	213
1957	1,419.6	56	1965	2,671.3	197
1958	2,142.2	108	1966	3,142.7	202
1959	2,295.6	112	1967	4,160.4	209
1960	2,443.5	187	1968	6,400.7	233
1961	2,338.4	206	1969	8,291.5	324
1962	2,600.6	206	1970	10,749.1	401

Source: Moody's Convertible Bond Survey, January issues.
Note: Series began, September, 1955.

Securities and Exchange Commission data.-- Data on absolute convertible debt financing was presented in the previous section. The SEC compiles and publishes continuing series on corporate financing for bonds, preferred stock, and common stock. Since 1956, the series includes data on convertible bond financing (Table 2.6). A discussion of the issues included in the SEC data will be presented in a later section. Basically, these are all issues sold for cash in the United States and include private placements.

TABLE 2.6

NEW CONVERTIBLE BONDS OFFERED FOR CASH
IN THE UNITED STATES
(Millions of Dollars)

Year	Total Dollars	Publicly Offered		Privately Placed	
		Dollars	Percentage	Dollars	Percentage
1956	925	763	82.6	163	17.4
1957	1,064	995	93.5	69	6.5
1958	1,147	1,071	93.6	77	6.4
1959	628	536	85.3	92	14.7
1960	426	356	77.2	105	22.8
1961	710	625	88.0	84	12.0
1962	445	346	75.5	99	24.5
1963	357	234	65.6	122	34.4
1964	425	366	86.2	59	13.8
1965	1,264	1,181	93.4	83	6.4
1966	1,872	1,764	94.3	109	5.7
1967	4,475	4,108	91.8	367	8.2
1968	3,281	2,663	81.2	619	18.8
1969	4,041	3,099	76.7	942	23.3
Totals	21,096	18,107	85.8	2,990	14.2

Source: U. S., Securities and Exchange Commission, Statistical Bulletin, XXIX (March, 1970), 19.

Comparing the volume of convertible bonds to other financing forms shows the relative popularity of convertibles. Stated differently, Table 2.7 analyzes on a relative dollar basis in what magnitude management actively chose to employ the conversion option. This data includes both public and private issues with the exception of those issues specifically labeled as public.

It can be stated that both absolutely and relatively the

TABLE 2.7

CONVERTIBLE BONDS RELATIVE TO OTHER FINANCING
(Millions of Dollars)

Year	Total Financing	C. B. as % of Total Financing	Total Bonds	C.B. as % of Total Bonds	Total Common Stock	C. B. as % of Common Stock	Total Public Bonds	Public C.B. as a % of Public Bonds
1956	10,939	8.5	8,002	11.6	2,301	40.2	4,225	18.1
1957	12,884	8.3	9,957	11.7	2,516	42.3	6,118	16.3
1958	11,558	9.9	9,653	11.9	1,334	86.0	6,332	16.9
1959	9,748	6.4	7,190	8.7	2,027	31.0	3,557	15.1
1960	10,154	4.5	8,081	5.7	1,664	27.8	4,806	7.4
1961	13,165	5.4	9,420	7.5	3,294	21.6	4,700	13.3
1962	10,705	4.2	8,969	5.0	1,314	33.9	4,440	7.8
1963	12,211	2.9	10,856	3.3	1,011	35.3	4,713	5.0
1964	13,957	3.0	10,865	3.9	2,679	15.9	3,623	10.1
1965	15,992	7.9	13,720	9.2	1,547	81.7	5,570	21.2
1966	18,074	10.4	15,561	12.0	1,939	96.5	8,018	22.0
1967	24,798	18.0	21,954	20.4	1,959	228.4	14,990	27.4
1968	21,966	14.9	17,383	18.9	3,946	83.1	10,732	24.8
1969	26,744	15.1	18,348	22.0	7,714	52.4	12,735	24.3
Totals	212,895	9.9	169,959	12.4	35,245	59.9	94,559	19.2

Source: U. S., Securities and Exchange Commission, Statistical Bulletin, Various Issues.

Note: C. B. represents Convertible Bonds.

popularity of convertible bonds has increased markedly in the last half of the sixties. Beginning in 1956, convertible bonds relative to total financing and to total bonds dipped to a low point in 1963 and then rose to historically high levels at the end of the period. The relationship of convertible bonds to common stock has been somewhat more erratic. However, it can be assumed that in the later years management has perceived the convertible to be an increasingly desirable alternative to the issuance of common stock. A possible explanation of this is that the convertible is viewed as a first step in the evolution of what will eventually be equity financing.

Table 2.7 also includes the relationship of public convertibles to total public bonds. The pattern is quite similar to that of total bonds with the percentages somewhat higher in the public bond category. Private convertibles relative to total private bonds reveals that convertibles play a rather minor role in private placements. In almost all years private convertibles are approximately two per cent of all privately placed bonds. However, in the years 1967, 1968, and 1969 the relationship is 5 per cent, 9 per cent, and 17 per cent, respectively. It may be that private capital suppliers are recognizing the advantage of the conversion option or it may merely reflect the overall popularity of convertibles.

Comparison of data sources.--In this section a comparison is made of the four major data sources examined in this

study. First, Moody's Industrial, Utility and Transportation Manuals are considered. The data includes all domestic non-financial public convertible debt reported in the manuals. Private issues are not included since it appeared that this source does not present a complete picture of private financing. The second source, Moody's Convertible Bond Survey, is related to the first source. The data from the Survey is essentially similar to that from the Manuals except that it is almost exclusively composed of widely traded subordinated convertible debentures. Further, some issues appearing in the Survey for the first time may not be new issues as discussed in a previous section.

The third source is the Securities and Exchange Commission's Statistical Bulletin. This is a monthly publication which reports substantially all new issues of securities offered for cash sale in the United States in excess of $100,000 and with terms to maturity greater than one year.

Fourth, the Investment Dealer's Digest series includes all underwritten security issues in the United States and foreign issues of United States firms. The Digest also reports any non-underwritten securities that come to its attention. It is felt that this includes practically all such issues. These four sources are compared in Table 2.8 for public issues.

It is evident that the two Moody's series will not agree

with each other nor will they agree with the Investment Dealer's Digest or SEC. This is due primarily to the exclusion of foreign and financial issues in the author's compilation. The Investment Dealer's Digest data is more of a "universe" of offerings in that it also includes issues of U. S. foreign subsidiaries, exchange offers and SEC registered secondaries. On the other hand, the SEC data does not include registered secondaries, offers of closed end investment companies, SBIC's and other differences, but the SEC does make periodic revision of proceeds as reported by a company. An attempt to reconcile the Investment Dealer's Digest data with the SEC data for selected years was successful.

Another insight of the degree to which management, over all industry groups, chose to use a convertible rather than a non-convertible is found in the Investment Dealer's Digest data. Over the period 1959-1969, for which data was available, 32.6 per cent of the total number of public bond offerings were convertible. This compares to Pilcher's findings of 9.3 per cent for the period 1933-1952 using essentially the same source.[2] In terms of dollar volume reported by the Digest, 18.1 per cent of public bond offerings were convertible during 1959-1969. These figures can be compared

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[2] Pilcher, op. cit., p. 21.

TABLE 2.8

NEW PUBLIC CONVERTIBLE BOND SERIES
(Millions of Dollars)

Year	Moody's Manual			Moody's Convertible Bond Survey			Investment Dealer's Digest			SEC
	Dollars	Number of Issues	Mean	Dollars	Number of Issues	Mean	Dollars	Number of Issues	Mean	Dollars
1960	314.6	80	3.9	312.2	51	6.1	347.2	94	3.7	356
1961	642.6	100	6.4	556.8	42	13.3	525.2	82	6.4	625
1962	331.9	62	5.4	270.4	27	10.0	326.5	83	3.9	346
1963	263.8	47	5.6	306.0	26	11.8	228.6	50	4.6	234
1964	274.0	39	7.0	231.2	15	15.4	372.4	49	7.6	366
1965	919.3	61	15.1	1,192.3	34	35.1	1,183.2	61	19.4	1,181
1966	1,650.0	83	19.9	1,557.9	46	33.8	1,760.7	96	18.4	1,764
1967	3,749.8	209	17.9	3,408.0	101	33.8	4,062.3	230	17.7	4,108
1968	2,793.8	143	19.5	3,009.8	144	20.9	2,699.0	202	13.4	2,663
1969	3,243.3	119	27.2	3,555.0	119	29.8	3,021.9	176	17.2	3,099
Totals	14,183.1	943	15.1	14,399.6	605	23.8	14,527.0	1,123	12.9	14,742

Source: Compiled by author from publicly available records.

with those in Table 2.7.

Issue Characteristics

In the preceding section, data portraying the overall level of convertible debt financing was presented. Attention is now directed at specific issue characteristics. Among the factors examined are issue size, issuing firm size, maturities, ratings and interest rates. The following analysis is based primarily on data from Moody's Industrial, Utility and Transportation Manuals for the years 1950-1970.

Issue size and issue year.--Earlier it was shown that the mean issue size for convertible debt flucuated over the years 1950-1959. It then rose markedly from a low level in the early 1960's to reach a new high at the decade's end Tables 2.1 and 2.8). A more detailed breakdown of issue size is in Table 2.9. It can be seen that the bulk of the issues are below $10 million in size. However, over time there has been a decided shift to larger issue sizes - particularly in the last 5 years. Comparing the first 4 years of the study period with the last 5 years these were the years of greatest activity in the over $50 million category. The latter 5 year period also reflects a greater proportion of issues in the middle size category relative to the first 4 years. This is at the expense of issues in the under $10 million category, the number of which have been

TABLE 2.9

SIZE OF ISSUES BY ISSUE YEAR

Year	Number	Size in Millions of Dollars		
		0-10	11-50	51+
		%	%	%
1950	7	71	15	14
1951	14	79	14	7
1952	27	63	26	11
1953	23	78	9	13
1954	21	90	10	0
1955	58	76	17	7
1956	61	75	17	8
1957	64	67	25	8
1958	48	81	17	2
1959	84	85	14	1
1960	80	95	5	0
1961	100	82	16	2
1962	62	90	8	2
1963	47	91	9	0
1964	39	80	15	5
1965	61	69	21	10
1966	83	57	33	10
1967	209	59	33	8
1968	143	52	42	6
1969	119	40	49	11
Totals	1,350	69	25	6

Source: Compiled by author from publicly records.

dropping since 1960. As the conversion option becomes more popular there is a tendency to find greater numbers of the larger size convertibles. Indeed, 64 per cent of the over $50 million dollar issues during the study period appeared in the last 5 years. Also affecting this shift would have been price level changes.

Issue size and firm size.--It has been widely assumed in the literature that there is a direct relationship between issue size and issuing firm size. This contention is supported by the data in the current study. Table 2.10 illustrates the relationship of issue size and asset size taken at the time of flotation. The proportion of the smaller issues decreases as asset size increases and the bulk of the larger issues come from the larger firms. A second concept concerning firm size is that convertibles tend to be employed by relatively small firms.[3] Comparing the data in Table 2.10 with the fact that large issues have become more popular in the recent past suggests that the larger companies are beginning to use convertibles.

Years to maturity.--The relationship between issue year and years to maturity is illustrated in Table 2.11. There is a tendency to center maturities in the 15-24 year range. Examination of the raw data indicates that of the 433 issues in the 20-24 year range 417 had maturities of

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[3] Pilcher, op. cit., p. 18.

TABLE 2.10

ISSUE SIZE AND ISSUING FIRM SIZE
(Millions of Dollars)

Firm Size in Millions of Dollars	Issue Size in Millions of Dollars					
	0-10		11-50		50+	
	Number	%	Number	%	Number	%
0-50	791	84	41	13	0	0
51-100	93	10	70	22	0	0
100+	52	6	214	66	79	100
Totals	936	100	325	100	79	100

Source: Compiled by author from publicly available records.

20 years. Thus, roughly 60 per cent of all convertible bonds floated during the study period had maturities of 15-20 years. Closer examination of Table 2.11 shows the 25-29 year category becoming more popular. In fact, 9 per cent of the issues in the years 1950-1964 had maturities greater than 25 years while 29 per cent of the issues from 1965-1969 employed over 25 years maturities. A possible explanation is that with more convertibles being issued by larger firms there is a drift to longer maturities due to credit strength.

Rating versus issue year. -- Moody's regularly rates bond issues as to their investment quality. There are nine rating

TABLE 2.11

YEARS TO MATURITY

Years	Number of Issues	Years to Maturity											
		0-9		10-14		15-19		20-24		25-29		30+	
		Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
1954-54	92	7	7.6	32	34.8	33	35.9	14	15.2	1	1.1	5	5.4
1955-59	315	16	5.1	62	19.7	103	32.7	93	29.6	34	10.8	7	2.2
1960-64	328	22	6.7	81	24.7	126	38.4	82	25.0	10	3.0	7	2.1
1965-69	615	23	3.7	40	6.5	127	20.6	244	39.7	179	29.1	2	0.3
Totals	1,350	68	5.0	215	15.9	389	28.8	433	32.1	224	16.6	21	1.6

Source: Compiled by author from publicly available records.

categories beginning with bonds of the best investment quality (Aaa) and ranging down to bonds having extremely poor prospects (C) of attaining investment status. In addition, many bond issues are not rated as a matter of policy. The ratings received by convertible bonds during the study period is shown in Table 2.12. Based on the analysis of the preceding sections it would seem that the percentage of bonds in the higher ratings should be greater in the latter years of the study. Such does not appear to be the case. If anything, a shift to the lower quality grades is taking place. It should be noted that only bonds rated Baa or higher are considered "investment grade" and that Ba and B ratings indicate speculative features.

Ratings and maturities.--Continuing the examination of bond ratings, Table 2.13 reflects years to maturity. There appears to be a correlation between the bond's maturity and the issuer's strength. Bonds falling in the most popular maturity range of 15-24 years and rated Ba and B comprised 55 per cent of all issues. However, it can be seen that the stronger firms employed generally longer maturities and the weaker issuers fell in line with shorter terms. These findings are in general agreement with those of Broman in his study of 68 industrials issued in 1951-1959, except for a decided lack of 15 years maturities in that study.[4]

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[4] Broman, op. cit., 67.

TABLE 2.12

MOODY'S RATING VERSUS ISSUE YEAR

Ratings	1950 - 1969		1950 - 1954		1955 - 1959		1960 - 1964		1965 - 1969	
	#	%	#	%	#	%	#	%	#	%
Aa	10	1.2	5	9.3	4	1.9	1	0.6	--	--
A	30	3.7	5	9.3	13	6.1	2	1.3	10	2.6
Baa	95	11.8	11	20.4	35	16.5	16	10.2	33	8.7
Ba	364	45.3	24	44.4	115	54.3	63	40.2	162	42.6
B	297	37.0	9	16.7	43	20.3	71	45.2	174	45.8
Caa & Ca	7	0.8	--	--	2	0.9	4	2.5	1	0.3
Total Rated	803	100.0	54	100.0	212	100.0	157	100.0	380	100.0
Not Rated	547		38		103		171		235	
Totals	1,350		92		315		328		615	

Source: Compiled by author from publicly available records.

TABLE 2.13

MOODY'S RATINGS VERSUS MATURITY

Rating	Number of Issues	Years to Maturity													
		0 - 4		5 - 9		10 - 14		15 - 19		20 - 24		25 - 29		30+	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%
Aa	10	--	--	--	--	1	10.0	6	60.0	--	--	1	10.0	2	20.0
A	30	--	--	--	--	2	6.7	13	43.3	5	16.7	5	16.7	5	16.7
Baa	95	--	--	--	--	4	4.2	6	6.3	42	44.2	39	41.0	4	4.2
Ba	364	--	--	2	0.5	15	4.1	78	21.4	144	39.6	120	33.0	5	1.4
B	297	--	--	4	1.3	33	11.1	103	34.7	114	38.4	41	13.8	1	0.3
Caa & Ca	7	--	--	--	--	2	28.6	2	28.6	2	28.6	--	--	1	14.3
Not Rated	547	17	3.1	45	8.2	158	28.9	181	33.2	126	23.0	18	3.3	3	0.5
Totals	1,350	17		51		215		389		433		244		21	

Source: Compiled by author from publicly available records.

Ratings and coupon interest.--The relationship between Moody's ratings anc coupon interest rates is shown in Table 2.14. As would be expected there appears to be a correlation between interest levels and risk as defined by the ratings. A frequency distribution of the interest rates encountered for each Moody's rating indicated low interest rates for the higher grade bonds and progressively higher coupons as bond quality decreases.

Retirements

Once a convertible bond is issued its final disposition can be to mature, go into default, be voluntarily converted or called.

Calls.--Of particular interest to management is the call provision which is universal to convertible bonds. If the bond is called the bondholder ordinarily has the choice of accepting the call price or converting the bond sometime before the date set for payment. This assumes the conversion option is still in effect at the time the call takes place. If the conversion value is greater than the call price the end result is to force conversion. Thus, management is able to replace the debt with corresponding equity provided conditions are favorable. Table 2.15 shows the pattern for calls as taken from Moody's Convertible Bond Survey.

TABLE 2.14

MOODY'S RATINGS AND COUPON INTEREST

Rating	Number of Issues	Coupon Interest Rate													
		Below 3.0		3.0 - 3.9		4.0 - 4.9		5.0 - 5.9		6.0 - 6.9		7.0 - 7.9		8.0+	
			%		%		%		%		%		%		%
Aa	10	1	10.0	5	50.0	4	40.0	--	--	--	--	--	--	--	--
A	30	--	--	14	46.7	15	50.0	1	3.3	--	--	--	--	--	--
Baa	95	--	--	23	24.2	51	53.7	18	19.0	3	3.2	--	--	--	--
Ba	364	--	--	16	4.4	159	43.7	163	44.8	25	6.9	1	0.3	--	--
B	297	--	--	1	0.3	38	12.8	157	52.8	99	33.4	2	0.7	--	--
Caa & Ca	7	--	--	--	--	--	--	4	57.2	3	42.8	--	--	--	--
Not Rated	547	5	0.9	5	0.9	49	9.0	189	34.6	258	47.2	35	6.4	6	1.0
Totals	1,350	6	0.5	64	4.7	316	23.4	532	39.4	388	28.8	38	2.8	6	0.5

Source: Compiled by author from publicly available records.

TABLE 2.15

CONVERTIBLE BOND CALLS
(Millions of Dollars)

Year	Number of Issues	Dollar Amount Called	Standard & Poor's Index (1941 - 43 = 10)
1956	2	38.3	46.62
1957	1	8.0	44.38
1958	11	126.8	46.24
1959	1	0.7	57.38
1960	12	186.3	55.85
1961	16	105.4	66.27
1962	2	29.5	62.38
1963	10	84.8	69.87
1964	15	87.5	81.37
1965	12	216.8	88.17
1966	12	100.1	85.26
1967	28	662.6	91.93
1968	24	420.0	98.70
1969	12	229.3	97.84
Totals	158	2,296.1	

Source: Compiled by author from publicly available records.

Stock market activity could be expected to have a major influence on calls. If the purpose of calling is to force conversion, periods of rising stock prices would be the most conducive to successful calls. The probability of conversion value being safely above the call price would be greater given rising prices as opposed to falling prices. Management must make a decision as to how wide a differential they desire between the stock's market price and the conversion price before they risk a call. If market developments

push the price of the common stock back toward the conversion point it may become monetarily disadvantageous to convert and more attractive to accept the call price. Table 2.16 illustrates actual corporate practice regarding calls of convertible bonds for which data was available.

Based on conversion value almost a half of all calls took place in the range 111-160 per cent. Brigham reported that almost a quarter of the companies he surveyed (22) force conversion as soon as conversion value exceeds call price by 20 per cent.[5] As stated above, the company is risking market price deterioration between the time of announcing the call and the actual redemption date. In order to minimize this risk the technique of underwriting the call has evolved. In a survey of 29 underwritten industrial convertible bond calls, Williams and Letwat found that 19 calls went out when conversion value was in the range of 120-160 per cent.[6] In the present study, approximately 75 calls were underwritten. Regarding calls below one hundred, possible explanations are the removal of a "hung" convertible or the cleaning up of the capital structure preparatory to a merger.

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[5] Brigham, op. cit., p. 52.

[6] B. S. Williams and Marvin Letwat, "Underwritten Calls of Industrial Convertible Securities", Quarterly Review of Economics and Business, III (Spring, 1963), 76.

TABLE 2.16

PREMIUMS AT WHICH CALLS OCCUR

Premiums Above Call Price	Premium Based on Bond Conversion Value (Number of Bonds)	Premium Based on Bond Market Price (Number of Bonds)
100 and Below	17	3
101 - 110	8	23
111 - 120	18	20
121 - 130	18	17
131 - 140	12	10
141 - 150	14	15
151 - 160	9	11
161 - 170	6	6
171 - 180	5	5
181 - 190	6	4
191 - 200	1	4
201 - 210	6	2
211 - 220	5	4
221 - 230	3	4
231 - 240	2	8
241 - 250	6	0
251 - 260	2	4
261 - 270	1	1
271 - 280	1	0
281 - 290	1	1
291 - 300	0	0
301 and Above	5	5
Conversion Expired	1	-
Totals	147	147

Source: Moody's Convertible Bond Survey, January 1956 - December 1969.

Maturities and defaults.--Convertible bonds have a tendency not to mature since it is often management's goal to use convertibles as a means to effect equity financing. Most issues will end up in either voluntary or forced conversion. If market conditions favorable to conversion do not develop the security will often be called in order to pave the way for future financing. During the study period, 53 convertible bonds matured as compared to 1,350 new issues. The maturing face value was $30.1 million. Only 7 issues had amounts greater than $1 million outstanding and all were below $5 million.

Default experience with convertible bonds has been relatively rare. During the study period 8 issues were in default. There were also 10 firms in reorganization of which 2 had defaulted on convertible securities.

Repeat Issuers

A thesis sometimes seen in the literature is that convertible bond financing is used only rarely in the firm's life.[7] This is when the firm is relatively small but growing and a unique set of external and internal conditions provide a setting favorable to floating a convertible. In order to examine this idea, a tabulation was made of the number of convertible issues and their respective issuing firms (Table 2.17).

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[7] Eli Schwartz, Corporation Finance (N.Y.: St. Martin's Press, 1962), p. 177.

TABLE 2.17

FREQUENCY OF CONVERTIBLE BOND USAGE
1950-1969

Number of Issuing Firms	Issues Per Firm	Total Number of Issues
802	1	802
145	2	290
46	3	138
19	4	76
6	5	30
1	6	6
1	8	8
Totals 1,020		1,350

Source: Compiled by author from publicly available records.

It can be seen that 80 per cent of the issuing firms floated one convertible during the study period. However, those firms that employed convertibles more than once accounted for approximately 41 per cent of the total number of issues. Evidently, there is a group of companies that have enjoyed a favorable enough response to use them more than once.

Summary

This Chapter presented data pertaining to convertible

debt financing by domestic corporations for the years 1950-1969. Convertible debt enjoyed its greatest popularity on both an absolute basis and relative to other financing forms during the latter years of this period. Additionally, mean issue size was rising at the study's end after hitting a low in 1960.

Empirical data supported theory in many areas. It was found that, measured by assets, large companies tended to float large issues as compared to small companies putting out small issues. In a similar vein, stronger firms, as guaged by bond ratings, employed the largest maturities for convertible debt instruments. The most popular maturities fell in the 15 to 20 year range with longer-lived bonds becoming more popular at the study's end. Additionally, high bond ratings generally meant low face interest rates and vice-versa.

It was also found that more large firms have been issuing convertible debt which may account for the rise in mean issue size and the lengthening of maturities. Contrary to this idea is the fact that the general level of bond ratings for convertible debt has been dropping over the last 20 years.

Data relating to calls was also examined and it was found that 50 per cent of all convertibles were called while conversion premiums ranged from 111 to 160. Also, 50 per cent of all calls studied were underwritten. Finally, several firms have issued convertibles more than once.

CHAPTER III

BACKGROUND AND METHOD

Introduction

In this Chapter the study's scope is narrowed in order to examine financial effects on the firm from convertible bond usage. First, the procedure followed for selecting firms that were included in the study is presented. Next, the convertible issues floated by the selected firms is delineated. The method employed in the study group examination is discussed as an illustration of the experimental design. This discussion includes a presentation of the variables adopted in the study and implements the theory presented in Chapter I. Thus, this Chapter provides the details of the study issues and the method used for determining their effects on the respective firms. The results will be presented in Chapter IV.

Firm Selection

The primary criterion followed in firm selection was to obtain as complete a picture of convertible debt as possible. Therefore, it was determined to examine a relatively long time series as opposed to adopting cross section analysis. In this way, the effects of time as reflected by changing

market conditions and individual firm fortunes were encompassed. Chosen for investigation were issues floated during the period 1950 through 1965. Stopping at 1965 insured that actual operating data would be available for a minimum of five years.

Referring to Chapter II, it can be seen that a large number of convertible debt issues of various categories were floated during the period in question. In order to hold the study to manageable proportions, it was decided to select domestic nonfinancial corporations that issued subordinated convertible debentures in sizes greater than $10 million.[1] This form of convertible debt was and continues to be the most frequently employed. Limiting the study to issues over $10 million eliminated a large number of relatively small issues and eased the burden of analysis. Further, and more importantly, it gave the assurance that data would be available from public sources.

Convertible debt issues outstanding are listed yearly in the blue page inserts of Moody's Manuals. These lists were compared on a year by year basis for the Moody's Industrial, Utility and Transportation Manuals. In this way new issues were detected. Other sources such as Moody's Bond Survey and the Investment Dealer's Digest were scanned to insure that no new issues were missed. The size of each new issue and its specific form was determined from Moody's individual company

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[1] For the remainder of the paper, the term convertible will mean subordinated convertible debenture.

data. Those issues meeting the stated criteria were put in the study group. The issues selected are listed in Appendix A.

Once a firm was admitted to the study group, the problem arose of subsequent subordinated convertible debenture issues, particularly those following the 1965 cutoff date. All subsequent convertible subordinated dubentures were put in the study group, including the post 1965 issues, provided they met the initial size criterion. The study firms floated five issues during the 20 year study period that did not meet the size requirement.

Another consideration was that some firms offered subordinated convertible debentures in exchange transactions — either for another firm's assets or for its own securities. The trouble here was that in the case of five issues subsequent operating data was not available and so these issues were dropped from the study.

Mergers and liquidations caused a further problem. A number of companies in the original group disappeared during the study period due to mergers and one, Merritt Chapman Scott, was in the process of liquidation. These firms were examined individually and left in the study as long as seemed relevant. The prime consideration here was whether the convertible continued to exert influence on the surviving company's performance. This was determined based on the relative sizes of the merging companies as measured by

assets. Warren Petroleum was absorbed by Gulf Oil in 1956 and Warren's convertible was retired in the process. The company was dropped from the study. However, Sinclair Oil, Richfield, and Atlantic Refining were all in the original study group and all merged to become Arco. Arco and its component issues was carried through to the study's conclusion. There were 90 companies in the study group and these firms issued 141 convertible subordinated debentures during the study period.

Issue Characteristics

Table 3.1 presents background data on the study group issues. Issues ranged in size from $10 million to $200 million with approximately half the total number falling between $10 million and $30 million. Industrial firms were the heaviest users of convertibles. Utilities have virtually ignored convertibles and this is even more significant when it is considered that two of these issues were put out by General Telephone and Electronics Company, which performs a certain amount of manufacturing. Convertibles have become popular with airlines. In the transportation category, 17 issues were floated by airlines since 1960.

It should be noted that maturities on convertibles tend to be similar to those of straight debt. The question might be raised as to why such long maturities are used if relatively rapid conversion is expected. In a similar vein,

TABLE 3.1

STUDY GROUP STATISTICS

		Dollars (Millions)	Number of Issues Number	Per Cent
A.	Size of Issues	10 - 19.9	38	26.9
		20 - 29.9	32	22.7
		30 - 39.9	18	12.8
		40 - 49.9	9	6.4
		50 - 59.9	10	7.1
		60 - 69.9	6	4.3
		70 - 79.9	4	2.8
		80 - 99.9	3	2.1
		100 -124.9	10	7.1
		125 -149.9	3	2.1
		150 -174.9	6	4.3
		175 -199.9	2	1.4
B.	Industrial Categories	Category	Number	Per Cent
		Industrial	117	83.0
		Transportation	21	14.9
		Utility	3	1.5
C.	Maturity	Years to Maturity	Number	Per Cent
		10	1	0.7
		13	1	0.7
		15	8	5.7
		18	1	.7
		20	42	29.8
		21	1	.7
		22	3	2.1
		25	74	52.5
		26	2	1.4
		30	8	5.7

TABLE 3.1-Continued

D. Quality Ratings

Moody Rating	Number	Per Cent
A	4	2.8
Baa	37	26.2
Ba	84	59.6
B	14	9.9
Not Rated	2	1.4

E. Coupon Rate

Per Cent	Number	Per Cent
0 - 3	2	1.4
3 1/8 - 3½	11	7.8
3 5/8 - 4	25	17.7
4 1/8 - 4½	52	36.9
4 5/8 - 5	29	20.6
5 1/8 - 5½	16	11.3
5 5/8 - 6	6	4.3

F. Offerings

	Number	Per Cent
Public Offerings	75	53.2
Rights Offerings	61	43.3
Exchange Offerings	5	3.5

G. Conversion Price

	Number	Per Cent
Fixed	107	75.9
Variable	34	24.1

H. Sinking Fund

	Number	Per Cent
Sinking Fund	133	94.3
No Sinking Fund	8	5.7

I. Issues per Company

Number of Issues	Number of Companies	Per Cent
1	54	60.0
2	23	25.6
3	11	12.2
4	2	2.2

over 94 per cent of the issues included sinking funds. With a convertible, however, most sinking funds did not commence until several years after issue-typically, around 10 years. The sinking fund would not be a major factor then, if early conversion occurs. The funds were designed to retire from 50 to 90 per cent of the issue amount.

Bond ratings, as shown, tend to fall on the lower end of the rating scale. About 70 per cent were Ba or lower. Baa is the lower limit for investment grade and this may have implications for regulated institutional investors. However, it should be remembered that convertibles tend to be downgraded due to their equity aspects and thus convertible ratings are not an absolute measure of firm strength. About half the issues were offered publicly and there were relatively few direct exchange offers.

Approximately 75 per cent of the issues employed a fixed conversion price. The variable conversion price is sometimes used to encourage conversion before the conversion ratio drops. While not shown here, a number of firms provided for the conversion privilege to expire before maturity. Alternatively, a few companies delayed the conversion privilege's effectiveness until some time after the issue date. This is done if the conversion price is set below the common market price at issue. Thus, immediate conversion is precluded but eventual conversion virtually

assured assuming no drastic turn of events. Also not shown here but related to conversion is the fact that all the issues in the study group were callable.

Finally, it can be seen from Table 3.1 that 40 per cent of the study firms issued more than one convertible. The two companies with four issues a piece were both airlines.

Simulation

Procedures followed for selecting the study firms and their respective issues were presented in the preceding section. The study group consisted of 141 convertible subordinated debentures issued over a 20 year span. In this section, the analytical techniques employed in assessing the convertible's impact on the firm are detailed. As will be recalled from Chapter I, the study hypothesis was that the use of convertible bonds should positively improve company performance. Support for the hypothesis would be shown if convertibles had a favorable effect on such variables as earnings per share, rate of return and others. These are developed in the following material.

The fundamental approach was to build a model that would simulate study group firm performance under an alternative financing plan. Simulated performance was then compared to actual performance in order to measure the convertible's impact.

Straight Debt Alternative

It was assumed that, at the time the convertible was issued, management could have sold straight debt as opposed to convertible debt. The straight debt would carry a correspondingly higher face interest rate than the convertible. There is a precedent for such an assumption since Brigham found that, "All but two respondents indicated that straight-debt could have been sold."[2] There were 22 respondents. The problem of the interest rate to be assigned the hypothetical straight debt was solved by adopting the rates found in Moody's Bond Survey. Moody's regularly evaluates convertibles based on prevailing yields of non-convertible bonds of comparable quality and maturity. These estimates, taken at the issue date, formed the basis for comparison with the actual rates. To the extent that this is not a viable assumption the study results would not be general.

Another operational assumption incorporated in the model was that portions of the straight debt issues would be called from time to time and replaced by an equivalent amount of common equity. The purpose here was twofold. First, the actual convertibles were sometimes voluntarily converted and sometimes called in entirety. Retirement of the hypothetical issues was necessary to maintain comparable capital structures. Second, it has been suggested by several of the writers cited in Chapter I that the main purpose for using convertibles is that they are

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[2] Brigham, op. cit., p. 51.

an expedient way of selling common stock. Brigham found that 73 per cent of his respondents were primarily interested in obtaining equity.[3] Further evidence relating to this point will be found later in this paper. Therefore, a decision rule was adopted that whenever a cumulative 25 per cent of the actual issue was converted or called to force conversion that a corresponding amount of the hypothetical issue would be replaced by common equity. The 25 per cent figure was used to eliminate the need for replacing minor amounts of debt and to avoid hypothetically constant trips to the capital market.

There are two acceptable methods to account for the conversion from debt to equity.[4] The face amount converted can be transferred to equity at book value, or the market value of the stock surrendered on conversion can be transferred. The latter method involves recognizing a gain or loss on the income statement due to revaluing the bond before retirement. Investigation revealed that most firms follow the book value method. This is probably to avoid the loss recognition attendant in the market value method for a "successful" conversion. A loss, under this method, would arise whenever a company exchanges its convertible for stock whose market value exceeds the debt's book value. The book value method was used in this analysis since it was the most commonly encountered in practice.

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[3] Ibid.

[4] Eldon S. Hendriksen, Accounting Theory (Homewood: Richard D. Irwin, 1970), pp. 522-523.

Thus, the simulation model replaced the actual convertible with an equivalent straight debt issue which was gradually supplanted by common equity as the actual issue was converted. If the convertible was called without forcing conversion, the straight debt was also merely called without issuing common stock. Non-conversion calls were determined by comparing conversion values with call values in Moody's Convertible Bond Survey. Additional aspects of the simulation model are considered in the following discussion of financial variables.

Variables

Earnings Per Share

Support for the study hypothesis that convertible usage should improve operating performance would be shown if earnings per share under the convertible are greater than under the proposed alternative straight debt. It was noted that, ceteris paribus, the difference in interest rates should generate a difference in net earnings under the two alternatives. The expected increment in earnings after taxes for a given time period was expressed as:

$$\Delta E = E_A - E_S$$

Where: ΔE = change in net earnings

E_s = simulated net earnings under straight debt

E_A = actual net earnings under convertible[5]

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[5] A complete list of symbols used in this paper can be found in Appendix B.

Letting: EBT = earnings before taxes

t = time

tr = tax rate

n = nth issue of a given firm

I = dollars of interest

i = face interest rate

P = principal outstanding

EBIT = earnings before interest and taxes.

Then the analysis proceeded as follows using the subscript A to denote actual situation terms and the subscript S to denote simulated situation terms.

$$\Delta E = E_A - E_S$$

$$= (1-tr)\ (EBIT_A - I_A) - (1-t)\ (EBIT_S - I_S)$$

After some rearranging and the fact that $EBIT_A = EBIT_S$,

$$\Delta E = (1-tr)\ (I_S - I_A)$$

For operational purposes, use was made of the fact that $I_A = i_A P_A$ and $I_S = i_S P_S$ so that,

$$\Delta E = (1-tr)\ (i_S P_S - i_A P_A).$$

Since i_S was greater than i_A it was expected that ΔE would be positive. Once the earnings increment was calculated, simulated earnings were found by substitution in $E_S = E_A - \Delta E$.

The model shown above illustrates the calculation for one time period and one convertible issue outstanding. This situation was generalized by the addition of a time subscript, t, and an issue subscript, n. Thus, P_{A35} would denote the actual principal

outstanding, for the third convertible issued since 1950, in the fifth year since issuance. The model would then become:

$$\Delta E_t = (1-tr_t)\left[(i_{S1}P_{S1t} + \ldots + i_{Sn}P_{Snt}) - (i_{A1}P_{A1t} + \ldots + i_{An}P_{Ant})\right].$$

This method of calculation fits reality since it allowed the actual interest paid on the convertible to decrease over time as conversion took place. Further, interest paid on the alternative straight debt dropped only at those points where the firm replaced the debt with equity.

The next step was to calculate earnings per share. Actual earnings per share, EPS_A, were available from published data. Simulated earnings per share were calculated by dividing the previously determined E_S by the number of simulated common shares, S_S. In order to arrive at S_S it was necessary to remove the number of shares issued under the actual convertible and replace them with any shares issued under the simulated straight debt for each year in question.

If the convertible, P_A, was being voluntarily converted or called to force conversion, the number of common shares outstanding, S_A, had to be reduced accordingly by the number of shares issued on conversion. This was to get the number of shares back to where they would have been if straight debt had been issued originally. The number of shares that were removed, S_{Cnt}, was found by dividing the face amount converted by the conversion price, CP, for each year in which conversion shares were outstanding. The calculation was made according to the

formula:

$$S_{Cnt} = \sum_{n=1}^{m} \sum_{t=1}^{T} \frac{\Delta P_{Ant}}{CP_{nt}}$$

where T = maximum number of years the firm was in the study and m = the total number of issues outstanding at a given time by the firm in question. These cumulative figures were used to reduce the actual shares year by year.

However, as soon as a cumulative 25 per cent of the actual issue was converted, it was assumed that the same amount of P_S was called and equity issued in the same dollar amount. The number of shares that were hypothetically issued were found by dividing the face amount issued by the common's market price, MP, at the time of the simulated issuing. Again, the cumulative amount issued up to any time was calculated by:

$$S_{Dnt} = \sum_{n=1}^{m} \sum_{t=1}^{T} \frac{\Delta P_{Snt}}{MP_t}.$$

The total number of shares outstanding under the simulation alternative, S_S, was determined for each year by subtracting the number issued under actual conversion up to that time from the actual shares outstanding and then adding back the number issued under simulation up to that time.

Or:

$$S_{St} = S_{AT} - \sum_{n=1}^{m} \sum_{t=1}^{T} S_{Cnt} + \sum_{n=1}^{m} \sum_{t=1}^{T} S_{Dnt}.$$

Then the calculation for simulated earnings per share was made by:

$$EPS_{St} = \frac{E_{St}}{S_{St}}.$$

Before continuing with the development, it is necessary to digress briefly.

APB Number 15. -- It will be recalled from Chapter I that the Accounting Principles Board has established criteria regarding earnings per share computations for firms with convertible debt. Under the Opinion, companies whose convertibles meet the test as common stock equivalents have their earnings per share calculated as though the convertible debt had been converted. This results in a primary earnings per share and a fully diluted earnings per share neither of which resemble the traditional earnings per share measure. The procedures put forth under APB Number 15 were not followed in this study since it was felt that the resulting measures were not relevant for either managerial decision making or investment analysis.

There are several major criticisms of APB Number 15— Hawkins lists 18, and some others are presented here.[6] First, convertibles are judged as to whether they are common stock equivalents at issue and since conversion will never take place for some issues, the diluted earnings figures would not be relevant. Second, there is evidence that investors have accounted for possible dilution in establishing market prices.[7]

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6 David F. Hawkins, Corporate Financial Reporting (Homewood: Irwin, 1971), pp. 243-246.

7 Eugene M. Lerner and Rolf Auster, "Does the Market Discount Potential Dilution?", Financial Analysts Journal, XXV (July-August, 1969), 118-121.

Third, there was the inconsistency of relating diluted earnings to a capital structure in which no part of the proceeds received from floating the convertible are considered equity until conversion. Fourth, most pertinent to this study was the operational problem of second quessing management on issues which came out prior to APB Number 15. The question was whether or not the debenture would have been issued as a common stock equivalent. If the cash yield on the convertible is less than two-thirds the prime rate at issue the debenture is a common stock equivalent. Further emphasis was added to this point by applying the two-thirds rule to the study issues. Only 2 of the 141 issues would have been classified as common stock equivalents. The cash yield measure was based on offering price for all issues since Opinion Number 15 does not provide any guidelines for handling debentures offered on a rights subscription basis. Frank and Weygrandt performed the same test for all categories of convertibles issued in 1965. The only debenture they found qualifying as a common stock equivalent had shown no conversion at the study's end in 1968.[8] Since it was felt that neither management nor investors would benefit from a study based on a measure which is misleading at best, the traditional method for earnings per share calculation was adopted for this analysis.

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[8] Werner G. Frank and Jerry J. Weygrandt, "Convertible Debt and Earnings Per Share", Accounting Review, XLV (April, 1970), 280-289.

Comparative measures. -- Returning to the research design, the last step under the earnings simulation was to compare the actual and simulated earnings per share figures. As a means to affect this comparison, the ratio of actual earnings per share to simulated earnings per share was calculated. This ratio, EPS_A/EPS_S, was generated for each company for each year the company appeared in the study. The comparative measure was also run on the total earnings per share figures spanning the entire study time for each company. Support for the hypothesis would be shown if EPS_A was greater than EPS_S. Various comparisons and statistical tests were run on this data as presented in Chapter IV.

Time Values

One way to examine the cash flow costs and benefits associated with the alternative financing plans was to adjust these flows for time by finding their present values. The differential in interest rates between the simulated and actual debentures created an incremental benefit, ΔE. However, a future cost under wither of these plans was the dividend payment attached to the shares that resulted from actual conversion, S_C, or from selling simulated equity, S_D. Therefore, the incremental benefit, ΔE, could be compared to the incremental dividends arising under the two plans.

It was expected that interest costs on the simulated straight debt would be greater than those on the actual convertible and a positive ΔE would result as shown in the previous section. However, it was more difficult to make a priori-

statements about dividends since the number of shares varied with circumstances. The number of shares issued under the convertible were fixed by the conversion price, CP. The number of shares sold under the simulated debt depended upon the common's market price at the time of its hypothetical issuing. Then, the incremental shares, at a given time, could be found from the expression developed in the previous section:

$$S_{St} = S_{At} - \sum_{n=1}^{m} \sum_{t=1}^{T} S_{Cnt} + \sum_{n=1}^{m} \sum_{t=1}^{T} S_{Dnt}$$

rearranging,

$$S_{At} - S_{St} = \sum_{n=1}^{m} \sum_{t=1}^{T} S_{Cnt} - \sum_{n=1}^{m} \sum_{t=1}^{T} S_{Dnt} = \Delta S$$

It could be rather tentatively expected that ΔS would be positive since the common's market price generally would be greater than the conversion price if conversion was taking place.

The procedure followed was to, first, multiply the dividend rate by ΔS to find incremental dividends paid. It was assumed that the dividend rate would be the same under both plans as the rate that prevailed in the actual situation. Next, the incremental dividends were netted against ΔE and the net present value benefit was calculated using this figure. Or:

$$NPV = \text{Present Value } (\Delta E - \Delta DIV)$$

Fowllowing Bowlin's argument, the discount rate used was the

after tax net yield on the subordinated convertible debenture.[9] His analysis, for a bond refunding, concluded that the proper discount rate is the after tax net yield on the refunding bonds. Simply stated, this is because of the certainty of the interest savings due to refunding at a lower interest rate. Similarly, financing with a subordinated convertible debenture as opposed to a subordinated debenture creates an opportunity savings which gives rise to incremental earnings. Notice that the certain interest savings does not mean the discount rate equates to the pure interest rate since earnings could be spent by the firm before the lender is paid. If more than one issue was outstanding in a given year, a weighted average rate was used based on the principal amounts outstanding in that year. Call premiums, and issue premiums or discounts were ignored here since they are relatively minor factors for convertibles. Underwriting expenses were also ignored.

In summary, the discount rate employed was the after tax net yield for the subordinated convertible debenture in question since this was the rate that gave rise to the incremental earnings. The net present value for each firm for each year of the study and in total was calculated. The results are given in Chapter IV.

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[9] Oswald D. Bowlin, "The Refunding Decision", Journal of Finance, XXI (March, 1966), 63-64.

Rates of Return

Support for the study hypothesis would be shown if the rates of return on equity were greater for firms using convertibles as opposed to their using straight debt. In a manner similar to that followed under the earnings per share analysis, it was determined to compare rates of return according to the ratio:

$$\frac{\text{Actual Rate of Return}}{\text{Simulated Rate of Return}}$$

This ratio could be calculated from:

$$\frac{\text{Actual Net Income}}{\text{Actual Stockholder's Equity}} \Big/ \frac{\text{Simulated Net Income}}{\text{Simulated Stockholder's Equity}}$$

However, two factors simplified the analysis considerably. First, since book values were used and the model forced the simulated equity to be the same as actual equity, the ratio became dependent upon the difference in earnings. Second, since it was expected that ΔE would be positive due to the interest rate relationships, it was expected that RR_A/RR_S would be greater than one in almost all cases. However, the motive for actually making the calculation was to observe the magnitude of the difference in the rates of return. The results are presented in Chapter IV.

Conversion Rates and Calls

Actual conversion rates and convertible subordinated debenture calls for the study group were detailed in order to explain study results in the earnings and rate of return areas. This procedure also was intended to reveal the historical

pattern of conversions and calls over the study period. The method followed was to determine the principal amount outstanding at each year's end. Any changes from year to year were considered conversions and this amount expressed as a per cent of original issue amount. The yearly per cents were also cumulated to show the pattern of conversion from debt to equity. The results are presented in Chapter IV.

Capital Structure

An examination of capital structures measured the impact of convertible usage on the debt-equity mix for the study firms. Capital structure was defined as the difference between total assets and current liabilities. The ratio, long term debt to capital structure was then calculated for each firm at issue date. These ratios were classified by firm asset size to make them comparable to government figures. The Federal Trade Commission and the Securities and Exchange Commission regularly publish capital structure data for manufacturing companies.

Next, it was assumed that the convertible was entirely converted at issue date and the long term debt to capital structure ratio calculated again. The amount of equity issued under the "if converted" status was determined by multiplying the debenture's conversion value (conversion ratio X MP) times the issue size at issue date. These figures were then compared to the original capital structure ratios and to the government figures. The years 1956 to 1965 were used so as to make maximum use of the data available. Data collection for the new

issue population terminated in 1965 and the number of issues prior to 1956 were considered too few for comparison. The data was also adjusted to include preferred stock and minority interest, first as long term debt and then as equity.

In summary, this analysis revealed capital structures for firms using convertibles — both as convertibles and assuming equity had been issued in place of the debentures to show the change in structure due to the convertible. Government figures were used as standard. These calculations also provided a test of the assumption that straight debt could have been issued under the simulation model. The results are given in Chapter IV.

Conversion Value

An aspect of convertibles incorporated in the previous section was the issue's conversion value at offering. Firms may have used the convertible as temporary financing with the expectation of early conversion to equity. If so, conversion value at issue would be established so as to encourage early conversion. This idea was tested by expressing the conversion value as a discount from the debenture's face value at issue date. Again, conversion value was determined by multiplying each issue's conversion ratio times its associated common stock market price. Conversion value was then related to debenture face value and the results tabulated for both public and rights offerings for the original

study group issues. It was anticipated that conversion value would be close to face value if quick conversion was desired by management. The results are given in Chapter IV.

SUMMARY

In this Chapter, the study's research design was discussed. The selection of 141 issues representing 90 firms was outlined along with the pertinent issue characteristics. As seen, the basic technique applied in the study was simulation of firm performance. Simulation was adopted in order to compare actual operating results with performance expected under alternative straight debt financing. The discussion then centered on the method followed for analyzing earnings per share, rates of return and time values. Finally, several other aspects of convertibles were examined with the purpose of explaining convertible subordinated debenture influences on the firm. Chapter IV will present the results of this analysis.

CHAPTER IV

EMPIRICAL ANALYSIS

Introduction

Research results are presented in this Chapter. The results were generated by applying the method outlined in the previous Chapter. Discussed first are the various aspects of earnings per share. Next, time adjustments for cash flows are presented. Third, the rate of return analysis is given in the same context as earnings per share. Finally, the study's investigation into convertible effects on capital structure is discussed. The emphasis here is on conversion rates and their relation to earnings per share.

Actual Relative to Simulated Earnings

Convertible bond theory, as discussed in Chapter I, revealed several factors pertinent to this phase of the analysis. It was expected that the number of common shares ultimately outstanding due to a convertible issue would be less than for a comparable equity financing. If straight debt, gradually supplanted by common stock, was the alternative to a convertible it would be more difficult to make statements about share numbers. The determining factor would become the price at which future equity could be sold. The theory also indicated that total earnings should be higher under the convertible than under straight debt-equity due to the difference in face in-

terest paid. Study group earnings per share hinged on these factors. Support for the hypothesis required that actual earnings performance, based on convertible financing, be greater than simulated performance based on the straight debt alternative. Total earnings per share and earnings per share over time are examined here.

Earnings Per Share

Total for study period. -- Over the study period there was a significant difference between actual and simulated earnings per share. See Table 4.1.

TABLE 4.1

ACTUAL RELATIVE TO SIMULATED EARNINGS PER SHARE

TOTALS FOR STUDY PERIOD

Actual Earnings per Share Relative to Simulated EPS_A/EPS_S		Probability of as Many Observations Below Simulated	Actual to Simulated (Per Cent)	
Equal or Above	23	Negligible	High	104.72
Below	67		Low	71.13
Total	90		Average	95.51

Note: See Appendix C for a brief description of statistical tests used in this paper. The probability here was based on the binomial with P=.5. The average was obtained by summing, over all the observations, the total actual earnings per share divided by the total simulated earnings per share and dividing by the number of observations.

This data provides evidence for rejection of the hypothesis. The results do not confirm the hypothesis because of the test result direction. During the study period, 1950-1969, simulated earnings were generally greater than actual earnings. A frequency distribution of actual relative to simulated earnings per share displays the differences that prevailed under the alternative financing forms. See Appendix D.1.

Per year during study period. -- On a per year basis, average actual relative to average simulated earnings per share never exceeded 100 per cent. See Table 4.2. This table illustrates the average impact on earnings from convertibles relative to straight debt-equity as measured from the issue date. Throughout the study period, average simulated earnings per share were always greater than average actual earnings per share. This was true regardless of the number of years from the time a firm first issued a convertible. The relationship hovered around 99 per cent during the first four years but thereafter dropped to a point where actual earnings per share were approximately 5 per cent below simulated earnings per share. Subsequently, the ratio deteriorated even further to the study's end. See Appendix D.2 for a complete distribution of the ratio. Therefore, it was concluded that the use of convertible subordinated debentures may slightly decrease earnings per share below what might have been experienced under straight debt-equity.

TABLE 4.2

AVERAGE ACTUAL RELATIVE TO AVERAGE SIMULATED EARNINGS PER SHARE EACH YEAR DURING STUDY

Number of Years From Issue Date	Average $\frac{EPS_A}{EPS_S}$ (Per Cent)	Number of Companies
1	98.80	76
2	99.00	87
3	99.08	86
4	99.30	81
5	96.46	78
6	95.95	71
7	97.55	69
8	98.54	66
9	96.80	57
10	94.75	46
11	95.35	41
12	93.17	38
13	93.79	33
14	94.08	19
15	94.99	11
16	93.06	4
17	86.89	3
18	69.95	3

Run Tests

One approach to time series analysis is the use of distribution free, non-parametric statistics. The particular tool employed here is the runs test. A run is a succession of items of the same class. By examining the total number of runs in a series or the length of the longest run it is possible to determine the randomness of a series. The study series were suited to runs test analysis since the earnings relatives divided naturally into classifications above and below 100 per cent. If the ratios were independent, it would be expected that the data would be normally distributed around the 100 per cent level.

Firm runs. -- Three versions of runs tests were applied to the individual firm actual relative to simulated earnings per share series. These tests were meant to examine the supposition that there was a difference in earnings performance under the two financing forms. The proposition was that there was no clustering. Rejection of this proposition and acceptance of the alternative would mean that there were too few runs for the observations to be independent.

The first test was involved with the number of runs above and below the 100 per cent level for the ratio. Table 4.3 shows the number of firms whose earnings series were found to show no difference and those whose actual versus simulated earnings per share were significantly different. A lower tail test was appropriate since too few runs would indicate rejection.

TABLE 4.3

NUMBER OF RUNS ABOVE AND BELOW 100 PER CENT

Firms Whose Earnings Series Were		Level of Significance
Independent	Not Independent	
44	41	.05

Note: Firms in study less than 5 years were not included.

For the firms whose ratios were not independent it can be said that the difference between actual and simulated earnings per share tended to be high for several years and then low for several years. For these firms, to estimate the next years earnings relationship, the latest year's ratio is likely to be closer than the series average.

Another test of independence was an examination run lengths on either side of the 100 per cent level. It was possible that while the number of runs would indicate independence, the probability of encountering a run of given length or greater would show nonrandom influences. Table 4.4 shows the number of firms whose earnings series were found to be independent under this test. Thus, 63 firms were found to exhibit runs too long to be considered random.

A third test concerned with independence involved the length of runs of ascending or descending order. This test examined consecutively increasing or decreasing runs regardless of their position relative to the 100 per cent level.

TABLE 4.4

LENGTH OF RUNS ABOVE AND BELOW 100 PER CENT

Firms Whose Earnings Series Were		Level of Significance
Independent	Not Independent	
22	63	.05

It was possible that directions of movement, once begun, tended to continue. This might be the case for a firm when conversion starts. Table 4.5 shows the results of the test.

TABLE 4.5

LENGTHS OF RUNS OF ASCENDING AND DESCENDING ORDER

Firms Whose Earnings Series Were		Level of Significance
Independent	Not Independent	
72	13	.05

Industrial runs. -- An attempt was made to reduce the runs tests results from a macro level to the point where they would be more useful for decision-making. The first approach was to classify runs with conversion rates. However, no systematic pattern was detected. Another approach was to segregate the data by industry. Study group firms were placed in industrial classifications by Standard Industrial Classification

(SIC) numbers.[1] It was found that most study group firms fell into a relatively small number of industries. See Appendix E for a complete industrial classification. Results of the test for the number of runs above and below 100 per cent were then classified by industry. These results are shown in Table 4.6.

Most industries contained approximately the same number of firms whose earnings ratios were independent versus those whose earnings were not independent. However, two industries, petroleum refining and transportation equipment, were predominantly independent and not independent, respectively. It should be noted that all firms in both these industries had average actual earnings per share relative to simulated earnings per share below 100 per cent. The results indicate the experience that firms issuing convertibles in these industries might expect.

Runs based on averages. -- It was noted earlier that the average earnings ratio never exceeded 100 per cent on a per year basis. See Table 4.2. An apparently steady decrease in the ratio was also observed. This pattern was analyzed by using runs tests. A test for ascending and descending order showed that the direction of movement tended to persist going from relatively higher to lower levels as the number of years from issue date increased. In other words, the probability of so few runs up and down, if there were no real persistance of movement in the same direction, would be .031 based on the

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[1] Dun and Bradstreet, Million Dollar Directory, 1971, (New York: Dun and Bradstreet, 1970).

TABLE 4.6

NUMBER OF RUNS ABOVE AND BELOW 100 PER CENT
BY INDUSTRY

Industry	Firms Whose Earnings Series Were	
	Independent	Not Independent
Air Transport	4	2
Chemical	5	4
Conglomerate	5	5
Distribution	6	5
Electrical Equipment	3	3
Food Processing	2	2
Machinery	6	3
Office Machinery	4	3
Paper	1	2
Petroleum Refining	2	7
Steel	1	2
Textile	3	4
Transportation Equipment	8	1

Table 4.2 data. It could be condluded that, based on averages, a firm issuing convertibles would experience steadily decreasing earnings relative to what could be expected from employing straight debt-equity.

In summary, the runs test analysis shows that a large number of firms experienced significant differences in the relationship of actual to simulated earnings per share due to non-random influences. This was true not only for individual firms but to some extent on an industry basis as well. Placed in the context of the earnings levels the analysis shows that convertible issuers were at a significant earnings disadvantage relative to the use of straight debt-equity. This can be seen by comparing the number of firms that experienced ratios above 100 per cent to those below that level. Further, the disadvantage becomes worse as the number of years increases from date of issue. This point will be considered again under the conversion rate topic.

Present Value Cash Benefits

Cash benefits were defined as the net of the incremental earnings generated and the incremental dividends paid under the alternative financing forms. Yearly net cash benefits were discounted by the convertible's after tax interest cost to arrive at a net present value cash benefit for each firm. Table 4.7 summarizes the results. A complete frequency distribution of the net present values is given in Appendix D.3.

TABLE 4.7

SUMMARY OF NET PRESENT VALUE BENEFITS DURING STUDY

Present Value Benefits (Number of Firms)		Probability of as Many Positive Observations
Positive	60	
Negative	30	Negligible
Total	90	

Note: Probabilities based on binomial with P=.5.

A distribution of the weighted average net present value cash benefits by year of issue is presented in Table 4.8. This table shows the average net present value cash benefits experienced by study group firms ranked according to when they first issued a convertible. For example, firms issuing convertibles for the first time during the study in 1963 experienced a positive net present value benefit of $750,000 to the study's end. The actual averages should be viewed cautiously for the years represented by a small number of issues since extreme values may have affected the average.

As can be seen from Table 4.8, firms issuing convertibles in the study's early years experienced a loss in terms of net present value. The results from the study's latter years were predominantly positive. These figures are supported by the number of firms that experienced positive versus negative net

TABLE 4.8

AVERAGE NET PRESENT VALUE CASH BENEFITS FROM ISSUE DATE

Issue Year	Average Net Present Value For Given Year Issues (Millions of Dollars)	Number of Firms Whose Net Present Value Was	
		Positive	Negative
1951	Zero	1	0
1952	- 2.500	1	2
1953	-12.500	0	1
1954	-12.500	0	1
1955	- 1.238	3	5
1956	- .511	6	3
1957	- .910	8	7
1958	- 1.375	3	3
1959	1.433	6	3
1960	1.583	2	1
1961	1.654	11	1
1962	1.610	5	0
1963	.750	2	1
1964	.516	3	0
1965	1.691	10	1

Note: Time zero for firms issuing more than one convertible was taken as the first issue's flotation date.

present value. A cyclical pattern also appeared and was confirmed by a runs test for runs of ascending and descending order. Thus, the net present values have tended to move consecutively in the same direction more often than would be the case for independent observations. However, a second runs test for overall trend did not show significance and so there has been no general shifting from a lower to higher level of net present value cash benefits -- just the cyclical pattern.

The shift from negative to positive net present values over the study period can be partially explained by the increase in interest rates (and interest rate differentials) over the study period and by the trend to larger size issues. Larger issue sizes and greater differences between convertible and straight debt interest rates means larger incremental earnings. See Appendix D.4. However, it is felt that another important factor is the conversion rate. This can also be seen in Table 4.8, since issues from the early study years have had a greater chance at conversion than those of the latter years. Once conversion begins, more dividends tend to be paid under the convertible as opposed to the straight debt alternative. Thus an increase in dividends plus a decrease in incremental earnings would tend to create negative net present value as time passes. One way for firms to avoid this problem might be to replace a convertible with another convertible in order to maintain the incremental earnings advantage. Further information on this point is presented under the conversion rate topic.

Actual Relative to Simulated Rates of Return

The rate of return is a measure of the owner's equity productivity. As defined by the model, actual rate of return relative to simulated rate of return was expected to exceed 100 per cent. Of interest here was the magnitude of the effect convertible issues would have on rates of return. A frequency distribution showing the observations calculated for all firms over all the study years is given in Table 4.9. It can be seen that 840 out of 898 data points fell in the range 100-105 per cent. Within this range the large bulk of the observations were below 102 per cent. There were isolated instances of ratios below 100 per cent due to Moody's straight interest estimates. The return on the scale's higher end were also isolated. No one firm or any time period enjoyed consistently high actual relative to simulated rates of return. From this it was concluded that further analysis related to this ratio would be non-productive.

In summary, the use of convertible subordinated debentures raised rates of return to only a slight degree compared to the straight debt-equity alternative. Combining this result with the findings related to earnings per share provided only minimal support for the study hypothesis. Therefore, the study hypothesis that financing with convertible subordinated debentures, as opposed to straight debt-equity, would positively improve financial performance was

TABLE 4.9

FREQUENCY DISTRIBUTION OF ACTUAL RELATIVE TO SIMULATED RATES OF RETURN

Actual Relative to Simulated Rates of Return (Per Cent)	Number of Firms
Less than 100	30
100 - 105	840
106 - 110	9
111 - 115	10
116 - 120	6
121 - 125	3
Total:	898

rejected. Further consideration is given to these results in Chapter VI.

Capital Structure

Convertible subordinated debentures have a direct effect on capital structure. Capital structure as defined in Chapter III is total assets minus current liabilities and thus encompasses all long term financing sources. Convertible debt's place in the structure has generated a certain amount of controversy. This is reflected in the measurement of earnings per share as discussed earlier. The question is when to

change the convertible's classification from debt to equity. Figure 1.1 shows that as time passes, assuming rising stock prices, the convertible's value and nature are determined, first by its debt characteristics and then by equity influences. It has been suggested that convertibles provide a means for automatic debt retirement without a corresponding dollar outlay. These concepts are put into perspective in this section by examining the study group firm's capital structures over the study period.

Debt Capacity

One capital structure measure is the ratio long term debt to total capital structure. Table 4.10 presents the results from applying this ratio to the study group firms at issuance. The asset size categories were dictated by the Federal Trade Commission figures. These figures reflect the impact on capital structure due to the issuance of convertibles by the study firms. The actual long term debt to capital structure is compared to the same ratio assuming full conversion at issue and to the ratio for all manufacturing companies.

Results show that long term debt as a percentage of capital structure was much higher for the study group firms compared to the macro data for manufacturing firms. The difference was greatest for the smallest and largest size categories. This evidence weakly supports the theory that when smaller firms engage in convertible financing they do so in high volume since

TABLE 4.10

FIRM CAPITAL STRUCTURE AT ISSUE DATE

Asset Size (Millions)	Long Term Debt to Capital Structure at End of Issue Year (Per Cent)	Long Term Debt to Capital Structure Assuming Full Conversion at Issue (Per Cent)	All Manufacturing Companies, 4th Quarter Figures[a] (Per Cent)	Number of Firms Studied
1956 - 1960				
50 - 99.9	56.4	31.6	17.2	8
100 - 249.9	36.3	23.2	20.4	23
250 - 999.9	42.6	33.2	21.3	13
1,000 +	28.4	15.8	14.6	2
1961 - 1965				
50 - 99.9	35.1	11.5	19.9	7
100 - 249.9	44.1	21.1	21.4	14
250 - 999.9	46.0	35.8	23.6	25
1,000 +	54.9	50.3	15.6	3
1956 - 1965				
50 - 99.9	47.4	23.2	18.6	15
100 - 249.9	38.7	22.6	21.0	37
250 - 999.9	44.7	34.8	22.6	38
1,000 +	46.0	38.7	15.2	5

[a]Federal Trade Commission - Securities and Exchange Commission, Quarterly Report for Manufacturing Companies, various years. Dollars figures for all firms converted to percentages.

convertibles may be the only source available. In general, it can be concluded that the study firms came close to exhausting debt capacity through the use of convertibles. This was true for all periods. It should be noted that the macro data reflects debt in all stages of retirement and firms with no debt at all. However, the conclusion still seems valid.

In contrast, the long term debt to capital structure ratios assuming full conversion at issue came reasonably close to the limits established by the aggregate figures. This finding bears out the theory that firms consider convertibles to be temporary, quasi-equity instruments. Convertibles may have been used for financing as a temporary expedient with the goal of eventually having common stock outstanding. This conclusion seems even more plausible in light of the earnings per share results which provided only minor support for the study hypothesis. Thus, the long term debt to capital structure at issue may be too harsh a measure of capital structure depending on management's motivation in originally electing convertible financing. Further evidence on this point will be presented in the following sections.

Conversion Values at Issue

One indication of management's intentions regarding convertible disposition can be found in conversion value. It was expected that management would establish conversion prices in close proximity to the common's market price at flotation

time if early conversion was desired. If quick transformation from debt to equity was not intended, the conversion price would be set so that the attractiveness of convertibility would have only speculative value.

It was found that approximately one-half the issues studied had conversion values at issue within 10 per cent of the debentures' market prices. See Table 4.11. Rights offerings were found to have conversion values set closer to debenture market price more often than public offerings. About 64 per cent of the privileged subscriptions were offered at a discount of less than 10 per cent from debenture price as compared to about 44 per cent of the public offerings. None of the rights offerings were sold at a discount greater than 17 per cent. Since rights offerings have a certain built-in acceptability to stockholders, the attempt to add quick equity value to the convertible would tend to minimize the risk of non-purchase by stockholders. Supporting the discussion are the weighted average discounts from market price shown in Table 4.12.

Based on this evidence, it was concluded that management made a conscious effort to add equity value to the convertible -- if not at issue date then soon after flotation. Thus supporting the supposition proposed under capital structure that management regards convertibles as temporary debt financing with the intention of conversion to equity. The rapidity of this transformation is discussed next under conversion rates and calls.

TABLE 4.11

CONVERSION VALUE AT ISSUE EXPRESSED AS DISCOUNT FROM MARKET PRICE

Discount From Market Price (Per Cent)	Public Offerings (Number)	Rights Offerings (Number)	Exchange Offerings (Number)
0 - .9	0	1	0
1.0 - 1.9	1	0	0
2.0 - 2.9	0	4	0
3.0 - 3.9	2	2	0
4.0 - 4.9	4	2	0
5.0 - 5.9	2	2	0
6.0 - 6.9	2	4	0
7.0 - 7.9	4	6	0
8.0 - 8.9	2	2	1
9.0 - 9.9	7	6	0
10.0 - 10.9	5	2	0
11.0 - 11.9	3	1	0
12.0 - 12.9	3	2	0
13.0 - 13.9	1	1	0
14.0 - 14.9	0	4	0
15.0 - 15.9	2	4	0
16.0 - 16.9	5	2	1
17.0 - 17.9	2	0	0
18.0 - 18.9	4	0	2
19.0 - 19.9	0	0	0
20.0 +	5	0	1
	54	45	5

Note: Four issues were sold with conversion price set lower than the common market price at issue.

TABLE 4.12

WEIGHTED AVERAGE DISCOUNT FROM MARKET PRICE

Type of Offering	Weighted Average Discount (Per Cent)
Public	11.9
Rights	9.0
Overall	10.6

Conversion Rates and Calls

Under the theory discussion in Chapter I it was suggested that convertible financing may result in a "savings" of shares ultimately issued. The study results in this area are presented here. The second topic presented is the rate of change from debt to equity, or the actual conversion rate. Adjunct to the conversion rate analysis is the consideration of call policy.

Share saving. -- In Chapter I it was pointed out that the number of shares emanating from a convertible issue would be less than the number of shares necessary for a comparable equity financing. This would be due to: (1) the fact that conversion prices are invariably set higher than market at issue date; and (2) that many convertibles are never fully converted. The conversion price versus market price idea was borne out by the relationships presented in the previous section. Conversion rates are examined in the next section.

It was further pointed out in Chapter I that this ephemeral

"savings" would disappear if the financing was postponed to a more favorable time for direct equity flotation. In effect, the study model simulated this situation since it postponed common stock issuance with stop-gap straight debt. A comparison of the ultimate number of shares issued under the actual (convertible) situation versus the simulated (straight debt-equity) situation is presented in Appendix D.5. Results show that for 89 out of 90 firms, the number of shares issued under the postponed equity financing are less than for the convertible.

This could mean that firms issuing convertibles were willing to pay more in terms of shares to obtain immediate debt financing and hoped for future equity through conversion. The attendant "costs" of possibly lower earnings per share and higher dividends would be relevant factors in this decision. Therefore, it was concluded that, contrary to theory, the advantage of share saving is not as attractive under convertibles as first appears.

Conversion rates. -- It has been suggested that conversion experience may have influenced the study results. Table 4.13 illustrates the study group's conversion pattern on a per year basis. Conversion into common stock was less than 5 per cent per year in a majority of cases. Even by the tenth year from issue over one-half of the 28 convertibles still in the study were experiencing conversion rates of less than 5 per cent of the original issue amount.

TABLE 4.13

PER YEAR CONVERSION OF CONVERTIBLE SUBORDINATED DEBENTURES INTO COMMON STOCK

Year	Per Cent of Issue Converted							
	0 to 5.0	5.1 to 10.0	10.1 to 20.0	20.1 to 30.0	30.1 to 50.0	50.1 to 75.0	75.1 and over	Total Issues
1	103	2	1	2	1	0	0	109
2	92	5	0	4	4	0	1	106
3	74	6	8	5	4	4	1	102
4	68	4	8	6	5	1	0	92
5	59	9	8	3	2	1	0	82
6	52	3	5	6	2	0	0	68
7	46	5	4	2	1	0	0	58
8	38	6	4	3	2	1	0	54
9	34	3	5	2	1	1	0	46
10	16	6	4	0	2	0	0	28
11	10	2	1	3	2	1	2	21
12	9	1	1	1	0	0	0	12
13	4	1	2	0	1	1	0	9
14	4	1	0	1	0	0	0	6
15	2	0	0	0	0	0	0	2
16	1	0	0	0	0	0	0	1
17	1	0	0	0	0	0	0	1
18	1	0	0	0	0	0	0	1

Note: Calls and conversion expirations are included only to the extent of conversion that took place prior to termination.

However, there were also situations where substantial conversion occurred in a year's time. During the study, 41 issues experienced conversion of over 30 per cent inside one year. These figures seem to indicate that when conversion does become attractive, investors will exchange a sizeable block of debt for common stock.

Table 4.14 presents data relating to cumulative conversion during the study. It can be seen that by the end of the tenth year 9 out of 30 issues still outstanding had experienced total conversion of less than 5 per cent. However, another 9 of the same 30 issues were more than 75 per cent converted. This was the general pattern. In addition, while not directly reflected here, 23 issues were more than one-half converted by the end of the fifth year -- exclusive of calls. Calls and conversion expirations were not included in Tables 4.13 and 4.14 once termination took place. Thus, the over 75 per cent category includes only outstanding issues.

It was concluded that conversion rates tended toward extremes. Issues tend to stay outstanding or be substantially converted within a relatively short period.

Calls and conversion expirations. -- Aside from voluntary conversions, calls and conversion expirations are ways to terminate a convertible's life. Table 4.15 illustrates the number of calls and conversion expirations during the study. Relatively few convertibles make use of the conversion expiration device, of those that did in this study, the tenth year was a popular time to invalidate the conversion option. Similarly,

TABLE 4.14

CUMULATIVE CONVERSION OF CONVERTIBLE SUBORDINATED DEBENTURES INTO COMMON STOCK

Year	Cumulative Per Cent of Issue Converted							
	0 to 5.0	5.1 to 10.0	10.1 to 20.0	20.1 to 30.0	30.1 to 50.0	50.1 to 75.0	75.1 and over	Total Issues
1	103	2	1	2	1	0	0	109
2	91	6	1	2	4	2	1	107
3	68	8	4	7	5	8	3	103
4	56	6	7	5	8	7	8	97
5	49	6	8	3	4	9	10	89
6	35	3	7	2	7	9	6	69
7	28	6	4	2	5	6	8	59
8	19	3	5	4	7	6	10	54
9	17	3	5	2	4	8	10	49
10	9	2	1	1	5	3	9	30
11	2	2	0	2	4	2	12	24
12	1	0	1	2	2	1	6	13
13	0	0	1	0	0	1	8	10
14	0	0	0	0	1	1	4	6
15	0	0	0	0	0	0	2	2
16	0	0	0	0	0	0	1	1
17	0	0	0	0	0	0	1	1
18	0	0	0	0	0	0	1	1

Note: Calls and conversion expirations are included only to the extent of conversion that took place prior to termination.

TABLE 4.15

CALL AND CONVERSION EXPIRATION YEARS FROM ISSUE

Year	Calls	Conversion Expirations
1	1	0
2	3	0
3	6	1
4	9	1
5	8	0
6	4	0
7	2	0
8	4	0
9	4	0
10	6	1
11	4	6
12	3	0
13	1	0
14	0	0
15	0	0
16	0	0
17	0	0
18	0	0
Total Issues	55	9

by the end of the tenth year, 47 issues had been called out of the 55 that were retired by this method. In fact, one-half of all calls took place by the end of year five.

The pattern of small versus large conversion is reinforced by the data in Table 4.16. Most calls and expirations lie at the extremes. It seems that some conversion may be prompted by the proximity of a call or expiration. This was especially true for expirations since the termination date was known with certainty far in advance of the actual date. Examination of the raw data revealed a rash of conversions in the period immediately preceding expiration.

Calls are not as easy to detect although the astute investor should be able to predict a call with some probability based on market values and past company policy. The data here includes only conversions before the call is announced. Therefore, none of the flurry of forced conversion is reflected in Table 4.16. The mean conversion rate for called convertibles was 32.8 per cent and for expirations, 58.7 per cent. Average life for called issues was 5.2 years. Averages are not too meaningful, though, in light of the disparity in values.

For calls, it would appear that management often exercises its option to retire an issue as soon as voluntary conversion becomes profitable to investors. This could be a signal that conversion can be forced. The evidence of this section regarding the capital structure ratio limits, the closeness of conversion values to issue price and the conversion rate pattern

TABLE 4.16

CUMULATIVE CONVERSION OF CALLED CONVERTIBLE SUBORDINATED DEBENTURES UP TO CALL DATE AND CONVERSION EXPIRATIONS

Per Cent Converted Up to Call	Number of Issues	
	Calls	Expirations
0 - 5.0	23	2
5.1 -10.0	2	0
10.1 -20.0	3	0
20.1 -30.0	4	1
30.1 -50.0	5	1
50.1 -75.0	7	0
75.1 and over	11	5
Total Issues	55	9

indicates that management is more interested in using convertibles to acquire equity as opposed to the advantage of relatively cheap interest.

Conversion Versus Earnings Per Share

Earlier it was suggested that conversion rates have an effect on the earnings variables. Results presented in the last section showed that a number of firms had relatively rapid conversion which would help explain the present value data. The more rapid the conversion, the sooner "cheap" debt is replaced

by "expensive" equity. Further examination of the conversion rate data revealed that firms whose actual earnings per share relative to simulated earnings per share were greater than 100 per cent also experienced little conversion before termination. There were 23 of these firms, represented by 32 issues. One of these issues was still out when the study ended, 4 had disappeared through merger and of the remaining 27 all but 4 left the study less than 25 per cent converted. Rapid and substantial conversion, on the other hand, tends to result in a relatively low earnings ratio. Firms whose issues experienced at least 75 per cent conversion in the first five years after flotation had an average actual earnings per share relative to simulated earnings per share of 93 per cent. These findings show that relatively rapid conversion tends to produce low ratios while retirement of issues before substantial conversion results in high actual relative to simulated earnings per share.

Plots of the earnings ratio for a sample of firms revealed that, in general:

1. before conversion started the ratio was fairly stable,
2. when conversion started, the ratio became erratic,
3. when approximately one-half the issue was converted, the ratio stabilized again, usually at a lower level than at the start.

The curves would have a tendency to flatten out when conversion was over since the incremental earnings would stabilize and the

number of actual shares would become fixed relative to the simulated shares. The level of the curves would also depend on incremental interest rates and issue size. Therefore, it is suggested that when managing a convertible, the bond should be called as soon as it becomes possible to force conversion.

Summary

This chapter presented the research results as obtained from an empirical analysis of study group data. It was found that while 23 firms had actual earnings per share greater than simulated earnings per share, there was little else to support the hypothesis. In general, the earnings ratios were below 100 per cent and tests showed the ratios had a tendency to deteriorate as time passed. Time value analysis indicated a shift from positive to negative net present values as time from issue date increases and conversion takes place. Rates of return were enhanced only minimally by the use of convertible subordinated debentures. Based on this evidence, the study hypothesis was rejected and the null hypothesis accepted.

Capital structure analysis revealed that convertible issuers tended to push debt limits to the extreme but usually this was a temporary phenomenon. Consideration of conversion values and conversion rates indicated that management desired a relatively quick transformation from debt to equity values. This lent credence to the proposal that convertible subordinated debentures

are used mainly as a device for floating common stock. Finally, the relation between conversion rates and earnings per share was explored.

CHAPTER V

TRADEOFF CURVES

Introduction

Convertible subordinated debenture effects on the firm were analyzed in the two previous chapters. Under consideration here is a problem management faces in designing the convertible issue. That is the dilemma of establishing the face interest rate and conversion price. It has been suggested that a tradeoff exists between these parameters. At this point, the study's purpose was to examine the idea by developing tradeoff curves for a variety of convertible categories.

Previous Research

It will be recalled that Brigham's work in this area was reviewed in Chapter I.[1] Iso-yield curves were developed for given growth rates, g, and terminal values, TV, according to Brigham's model:

$$TV = MP_o\ (1+g)^N \left(\frac{M}{CP}\right)$$

and:

$$M = \sum_{t=1}^{N} \frac{I}{(1+k)}\ t + \frac{TV}{(1+k)^N}\ .$$

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[1] Brigham, op. cit., pp. 38-48.

The first expression gives a convertible's terminal value, TV, in conversion at time N. This is done by compounding the common's market price at a rate, g, and multiplying by the number of shares obtainable on conversion. The second expression defines a convertible's internal rate of return, k, as the rate which equates the price paid for the bond, M, to the stream of interest payments and the terminal value. Then, if management has expectations about g, and a call policy regarding TV, it can be determined how many years, N, the convertible should be outstanding. This requires establishing a conversion price. Next, substituting N in the second expression and setting k, the face interest can be found that matches the previously set conversion price. The combination of interest rate and conversion price provide one point on the iso-yield curve for k. Using this procedure a set of iso-yield curves could be developed. A family of curves, for various k, is illustrated in Figure 1.2. The straight debt interest to convertible interest ratio is plotted versus the conversion price to common market price ratio. This is to show the relationships that exist as a convertible's parameters are changed vis a vis straight interest and market prices. For example, reducing the convertible interest relative to the straight interest would mean the firm must tradeoff by also lowering the conversion price relative to the common's market price.

Again referring to Chapter I, it was pointed out that for iso-yield curves to be tradeoff curves, investors must be indifferent between interest payments and capital gains. Moving along an iso-yield curve would mean investors should be equally happy with investments of the same return but unequal risk. The higher points on a curve would mean greater risk due to the dependence on capital gains for achieving k. In this situation investors would be demanding a higher rate of return than if the interest yield were set close to the straight yield and the convertible sold on a basis similar to a straight bond. Therefore, the actual tradeoff curve may cut across and be somewhat flatter than the family of iso-yield curves.

Bladen, in a parallel development to Brigham's work, compared the premium of convertible market price over bond value to the premium of convertible market price over conversion value.[2] In this instance, an inverse relationship was also found when the two premiums were plotted against each other. The logic of the two studies was similar. Brigham used interest rates and stock prices while Bladen compared bond premiums.

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[2] Ashly Bladen, Techniques for Investing in Convertible Bonds (New York: Salomon Brothers & Hutzler, 1966).

Current Study

Purpose

The motivation for considering tradeoff curves in this study arose from the benefit management could derive if tradeoff curves do, in fact, exist. Assuming that a tradeoff curve could be consulted when designing a convertible issue, much of the work would be eliminated in setting the face interest rate and conversion price. Also, the debenture's marketability would be enhanced. Management could consult the appropriate curve and read off feasible combinations of interest rates and conversion prices given their expectations as to growth and terminal value.

Proposal

The proposal was that there is an inverse relationship between convertible subordinated debenture interest rates and conversion prices. It must be assumed that the growth rates for given stocks as well as their associated capitalization rates are constant in the analysis. However, the restrictions implied by the assumptions can be lessened by certain techniques.

Method

Brigham's approach of plotting interest rate ratios against price ratios was used since the objective was to develop a usable tool. Curves expressed directly in issue

parameters would be directly applicable by management. First, interest rate ratios were expressed as of the issue date. This was done by dividing the convertible coupon rate, i_A, into Moody's estimated straight debt rate equivalent, i_S. Price ratios were calculated by dividing the common's market price at offering, MP_O, into the conversion price, CP. Data was drawn from the study group issues. Alternatively, ratios were calculated for already outstanding issues using yields to maturity and common prices determined at some point after issue. This was done in certain situations to test the validity of the curves and compare the two measurement techniques.

Regression and correlation analysis was used to determine the closeness of the relationship. Several mathematical curves having the postulated shape were applied to the data in order to find the best fit. It was determined that an equilateral hyperbola of the form:

$$Y = \frac{1}{a+bX}$$

provided the best fit and still described the tradeoff relationships outlined above. Simple curvilinear regression was then applied for several situations.

Scatter diagrams were plotted for different natural data classifications. The classifications plotted were:

1. New issues in various years for rights and public offerings.
2. New issues lagged one year for rights and public offerings.

3. New issues floated during recession periods as defined by the National Bureau of Economic Research.[3]
4. All new public issues of the original study group 1950-1965.
5. New issues for various industrial categories. Companies were assigned to industries according to Standard Industrial Classification (SIC) numbers.[4]
6. New issues classified by industrial categories lagged one year from issue.
7. New issues classified by growth.
8. New issues classified by firm asset sizes.
9. New issues classified by Moody ratings.
10. Issues of companies with convertibles outstanding that appeared in Moody's Convertible Bond Survey for January, 1971 but were deemed non-growth companies.
11. Issues of growth companies determined by comparing Moody's Convertible Bond Survey for January, 1971

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[3] Arthur Burns, Business Cycle In A Changing World, National Bureau of Economic Research (New York: Columbia University Press, 1969), p. 76.

[4] Dun and Bradstreet, Million Dollar Directory, 1971, (New York: Dun and Bradstreet, 1970).

with the Value Line Growth Stock list for January, 1971.

As described previously, parameters for new issues were determined at the flotation date. Data for lagged or already outstanding issues was based on market determined yields and stock prices at the given times. A problem encountered in classifying the data was accumulating a meaningful number of data points. For example, it was necessary to obtain data for industrial categories over time since there were no industries with a sufficient number of new issues in a given year to provide relevant analysis. On the other hand, it was necessary to include several categories of issues when performing a cross-section analysis on outstanding issues.

Results

After plotting, regression and correlation analysis was applied to the categories whose data appeared to conform best to the postulated tradeoff curve shape. Summary statistics for this analysis are presented in Table 5.1.

Moody's and Value Line. -- Data from already outstanding issues eliminated the problem of basing tradeoff curves on figures taken over time. Changing market conditions could have influenced the tradeoff curve's shape and position. The theory indicates that curves derived from the interest rate and price ratios should be approximated by downward

TABLE 5.1

CORRELATION AND REGRESSION MEASURES
FOR TRADEOFF CURVES

Category	Correlation Coefficients	Standard Errors	b Coefficients
Moody's, Jan., 1971	.757	.086	.191
Value Line Growth	.702	.068	.068
Low Growth	.499	.051	.308
Medium Growth	.274	.059	.462
Low Growth-Straight	.512	.061	-.379
Medium Growth-Straight	.285	.073	-.594
New Issues in 1957	.067	.061	-.092
Asset Size 3	.319	.044	.214
Petroleum at Issue	.553	.077	-.954
Petroleum Lagged	.840	.113	.645
Air Transport at Issue	.704	.055	-.426
Air Transport Lagged	.830	.106	.317

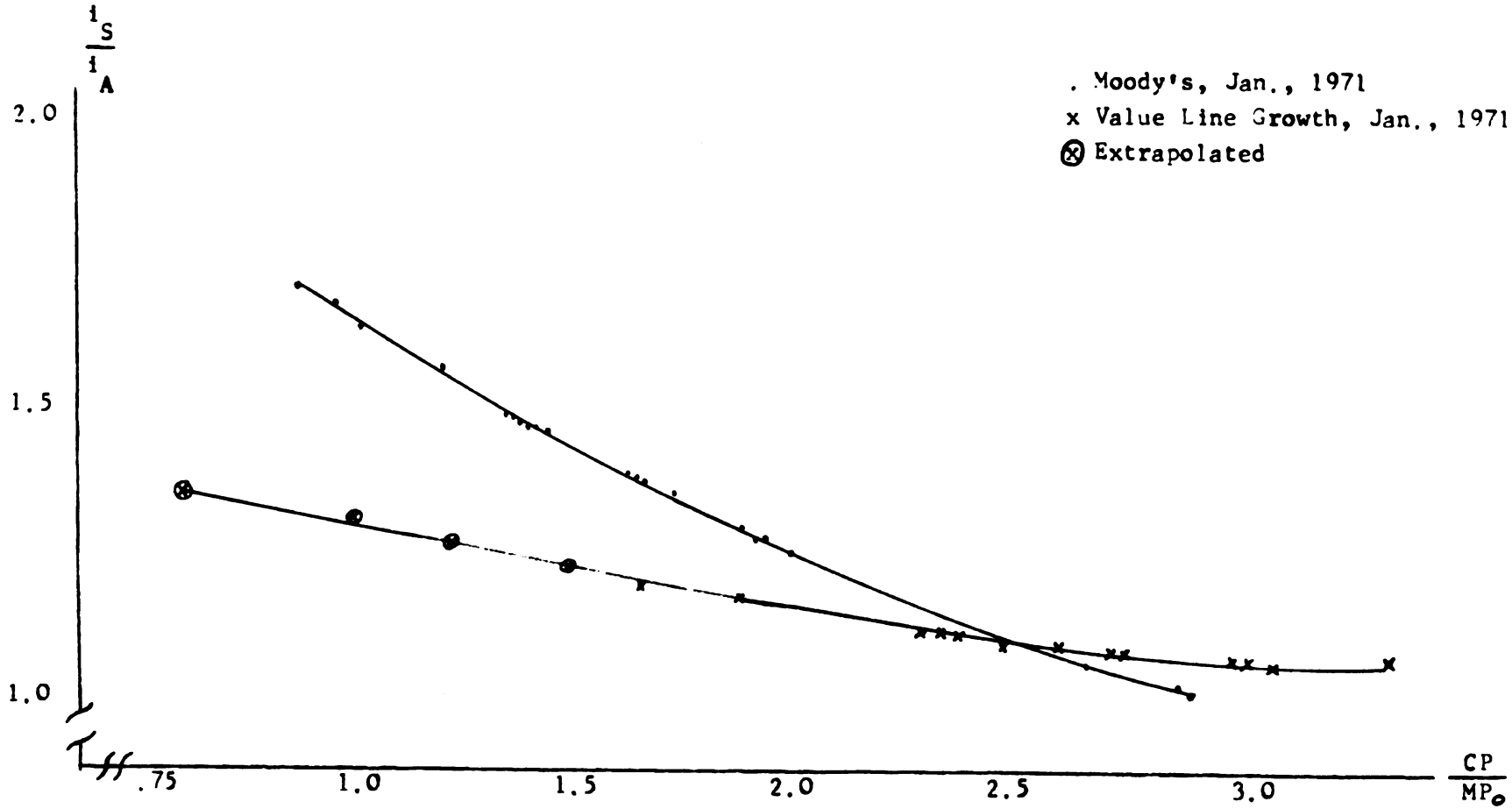
sloping curves that are somewhat flatter than iso-yield curves. This was found to be the case for both the growth and non-growth data as defined by Value Line and Moody's. The regression coefficients of .702 for growth and .757 for non-growth issues were reasonably good and the standard errors relatively low.

Both curves have the expected slope. However, a plot of the regression lines shows the growth curve to be quite flat and intersecting the non-growth curve. (see Figure 5.1) It would be expected that the growth curve would lie above the non-growth curve. The nature of the tradeoff is such that, other things constant, an equal increase in interest rates (drop in the ratio) means the conversion price could be set higher for a growth situation than for a non-growth situation. It appears that, for the period illustrated, investors in growth firm convertibles were willing to tradeoff more of their equity option (increase in the price ratio) for the added security of more interest (decrease in interest ratio) than non-growth investors were willing to tradeoff. Relative flatness of the growth curve can be explained by the fact that with higher growth a convertible's equity portion would determine the instrument's value quicker than for a non-growth situation.

The proximity of the growth and non-growth curves plus the fact that the interest rate ratios were close to unity

FIGURE 5.1

TRADEOFF CURVES
MARKET DATA



indicates that investors were buying both convertible categories for yield rather than appreciation. As the interest rate ratio approaches unity, the convertible tends to sell on a straight yield basis since the interest rate spread approaches zero. This was probably true due to the state of the stock market and the U. S. economy's uncertain future at that point. Investor's were buying security and speculating on a distant conversion possibility.

These regression curves represent one point in time and their predictive ability would be limited to markets reflecting the same conditions. In addition, they ignore other differences in firms, such as credit strengths, stepped up conversion prices and the broad definition of growth versus non-growth categories.

Other growth curves. -- Another approach to the problem of differing growth rates was to define growth more narrowly and derive curves from the study group data. The method followed here was to use ex post data from called convertibles. In this way, it was possible to calculate growth using Brigham's model as presented earlier in this chapter. Since only called debentures were included, terminal values and the convertibles' lives were known with certainty.

The procedure was to scan the study group issue list and determine the number of years each called bond was outstanding as well as terminal value. Terminal value was taken as conversion value if conversion was being forced,

call price if the common's market price was below the conversion price. This was done for both public and rights offerings. Prices paid for the convertibles depended upon the type of offering. Growth was then calculated using the model. The resulting growth rates range from -4.7 per cent to +67.6 per cent. Convertibles floated from 1952 to 1965 with lives from 1 to 12 years were represented. There were 27 public offerings and 24 rights offering.

In order to accumulate a sufficient number of points for meaningful curves, the growth rates were characterized as low, medium, or high and the data clasified accordingly. Low growth was defined as ranging from 0 per cent to 6.5 per cent, medium from 6.6 per cent to 15.5 per cent and high growth as above 15.5 per cent. Scatter diagrams were then plotted for publicly issued convertibles that were called, for rights issues that were called and for combinations of public and rights issues — all in the proper growth categories. Inspection revealed that only the low and medium growth categories, for public issues, exhibited the expected shapes and positions.

The correlation coefficients for these categories, as shown in Table 5.1, are disappointingly low. Both curves have the proper shape but the medium growth curve intersects the low growth curve from above and stays below it for price ratio values greater than 1.10.

Since the scatter diagrams were relatively non-descriptive, the data for the same two categories were run again as straight lines. The results are labeled Low Growth-Straight and Medium Growth-Straight in Table 5.1. The improvement in correlation coefficients is minor under this configuration and the standard errors are larger. These curves also have the expected negative slope but they too intersect. Further discussion of these curves will be deferred until Chapter VI.

New issues. -- As a means of solving the time series problem yearly new issues were analyzed. This is similar to the Moody's and Value Line curves except that they reflect market determined parameters. Here, the interest rate and stock price ratios were determined at issue. Scatter diagrams showed 1957 issues to come closest to the expected plot. However, the correlation coefficient was only .067 and the curve sloped positively upward.

Asset sizes. -- Another approach was to categorize the issuing firms according to asset size. The size categories were the same as those employed for the capital structure analysis reported in Chapter IV. Of the four size categories, the best results were obtained for firms whose sizes ranged from $250 million to $1,000 million. This was the second largest size category. However, the correlation

coefficient is a low .319 for issues from the study group. Thus, the analysis based on parameters taken at the issue date for growth, new issue and asset size tradeoff curves reveals only minor evidence to support the hypothesis. Further discussion will be found in Chapter VI.

Industrial curves. -- Industrial categories were examined as a final attempt to develop curves management might use for guidance in establishing convertible interest rates and conversion prices. The industries analyzed, petroleum and air transport, were selected since they are rather narrowly defined, provided a sufficient number of issues during the study period, and because of the particular flotation dates. In the petroleum sample 11 of the 14 issues were offered prior to 1959 and only 1 was offered subsequent to 1963. For the air transports, all of which were regularly scheduled airlines, 13 of the 19 issues were offered after 1964 and 14 of the 19 were floated by 4 firms. Further, these 4 firms were all in the same asset size category throughout the study. The issue date bunching minimized the time span problem.

Regressions were run on the data from both industrial samples as of the issue date and lagged one year after issue. Again, issue date convertible interest rates and conversion prices were those set by management, and the straight interest rates were Moody's estimates. The lagged interest rates

were market determined yields for the convertibles and Moody's estimates for comparable straight debt at that date. Correlation data is presented in Table 5.1. The correlation coefficients for the industrial issue date curves are relatively good compared to the other issue date category curves. However, both petroleum and air transport curves have the wrong shape being positively shoped. On the other hand, curves based on the lagged data exhibit the best correlations encountered being .84 for petroleum and .83 for air transport. In addition, they both have the proper shape and position. Standard errors are the greatest encountered though not excessive for the range of values. These curves are shown in Figure 5.2

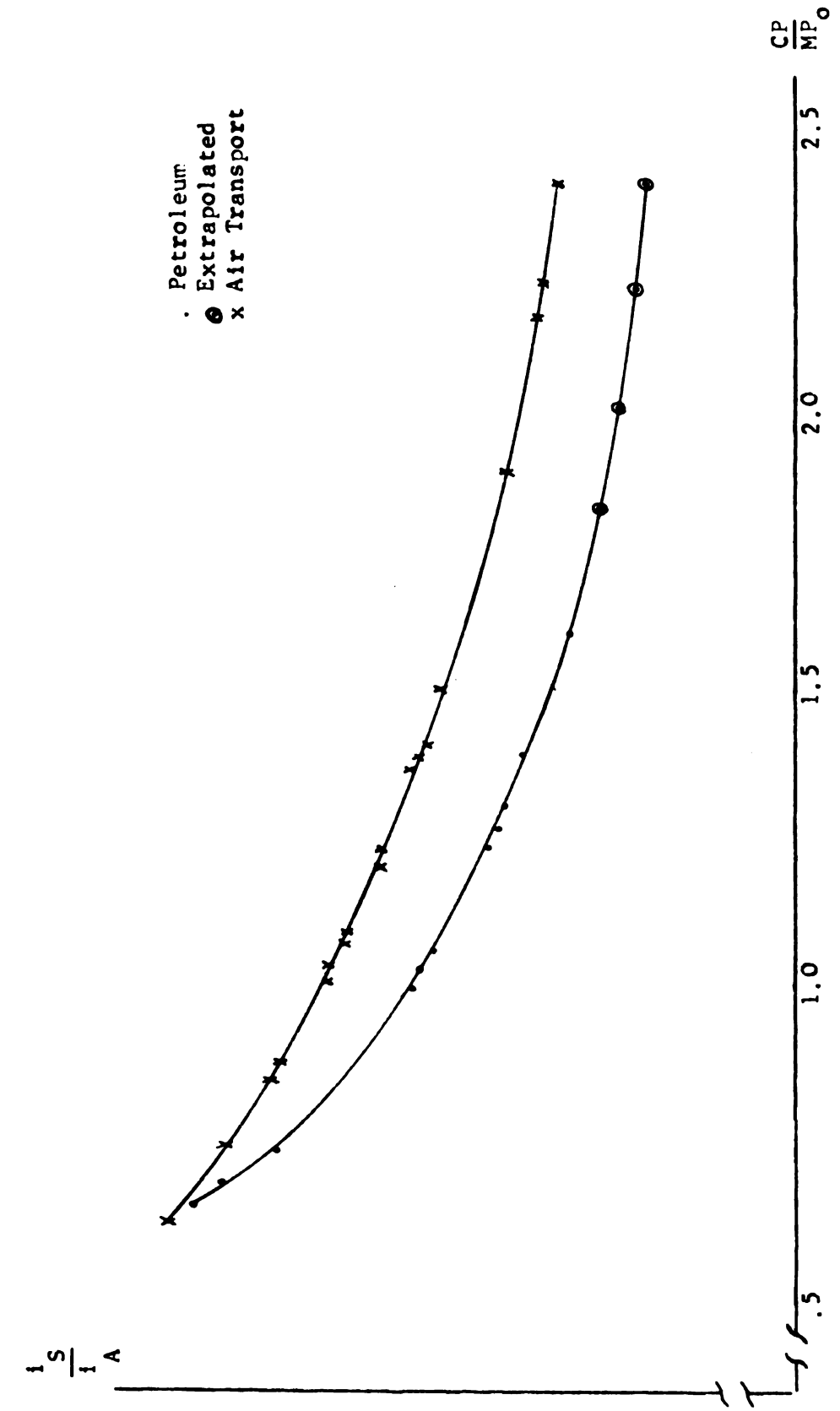
Based on the issue date industrial data, if the hypothesized tradeoff curves do exist, either this analysis has failed to uncover them or management has chosen to ignore their dictates in setting parameters. However, once trading ensues market forces tend to produce data that reflects the expected relationship. The usefulness of these curves depends on their stability over time.

Summary

The hypothesis that there are tradeoffs between convertible interest rates and conversion prices was examined in this chapter. Tradeoff curves were developed for a variety of

FIGURE 5.2

TRADEOFF CURVES
LAGGED INDUSTRIALS



situations based on issue date data and on market data. There is a weak evidence to support the theory based on issue date figures. However, curves based on market data do exhibit relatively strong correlation. The results are discussed further in the following chapter.

CHAPTER VI

REVIEW AND EVALUATION

Introduction

The study's purpose was to investigate convertible debt and determine its impact on issuer financial performance. After the convertible's basic nature was described, the research was divided into two stages. Stage one proceeded to document the volume of convertible bond financing over the years 1950-1969. Stage two research concentrated on convertible subordinated debentures larger than $10 million in size. Actual and simulated performances were compared to analyze convertible effects on financial variables. Finally, the idea of tradeoff curves was investigated empirically.

Convertible Debt Aggregate Financing

Domestic corporate convertible debt financing was used to its greatest extent in the latter years of the study period 1950-1969. After a cyclical usage pattern convertible volume rose on both an absolute basis and relative to total bond financing. Convertible debt dollars averaged approximately 20 per cent of all bonds issued over the last 3 study years. Additionally, mean issue size was rising at the study's end after hitting a low in 1960.

Empirical data supported theory in many areas. It was

found that, measured by assets, large companies tended to float large issues as compared to small companies putting out small issues. In a similar vein, stronger firms, as guaged by bond ratings, employed the longest maturities for convertible debt instruments. The most popular maturities fell in the 15 to 20 year range with longer-lived bonds becoming more popular at the study's end. It might be questioned as to why convertible issuers choose such long maturities. Research results from the study group firms showed that companies tend to consider convertible subordinated debentures as quasi-equity and to promote early conversion. Although relatively long-lived issues may benefit the firm through low interest, the options available for future financing are probably restricted. Perhaps management is afraid of limiting marketability by going against tradition and using shorter maturities. Investor's who emphasize a convertible's fixed income aspect might become discouraged by shortened maturities.

It was also found that more large firms have been issuing convertible debt which may account for the rise in mean issue size and the lengthening of maturities. Contrary to this idea is the fact that the general level of bond ratings for convertible debt has been dropping over the last 20 years. Possibly, more credit weak firms are using convertibles today or convertible issuers are employing more debt than is deemed prudent by bond rating agencies. This says little about what would be

causing credit weakness.

Data relating to calls was also examined and it was found that about 50 per cent of all convertibles were called while conversion premiums ranged from 111 to 160 per cent based on both conversion price and market value. Also, 50 per cent of all calls were underwritten. An area for future study, might be an investigation into the benefits received from such underwriting compared to its cost. The risk borne by a forced conversion call may not justify the expense of avoiding failure. Once convertibles reach a certain market price, the probabilities of non-conversion on call would appear to be minimal.

Finally, several firms have issued convertibles more than once. This indicates that, rightly or wrongly, some managements have found the hybrid convertible useful.

Financial Performance

Firms issuing convertible subordinated debentures had their financial performance evaluated primarily by earnings per share, net present value cash benefits, and rates of return. The study hypothesis was that convertible issuers enjoy superior financial performance as compared to what would be experienced if straight debt-equity were used for the same financing. Based on the relative performance of earnings per share and rate of return, as well as net present value, the study hypothesis was rejected.

While testing detected some differences in actual earnings per share relative to simulated earnings, the results showed that actual earnings generally fell below simulated earnings. Runs tests indicated, that for a large number of firms, the earnings ratio series were affected by non-random influences. However, the differences pointed to inferior rather than superior performance under convertibles.

One factor behind these results is the rate of conversion. It was found that many issues were converted rather quickly -- either voluntarily or on call. The biggest factor prompting conversion appears to be the common's market price. Voluntary conversion becomes attractive whenever the common's market price exceeds conversion price. During the study, this often prompted a call to force conversion. The point is that the firm must give up more shares in conversion than would be needed if equity was being sold directly at that time. Study results showed only one firm "saving" shares under the convertible as opposed to the straight debt-equity alternative. This disparity in share numbers resulted in simulated earnings per share dominating actual earnings in many cases.

Related factors affecting firm performance are issue size and interest rate. Study results showed that incremental earnings relative to actual earnings were quite small in many situations. Incremental earnings were calculated by applying the after-tax interest savings to the outstanding principal.

The magnitude of these interest rates was not enough to

materially enhance earnings for a number of firms. Therefore, it can be concluded that, in general, firms should not issue convertibles with the expectation of enjoying superior earnings performance.

Rate of return results can also be explained by the influences of issue size and interest rate. Rate of return was defined as after tax earnings divided by book equity. Rates of return were increased under the convertible alternative but not substantially. Analysis showed this was due to the relatively minor effect incremental earnings had on overall earnings.

Net present value cash benefits followed a cyclical pattern. They were negative for early study issues and became positive for latter year issues. The underlying force here appeared to be conversion rates. Once conversion started the incremental earnings inflow diminished and dividend outflow increased. Latter year issues had not had as great an opportunity at conversion as early study year issues. It can be concluded that conversion rate as well as issue size interest rate and dividend rate influence the net present value cash benefit expected by the firm.

Convertible issuing firm capital structure was also examined. Initially, it appeared that convertible issuers overextended themselves in using debt as measured by the long term debt to capital structure ratio. However, when full conversion was assumed the ratio agreed favorably with the standard

as set by the average for all manufacturing firms. Further, conversion values at issue indicated management expected rapid transformation from debt to equity. Both voluntary and forced conversions tended to reinforce this finding. Therefore, it can be concluded that firms employ convertibles not so much for improved financial performance but as a quasi-equity device for floating common stock.

Interest and Conversion Price Tradeoff

Theory indicates that a tradeoff should exist between convertible interest rates and conversion prices. For a group of issues this tradeoff should describe a negatively sloped curve reflecting the characteristics of the various issues. The purpose here was to test the theory by empirically deriving tradeoff curves. Also, it was hoped that usable curves would result thus giving management a tool that would reduce the uncertainty surrounding convertible issue design.

Available data was classified in a variety of ways. Both cross sectional and time series approaches were utilized. Data was taken at issue date and after market trading influenced the parameters. After plotting the data a hyperbolic function was adopted which best described the expected relationship. Regressions were run employing this function for a variety of data classifications.

The results were both disappointing and encouraging. Data taken at issue date exhibited relatively weak correlation in almost all cases. However, data taken one year after issue

showed fairly good correlation -- particularly for industrial classifications. This reflects the fact that despite management action in setting parameters, once the market exerts its influences the tradeoff between risk and return appears.

Based on the use of simple curvilinear regression, it can be concluded that tradeoffs do exist in the market place but not at issue date. It could be that management is not sensitive to the relationship or not sophisticated enough to apply its dictates relative to other issues. Alternatively, the method adopted here may have been too naive to detect the relationship. Another approach would be to query convertible issuers as to the possible interest-conversion price combinations they considered in designing the convertible issue. This would reveal whether the postulated tradeoff exists. However, two factors discouraged this approach. First, it must be assumed the various managements did consider more than one choice of interest-conversion price. Second, management must be willing to reveal this data. Brigham attempted something of this nature but usable responses were received from only 5 firms out of 42 sampled.[1]

This paper's approach could be improved and a more sophisticated analysis utilized. Multiple curvilinear regression and correlation could be attempted including such variables as

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[1] Brigham, op. cit., p. 45.

expected growth, firm size, issue year and others. This appears to be the most promising avenue for future research. Growth curves were developed in this paper with mediocre results. Different growth measures should be incorporated since the present definition has inherent limitations. The results presented here are encouraging and should lead to future research.

Study Implications

As a result of this research several items were determined that should be important to management. Firms probably should not issue convertible subordinated debentures and expect superior financial performance vis a vis the alternative of temporary straight debt-equity. Study results showed that the hypothesized advantage did not really develop for either earnings per share or rate of return and net present value cash benefits depend on conversion rates among other factors. However, if a convertible is issued the best management policy is to call the debenture as soon as conversion becomes attractive. Earnings per share would be optimized under this policy.

Research data analysis found that convertibles are often a thinly veiled disguise for selling common equity. One theory supporting this practice is that the number of common shares ultimately issued under the convertible will be fewer

than if common were sold directly. However, if the choice is between financing with a convertible now versus straight debt now that will be replaced by common to be sold later -- it is better to take the latter course. Under the straight debt-equity alternative fewer shares will be needed since the common can be sold at a higher price than under the convertible. Earnings per share would be directly affected.

Two convertible parameters that can be set by management are interest rates and conversion prices. Theory and this paper's empirical evidence show that tradeoffs exist between these two parameters as a means of balancing risk versus return. The crude curves derived here offer encouragement that more sophisticated curves can be developed. These curves could be used by management in designing convertible issues.

Summary

In this chapter the entire study was reviewed and its implications discussed. First, the highlights of aggregate convertible financing over the last 20 years were presented. Next, the research results of the study group's financial performance were discussed in the context of convertible debt management. The research into tradeoff curve development was reviewed and suggestions proposed for future research in this area. Finally, the study's results were put into perspective by presenting the research's policy implications.

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APPENDICES

APPENDIX A

STUDY GROUP ISSUES

This appendix contains a listing of the study group issues. The list is arranged chronologically according to the year a firm first qualified for inclusion in the study. Companies are listed alphabetically within years along with face rates, maturity dates, and principal at flotation in millions of dollars for the attendant issues.

1951

Warren Petroleum 3½s, '66; 15.0

1952

Dow Chemical 3s, '82; 100.0

International Minerals & Chemical 3.65s, '77; 20.0 and 4s, '91; 50.0

Union Oil 3 1/8s, '72; 35.0 and 3s, '75; 60.0 and 4¼s, '91; 60.0

1953

Sinclair 3¼s, '83; 101.8 and 4 3/8s, '86; 167.2

1954

Columbia Gas System 3½s, '64; 50.0

1955

Burlington 4¼s, '75; 30.0 and 5s, '91; 40.0

Continental Baking 3 5/8s, '80; 13.0 and 4 3/8s, '83; 13.2

Freuhauf 3 3/4s, '75; 15.0 and 4s, '76; 37.5 and 5½s, '94; 60.0

Grace 3½s, '75; 30.0 and 4¼s, '90; 83.4

Lockheed 3 3/4s, '80; 30.0 and 4¼s, '92; 125.0

Merritt Chapman Scott 4½s, '75; 25.0

National Tea 3½s, '80; 15.0

Radio Corporation of America 3½s, '80; 100.0 and 4½s, '92; 160.0

1956

Allegheny Ludlam Industries 4s, '81; 16.4

American Machine and Foundry 4¼s, '81, 10.8 and 5s, '77; 12.7 and 4¼s, '81; 39.9

Burroughs 4½s, '81; 30.2 and 3 3/4s, '93; 75.0 and 4 5/8s, '94; 100.0

Capital Airlines 4¼s, '76; 12.0

Combustion Engineering 3 3/8 s, '81; 15.0

General American Transportation 4s, '81; 23.8

Lowenstein 4 3/8, '81; 40.0

National Cash Register 4/½s, '81; 28.2 and 4¼s, '92; 88.6

Textron 5s, '71; 20.0

1957

Atlantic Refining 4½s, '87; 100.0

Carrier 4 1/8, '82; 18.0

Chance Vought 5¼s, '77; 12.5

Commonwealth Oil 6s, '72; 20.0 and 4¼s, '92; 20.0

Douglas Aircraft 4s, '77; 27.9 and 4 3/4, '91; 75.0

Dresser Industries 4 1/8s, '77; 20.0

Fairbanks Morse 5 3/4, '72; 15.0

General Portland Cement 5s, '77; 15.0

Macy 5s, '77; 12.3 and 4¼s, '90; 21.8 and 5s, '92; 23.0

McDermott 5s, '72; 20.2

National Cylinder Gas 5 1/8s, '77; 17.5

Olin 5½, '82; 60.0 and 5½s, '83; 40.0

Phillips Petroleum 4¼s, '87; 171.7

Shamrock Oil 5¼s, '82; 17.5

Thompson Products 4 7/8s, '82; 19.7

1958

Boeing 4½s, '80; 30.6 and 5½s, '91; 129.9

Case 5½s, '83; 20.1

Continental Airlines 5 3/4s, '73; 12.5 and 3½s, '92; 35.0

ITT 4 7/8s, '83; 28.7

Richfield Oil 4 3/8s, '83; 50.0

Sylvania and General Telephone & Electronics 4½s, '83; 18.0 and 4s, '90; 100.0 and 5s, '92; 150.0

1959

Avco 5s, '79; 15.0

Cerro 5½s, '79; 26.3

Champion Paper 4½s, '84; 20.0

Food Fair 4s, '79; 21.2

General American Oil of Texas 4 3/4s, '84; 20.0

Hooker Chemical 5s, '84; 24.4

Pan American World Airways 4 7/8s, '79; 47.0 and 4½s, '84; 60.4 and 4½s, '86; 175.0 and 5¼s, '89; 175.0

Philco 4¼s, '84; 22.0

Spiegel 5s, '84; 15.0

1960

Collins Radio 4 3/4s, '80; 12.0 and 4 3/4, '83; 12.5 and 4 7/8s, '87; 40.0

Kayser Roth 5½s, '80; 16.1

United Airlines 4 7/8, '85; 25.0 and 4s, '90; 66.5 and 5s, '91; 103.4 and 4¼s, '92; 130.8

1961

Allied Stores 4½s, '81; 27.0 and 4½s, '92; 50.0

Armour 4½s, '83; 32.6

Automatic Canteen 4 3/4s, '81; 22.6

Brunswick 4½s, '81; 25.6

City Products 5s, '82; 15.0

Crowell Collier 4½s, '81; 12.0 and 4s, '92; 25.0

FMC 3 1/8s, '81; 30.0 and 4¼s, '92; 100.0

Hunt 4 3/8s, '86; 38.7

Keystone Steel 4½s, '81; 20.0

Ling Temco Vought 5½s, '76; 55.2 and 4 3/4s, '76; 23.3

United States Freight 5s, '81; 15.4

Xerox 4½s, '81; 15.0 and 4s, '84; 51.2

1962

Air Reduction 3 7/8s, '87; 45.0

Control Data 4 3/4s, '77; 35.0 and 3 3/4s, '89; 15.0

Litton 3½s, '87; 50.7

Rapid American 5 3/4s, '77; 13.4

Stokley Van Camp 4¼s, '82; 15.0

1963

Ashland Oil 3 7/8s, '93; 35.0

Trans World Airlines 5 3/4s, '83; 38.5 and 4s, '92; 100.0 and 5s, '94; 150.0

United Aircraft 4½s, '88; 42.8 and 5 3/8s, '91; 58.9 and 4½s, '92; 119.8

1964

Cluett Peabody 4¼s, '84; 12.5

Granite City Steel 4 5/8s, '94; 30.0

MSL 4½s, '84; 12.0

1965

American Airlines 4s, '90; 53.1 and 5½s, '91; 81.7 and 4¼s, '92; 167.4

Beaumit 4¼s, '90; 25.0

Celanese 4s, '90; 78.8

Eastern Airlines 5 3/8s, '83; 22.0 and 5s, '92; 75.0 and 4 3/4s, '93; 50.0

General Instrument 4¼s, '85; 12.0 and 5s, '92; 50.0

Grant 4s, '90; 35.0

Insilco 4s, '85; 12.0 and 5s, '93; 35.7

Standard Packaging 5¼s, '90; 20.0

Stevens 4s, '90; 30.0

Twentieth Century Fox 4½s, '90; 18.3 and 5 3/4s, '92; 28.1

United Merchants and Manufacturers 4s, '90; 40.0

APPENDIX B

LIST OF SYMBOLS

E_A = actual net earnings under convertible

E_S = simulated net earnings under straight debt

ΔE = change in net earnings

EBIT = earnings before interest and taxes

EBT = earnings before taxes

t = time

tr = tax rate

n = nth issue of a given firm, a subscript

I = dollars of interest

i = interest rate

P_n = outstanding principal for nth convertible issue

A = subscript to denote actual convertible subordinated debenture

S = subscript to denote simulated subordinated debenture

S_{At} = actual number of shares outstanding at time t

S_{St} = simulated number of shares outstanding at time t.

S_{Cnt} = number of shares issued due to actual conversion of nth convertible in year t.

S_{Dnt} = number of simulated shares arising from nth issue of straight debt in year t.

CP_{nt} = conversion price of nth issue at time t.

MP_t = market price of common stock at time t.

EPS_A = actual earnings per share

EPS_S = simulated earnings per share

ΔS = $S_C - S_D$

NPV = net present value

ΔDIV = incremental dividends

iy = net interest cost to firm after taxes

RR_A = actual rate of return on equity

RR_S = simulated rate of return on equity

TA = total assets

LTD = long term debt

SCD = subordinated convertible debenture

CL = current liabilities

CAPT = capitalization = TA - CL

SE = stockholder's equity

m = total number of issues of a given firm

T = number of years a firm was in the study

IP = SCD's issue price

M = maturity value

DV = pure debt value SCD

CV = conversion value of SCD

MV = market value of SCD

N = number of years the bond was held

g = growth rate

k = internal rate of return on bond

TV = terminal value

APPENDIX C

STATISTICAL METHODS

The binomial test is a test for goodness of fit. Its purpose is to determine the belief that the proportions observed in a sample could have come from a population having a specified proportion. In this study, a P of 0.5 was adopted to check the hypothesis of no difference related to earnings per share and net present value benefits.[1]

Runs tests are tests to determine the randomness of a series. A run is a succession of items of the same class. Data can be classified in a number of ways and the resulting runs examined to determine if non-random influences are present. Classifications can segregate the data according to lengths of runs, number of runs, runs of ascending order and runs of decending order as well as runs above and below the mean. The tests then determine randomness. It is also possible to check for cyclical patterns and for trend.[2]

Regression and correlation analysis is a statistical method used to measure the relationship between two or more variables. In this study simple curvilinear techniques were

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[1] Sidney Siegel, Nonparametric Statistics For The Behavioral Sciences (New York: McGraw Hill, 1956), pp. 36-42.

[2] W. Allen Wallis and Harry V. Roberts, Statistics: A New Approach (New York: Free Press, Collier Macmillan, 1956), pp. 565-575.

employed. First, to determine the average relationship between two variables as described by the regression equation. Second, to determine the closeness of the relationship as reflected by the correlation coefficients and standard errors.[3]

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[3] Mordecai Ezekiel and Karl A. Fox, Methods of Correlation and Regression Analysis - Linear and Curvilinear (3rd ed.; New York: Wiley, 1959).

APPENDIX D.1

ACTUAL RELATIVE TO SIMULATED
EARNINGS PER SHARE
1950 - 1969

Actual Earnings Per Share Relative to Simulated Earnings Per Share (Per Cent)	Frequency
below 80	3
80 - 84	3
85 - 89	6
90 - 94	15
95 - 99	36
100 -104	24
105 -109	3
Total firms	90

APPENDIX D.2

ACTUAL RELATIVE TO SIMULATED EARNINGS PER SHARE BY COMPANY

Year	Company	EPS_A / EPS_S (per cent)
1951	Warren Petroleum	100.00
1952	Dow Chemical	102.56
	International Mineral & Chemical	90.02
	Union Oil	90.25
1953	Sinclair Oil	96.72
1954	Columbia Gas System	98.51
1955	Burlington	94.96
	Continental Baking	95.86
	Fruehauf	95.65
	Grace	94.91
	Lockheed	97.72
	Merritt Chapman Scott	99.94
	National Tea	100.21
	RCA	92.89
1956	Alleghany Ludlam	96.40
	American Machine & Foundry	91.06
	Burroughs	100.28
	Capital Airlines	104.55
	Combustion Engineering	97.77
	General American Transportation	98.22
	Lowenstein	101.10
	National Cash Register	99.19
	Textron	96.26
1957	Atlantic	97.01
	Carrier	91.45
	Chance Vought	101.12
	Commonwealth Oil	75.12
	Douglas Aircraft	99.31
	Dresser Industries	92.00
	Fairbanks Morse	91.65
	General Portland Cement	100.86
	Macy	87.66
	Mc Derrmott	100.26
	National Cylinder Gas	96.05
	Olin	99.43

	Phillips Petroleum	99.06
	Shamrock Oil	97.47
	Thompson Products	91.39
1958	Boeing	98.08
	Case	72.27
	Continental Airline	93.38
	ITT	92.44
	Richfield Oil	99.43
	Sylvania - GTE	98.70
1959	Avco	99.59
	Cerro	96.20
	Champion Paper	100.00
	Food Fair	99.03
	General American Oil Texas	100.82
	Hooker Chemical	100.49
	Pan American World Airways	103.06
	Philco	92.61
	Speigel	100.20
1960	Collins Radio	98.67
	Kayser Roth	92.80
	United Airlines	96.93
1961	Allied Stores	96.91
	Armour	99.51
	Automatic Canteen	105.38
	Brunswick	95.37
	City Products	99.32
	Crowell Collier	101.31
	FMC	99.87
	Hunt	95.37
	Keystone Steel & Wire	103.30
	Ling Temco Vought	125.26
	U.S. Freight	100.04
	Xerox	100.18
1962	Air Reduction	101.39
	Control Data	96.92
	Litton	90.82
	Rapid American	101.91
	Stokely Van Camp	87.72
1963	Ashland Oil	94.20
	Trans World Airlines	92.71
	United Aircraft	97.75
1964	Cluett Peabody	97.35
	Granite City Steel	104.30
	MSL	101.81

1965	American Airlines	103.66
	Beaunit	100.44
	Celanese	93.44
	Eastern Airlines	100.19
	General Instrument	99.31
	Grant	98.46
	Insilco	94.86
	Standard Packaging	105.07
	Stevens	100.80
	Twentieth Century Fox	98.36
	United Merchants & Manufacturers	101.27

APPENDIX D.3

PRESENT VALUE CASH BENEFITS
1950 - 1969

Net Present Value Cash Benefits (Millions of Dollars)	Frequency
-11 thru -15	2
- 6 thru -10	5
- 1 thru - 5	14
0	31
+ 1 thru + 5	35
+ 6 thru +10	3

Note: The zero category includes all observations ranging from minus $500,000 to plus $500,000.

APPENDIX D.4

ISSUE SIZE AND STRAIGHT VERSUS CONVERTIBLE INTEREST

Year	Average Issue Size (Millions of Dollars)	Number of Firms	Equivalent Straight Interest Versus Face Interest - Averages i_S / i_A
1951	15.0	1	1.07
1952	51.7	3	1.02
1953	101.8	1	1.03
1954	50.0	1	0.93
1955	35.3	9	1.07
1956	36.5	11	1.07
1957	35.0	16	1.06
1958	28.8	7	1.10
1959	23.5	9	1.14
1960	17.7	3	1.22
1961	27.2	15	1.20
1962	31.4	4	1.27
1963	30.4	5	1.27
1964	33.5	6	1.23
1965	40.3	17	1.24

APPENDIX D.5

EXCESS SHARES REQUIRED UNDER ACTUAL VERSUS SIMULATED SITUATIONS

Number of Shares (in Millions)	Frequency
-0.2	1
-0.1	0
0	32
0.1	9
0.2	8
0.3	7
0.4	7
0.5	3
0.6	7
0.7	2
0.8	3
0.9	0
1.0	1
1.1	1
1.2	2
1.3	1
1.4	1
1.5	1
over 1.5	4

APPENDIX E

INDUSTRIAL CLASSIFICATIONS

The following industrial classifications were established from the study group companies. Eligibility for industrial classification was determined by reference to Standard Industrial Classification (SIC) numbers for all but two cases. The Office Machinery and Conglomerate Categories were determined by inspection.

Air Transport

American Airlines
Capital Airlines
Continental Airlines
Eastern Airlines
PanAmerican Airlines
Trans World Airlines
United Airlines

Chemicals

Air Reduction
Chemetron
Diamond Shamrock
Dow
FMC
Hooker
International Mineral and Chemical
Olin
W. R. Grace

Conglomerates

AMF
Brunswick
FMC
International Telephone and Telegraph
Litton
LTV
Olin
Textron

TRW
W. R. Grace

Distributors

Allied Stores
Automatic Canteen
City Products
Dresser
Food Fair
Grant
Lowenstein
Macy
MSL
National Tea
Spiegel

Electric Equipment Manufacturers

Collins Radio
Fairbanks Morse
General Instrument
International Telephone and Telegraph
Philco
RCA
Sylvania

Food Processors

Armour
Continental Baking
Hunt Foods
Stokley Van Camp

Machinery Manufacturers

AMF
Burroughs
Carrier
Combustion Engineering
Control Data
Dresser
J. I. Case
Litton
NCR

Office Machinery

Brunswick
Burroughs
Control Data
General Instrument
NCR
Xerox

Paper

Champion Paper
Crowell Collier
Standard Packaging

Petroleum

Ashland Oil
Atlantic Refining
Commonwealth Oil
General American Oil of Texas
Mc Derrmott
Phillips Petroleum
Richfield
Sinclair
Union Oil of California
Warren Petroleum

Steel

Alleghany Ludlam
Granite City Steel
Keystone Steel and Wire

Textile Mills

Beaunit
Burlington
Celanese
Cluett Peabody
Kayser Roth
Stevens
Textron
United Merchants and Manufacturers

Transportation Equipment

Avco
Boeing
Chance Vought
Douglas
Fruehauf
General American Transportation
Lockheed
Merritt Chapman Scott
Thompson Products
United Aircraft