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AN ALTERNATIVE CALL POLICY FOR CONVERTIBLE DEBT

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Abstract

The results of this study suggest that current convertible bond call policies do not maximize shareholder wealth. We offer an alternative call policy based on intuitive, firm specific characteristics. In addition, a cost effective trading strategy which results in a profit should a failed conversion occur is also formulated.

If management is trying to maximize current shareholder wealth, then both the premiums established in executing current call policies and the 20 percent rule-of-thumb premium are too large. Failed conversion costs are roughly four times the cost of the trading strategy developed to avoid them. This is true for all premium levels. Therefore, the optimal call policy as defined in this study is consistent with management's goal of maximizing shareholder wealth.

INTRODUCTION

Theory suggests that a firm concerned with maximizing the value of its outstanding common stock should call its convertible debt as soon as the conversion value begins to exceed the call price (Ingersoll 1977a and b; Brennan and Schwartz 1977, 1980). However, Brigham (1966), Mikkelson (1981), and Singh et al. (1991) identified many issues of outstanding convertible debt which exhibited a significant premium between conversion value and call price.

Ingersoll and Brigham both found that nearly all firms wait too long before calling their convertible bonds. Ingersoll documented a mean premium of 43.9 percent.[1] Brigham did not use empirical testing; instead, he surveyed 21 large firms and found an average premium of 20 percent. Even though there seems to be no empirical or economic justification for it, one can still find reference to this 20 percent premium in the literature (Asquith and Mullins 1991).

Most theories that attempt to explain the large premiums cite the existence of a call notice period and potential failed conversion costs. The call notice period, the time between the announcement of a call and its subsequent execution, is typically thirty days. If the price of a firm's common stock drops so that the conversion value falls below the call price by the end of the notice period, the firm must raise the capital necessary to execute the call. The costs associated with this capital acquisition process are known as "failed conversion costs."[2]

Using the concept of failed conversion costs, Brennan and Schwartz, and Mikkelson predicted the existence of a premium. However, their results did not reinforce the very large premiums found by Brigham and Ingersoll. Theory does not predict premiums large enough to agree with those actually observed. Consequently, in this study we formulate a premium which more accurately accounts for the tradeoff between shareholder value and the likelihood of a failed conversion. Using this premium, we develop a more efficient convertible call policy.

While most of these earlier studies have suggested that the existence of a call notice period and potential failed conversion costs are the primary causes of the premium, others have advanced alternative explanations. Using the sequential equilibrium concept of Kreps and Wilson (1982), Harris and Raviv (1985) developed their information signaling hypothesis to explain both the premium and the negative returns at announcement initially found by Mikkelson.[3] According to the information signaling theory, a firm uses its call policy and resulting premium to convey information to the market. Management calls its bonds only if it acquires unfavorable information about the future prospects of the firm. Conversely, uncalled bonds with large premiums convey favorable information. The theory suggests

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that firms which are in the premium region longer (i.e., have larger premiums) should outperform those firms which are in the premium region for a shorter duration (i.e., have smaller premiums). Ofer and Natarajan (1987) empirically verified the information signaling theory; however, Campbell et al. (1991) and Buetow (1993) both suggest otherwise.

Dunn and Eades (1989) proposed that management can maximize firm value by anticipating the voluntary conversion actions of investors. If the after-tax interest payments on its convertible debt are lower than the cash dividends on any newly converted stock, a firm should delay forcing conversion as long as investors do not voluntarily convert. If the firm can accurately anticipate the premium needed to coax passive investors[4] into converting, then it can predict when to call the bond. They successfully tested their theory using convertible preferred stock but did not test it for convertible debt.

Using the call notice period and the concept of failed conversion costs, Jaffee and Shleifer (1990) developed their financial distress hypothesis to explain the existence of the premium. A firm calls its convertible debt with the intention of forcing conversion. If the conversion value falls below the call price during the 30 day notice period, the firm could be forced to pay more for the bond than it is worth.[5] The firm may also face exorbitant underwriting costs to raise the necessary capital, especially when the cash must be raised in a short period of time. Jaffee and Shleifer argue that the existence of these costs is responsible for the premium. Their theory suggests that the more volatile the price of the stock, the larger the premium and the longer the bond will be kept within the premium region. While they offer no empirical support for their conclusions, Buetow (1993) evaluated the financial distress hypothesis with positive results.

To investigate the existence of the premium, Asquith and Mullins (1991) applied a three step filtering criteria to a sample of bonds whose conversion value exceeded their call price. The first criterion simply considered the restrictive covenant of the bond and eliminated all bonds which were call-protected during the period analyzed. The second criterion eliminated those bonds which had a premium of less than 20 percent. The third criterion eliminated those bonds with after-corporate-tax interest costs less than the dividends on any newly converted shares. The results were impressive. Using this filtering rule, they eliminated 89.5 percent of the original sample; of the remaining bonds, 68 percent were subsequently called during the year following the analysis. They concluded that the cash flow incentive on the part of both management and investors is the primary cause for the premium.

Brennan and Schwartz (1982) and Constantinides and Grundy (1985) offered several reasons why a firm might delay calling its convertible bonds. These include: (1) the call could adversely affect managerial compensation, (2) the loss of bondholder goodwill could adversely affect future capital needs, (3) some bondholders could decide not to convert into the common stock even though it is optimal to do so; a larger premium would be expected to reduce this behavior.

In section II, we discuss the paper's four objectives. In section III, we describe our original sample of 317 convertible bonds and the filtering rule we used to reduce it to a final sample of 53 bonds. In section IV, we present our methodology and in section V, our results. Section VI contains our concluding remarks.

OBJECTIVES

This section describes the four objectives of the study. The first is to develop a premium that better balances the trade-off between maximizing shareholder value and minimizing the probability of a failed conversion. While considerable attention has been given to explaining the presence of a premium, there has been no attempt to estimate it as a function of firm-specific characteristics. If a firm waits for a large enough premium to be established so that the probability of a failed conversion is sufficiently low (to be defined), then the optimal call policy can be expressed in terms of probabilities.

Our second objective is to develop a cost-effective trading strategy which will eliminate any loss the firm might suffer in the event of a failed conversion. Furthermore, if the strategy is constructed so that the failed conversion costs are covered under a conservative scenario (to be defined), then under any other scenario in which the conversion value falls to or below the call price, the firm will realize a gain over and above the failed conversion costs. Fortunately, we found the cost of the trading strategy to be significantly less than failed conversion costs, and therefore, it is consistent with the firm's objective of maximizing shareholder wealth. However, before the trading strategy can be fully developed, we need to consider general market effects of the call on the price of the stock (Mikkelson 1981). Because the optimal call policy depends on the failed conversion costs faced by the firm, the trading strategy developed to avoid them, and the probability of a failed conversion, it will be different for each firm.

The third objective is to evaluate the economic justification of the 20 percent rule-of-thumb premium employed by practitioners and still cited by academicians (Asquith and Mullins, 1991) years after Brigham's 1966 study. Our final objective is to evaluate whether different bond categories, each with unique financial characteristics, reflect different call policies.

DATA

Our original sample consisted of the 317 convertible bonds that were called between 1985 and 1991, as reported in *Moody's Manuals*, *Moody's Bond Record*, *Moody's Bond Survey*, or *Standard and Poor's Bond Guide*.[6] We separated the sample into five categories.

Table 1 lists the number of bonds (N), the average premium, and the standard deviation (SDEV) for each category.

TABLE 1
Summary Statistics For The Six Bond Categories

Category	N	Premium	SDEV
Initial Sample (All)	317	37.06%	70.09%
Final Sample (S)	53	72.56%	132.99%
Investment Grade (IG)	114	48.33%	98.51%
Below Investment Grade (BIG)	203	30.74%	45.96%
No Negative** (NoNeg)	267	48.87%	69.50%
Greater than 200 bp Drop (Grtr>2)	78	20.99%	45.20%

**Bonds with a negative premium were eliminated from the original sample prior to calculating the average and standard deviation.

Employing a five step filtering rule, we constructed the final sample (S) of 53 bonds which was used to develop our optimal call model.[7] Step 1 eliminated 50 bonds which had a conversion value less than or equal to the call price at the time of the call. Step 2 eliminated 52 bonds which were called due to a significant reduction in market interest rates. We accomplished this by comparing the market rate at issuance to the equivalent market rate for similarly rated bonds at the time of the call. If the market rate at the time of the call was significantly lower than the rate at issuance[8], we assumed that the bond was called for refunding purposes. Step 3 eliminated 141 bonds that were ranked below investment grade (i.e., below BBB by Standard and Poor's or Baa by Moody's), or not rated at all. Because the period being analyzed was a tumultuous time for low quality issues, firms may have called bonds that were rated below investment grade for a number of reasons.[9] Consequently, we excluded all lower rated bonds from the sample. Step 4 eliminated seven bonds that were variable rate issues or convertible into stock of other than the company which issued the debt. Finally, Step 5 eliminated 14 bonds which were not publicly traded at the time of the call.

TABLE 2
Summary Of Filtering Procedure

Step	Number Of Bonds Before	Number Of Bonds Eliminated	Number Of Bonds After
1	317	50	267
2	267	52	215
3	215	141	74
4	74	7	67
5	67	14	53
Final Sample	53		

Table 2, which shows the filtering rules in the order described above, summarizes the results. It should be noted that the steps of the filtering procedure are not mutually exclusive. Bonds eliminated by Step 1 might also have been eliminated by one of the later steps. The filtering process reduces the original sample of 317 bonds down to the final sample of 53.

Using the Compustat database, we obtained historical stock prices and dividends for each firm/bond in the final sample, with the first observation being sixty months prior to when a bond was called. Then we tabulated the mean and standard deviation of the monthly prices and returns for each firm/bond. Finally, we approximated the risk free rate of interest using the 90-day Treasury Bill rate found in the *Federal Reserve Bulletins*.

METHODOLOGY

Many of the theories discussed in Section I suggest that a firm waits for a premium to develop that is large enough to ensure that a failed conversion will not occur (i.e.; as much as possible, management wants to guarantee conversion). If the price of its stock falls enough so that the conversion value drops below the call price by the end of the notice period, a firm would incur failed conversion costs by having to raise new capital in order to purchase the bonds. The firm wants to force conversion and avoid these failed conversion costs.

However, management must attempt to avoid the failed conversion costs *while simultaneously maximizing shareholder value***.** It is not difficult to appreciate the precariousness of this situation - to minimize the probability of the conversion value falling below the call price during the notice period, management must simply establish a sufficiently large premium. However, as the premium increases, the value of existing shares increases at a slower rate than the convertible debt, and management is not maximizing shareholder value.[10] Consequently, the tradeoff is between decreasing the probability of a failed conversion and increasing shareholder value. The very large premiums documented in the previous section strongly suggest that firms are more concerned with the avoidance of the failed conversion costs than with the maximization of shareholder value.

By entering into a properly designed trading strategy using put options, management can reduce the risk of having to pay some or all of the failed conversion costs. Within the framework of call policy, the exercise price of the options is the value of the stock when the conversion value of the bond is equal to its call price plus one[11], and the current value of the stock is the price of the stock at the time of the call.

In order to implement the trading strategy and purchase the correct number of put options, the firm must know the value of the failed conversion costs. Since these costs are difficult to quantify, we model previous studies and express them as a percentage of the amount of capital raised (Ingersoll 1977b; Singh et al. 1991).

Since management has the ability to actually purchase put options, they are not maximizing current shareholder value when they allow the premium to become larger than optimal (to be defined). The cost of the trading strategy is equal to the price of an option times the number necessary to cover the failed conversion costs. For the trading strategy to be an effective alternative, its cost must be significantly less than the failed conversion costs.

The trading strategy must also account for any effects the call policy has on existing shares. Specifically, before using the Black-Scholes model, the price of the put option must incorporate the two percent drop in stock price resulting from the announcement of the call (Mikkelson 1981).

In addition to planning a trading strategy, management must also estimate the probability of a given premium level falling to zero (or conversion value falling to the call price) during the call notice period. This implies that each premium will have three values associated with it: trading strategy, probability of failed conversion, and cost of the trading strategy.

Optimal Call Premium

Within the framework of our model, we define the optimal call premium as that premium (or stock price) level which has a 10 percent probability of a failed conversion. The 10 percent probability level is arbitrary but is intended only as a reference for evaluating both the 20 percent premium level and current call policies. The actual optimal probability value will depend on the risk preferences of a firm's management. However, the importance of the optimal premium is not the probability value itself but the concept of using probabilities within the framework of an optimal call policy.

Four Premiums

We analyze four different stock price (or premium) levels, S_1, S_2, S_3 and S^*. They are defined as follows:

Equation 1

$$S_1 = .98 \times (S_c + \frac{\sigma_P}{2})$$

Equation 2

$$S_2 = .98 \times (S_c + \sigma_P)$$

Equation 3

$$S_3 = \frac{1.18 \times Call\ Price}{conversion\ ratio}$$

Equation 4

$$S^* = Price\ level\ with\ Prob(S^* < S_c) = 10\%$$

where σ_P, the standard deviation of monthly stock prices, is calculated over the 60 month period prior to the call; S_c, the price of the stock when the bond's call price equals its conversion price, is computed using:

Equation 5

$$S_c = \frac{Call\ Price\ Of\ The\ Bond}{Conversion\ Ratio}$$

and the constants, 0.98 and 1.18, account for the negative call announcement effect.[12]

Each bond has four premiums corresponding to the stock price levels defined by equations 1 through 4. S_1 and S_2 express the price levels in terms of firm specific characteristics (i.e., standard deviation of monthly stock prices). We use S_1 and S_2 in order to establish reference levels needed to evaluate optimal call policy. The results in Section V indicate that these levels do, indeed, give reasonable probability values.

We use S_3, the price level corresponding to a premium of 20 percent, in order to test whether it should continue to be accepted as a valid rule-of-thumb.

S^*, the price level in equation (4), corresponds to the optimal call policy defined in the previous section. We need this stock price in order to evaluate whether current call policies maximize shareholder value.

We calculate the total premium using:[13]

Equation 6

$$Prem = CR \times (1.0204 \times S_i - S_c)$$

where *Prem* is the amount of the premium above the call price for each bond *prior to* the call announcement; CR is the conversion ratio; S_c is the price of the stock when the conversion value is equal to the call price of the bond (equation 5); the constant preceding S_i is an adjustment factor to account for call announcement effects[14] and S_i (adjusted for announcement effects) is defined by equations (1) through (4).

Probability Values

After calculating the premiums, we compute the probabilities of the stock price at the time of the call, S_i, falling to S_c by the end of the notice period. These probabilities correspond to the aforementioned premiums. By assuming that the price returns are lognormally distributed (Boyle 1977; Dammon and Spatt 1992), and that the logarithm of a lognormally distributed variable is normally distributed, we can calculate the probabilities given the mean monthly return at the time of the call and the standard deviation of monthly returns.

For each bond in the final sample, we calculate three probabilities which correspond to the premium levels of equations (1) through (3). In addition, we also calculate the optimal stock price level, S^*, for each bond in the sample. The procedure for these calculations is described in Appendix A.

Trading Strategy

The trading strategy is simply an investment made by the firm at the time a bond is called. The profit from the investment is equal to (or greater than) the failed conversion costs in the event that the conversion value falls to (or below) the call price by the end of the call notice period under *a conservative scenario* (defined in the following section). The trading strategy offers management an alternative means of avoiding failed conversion costs without having to establish an unnecessarily large premium. The tradeoff between maximizing current shareholder value and having to pay failed conversion costs is mitigated.

For a profit to result when the conversion value just equals the call price (equation (5)), the exercise price chosen must be above the call price. For simplicity, we define the exercise price as (S_c+1).

After calculating the put option prices, we determine the number of options required per bond (n_{ij}) to cover the failed conversion costs (C_j). Using the findings of Singh, Cowan and Nayar (1991)[15], we develop a range of values for C_j then use them to calculate the required number of put options per bond. The values for C_j, ranging from 1 to 5 percent of the par value of a bond, are accurate for underwriting costs, but they are conservative and biased downward because they do not account for the other four potential sources of failed conversion costs.[16] However, due to the unavailability of accurate estimates of these other sources, we preferred to use a conservative approximation of failed conversion costs.

A Conservative Scenario

Before calculating the number of put options needed per bond, we first define a conservative scenario. If the conversion value is greater than the call price, all rational bondholders would convert into stock if the bond were called. Similarly, if the conversion value is less than the call price, all rational investors would accept cash (i.e., the call price). What happens when the conversion value equals the call price? Under normal circumstances one would expect a mix of some bondholders accepting cash and some accepting the stock. Therefore, a conservative scenario, which results in the highest possible level of failed conversion costs, is to assume that all bondholders prefer cash to stock when the conversion value equals the call price. If a trading strategy is developed for this conservative scenario, any other situation would result in a profit greater than the failed conversion costs.

Number Of Put Options Needed

We determine the number of put options for each bond using the following:

Equation 7

$$n_{ij} = C_j / \pi_{opt}$$

where,

Equation 8

$$\pi_{opt} = P_{opt}(S_c) - P_{opt}(S_i)$$

S_c is defined in equation (5), π_{opt} is the profit per option from the trading strategy using the price levels computed in equations (1) through (4), $P_{opt}(S_c)$ is the value of the put option at expiration when the stock price is S_c, and $P_{opt}(S_i)$ is the value of the option when the trading strategy is entered. Management purchases n_{ij} options at a price of $P_{opt}(S_i)$ and then sells them at $P_{opt}(S_c)$ at the end of the notice period; the difference is the profit per option. We approximate C_j, the failed conversion costs per bond, as a percentage of the par value of the bonds. This gives three values of n_{ij} for each S_i ($n_{ij}=n(S_i,C_j)$=the number of put options required at price level S_i for failed conversion cost C_j).

If the price of the stock falls to S_c and the firm has purchased n_{ij} options, it just covers its failed conversion costs. If the stock price falls below S_c, the put options are worth more than the failed conversion costs, and the firm realizes a profit. The value of n_{ij} is different for each firm and depends upon the price of the stock (S_i) used to calculate the option price.

Cost Of The Trading Strategy

This section describes how we compute the cost of the trading strategy for each premium. Using the Black-Scholes option pricing model with S_i, the historical price volatility of the stock, and the other inputs as previously defined, we first calculate the put option prices. We then multiply these prices by the number of options (n_{ij}) needed to cover failed conversion costs (C_j), or

Equation 9

$$CTS_{ij} = n_{ij} \times P_{opt}(S_i)$$

where CTS_{ij} represents the cost of the trading strategy per bond for price level S_i and cost level C_j; $P_{opt}(S_i)$ is the price of the put option obtained from the trading strategy using a stock price of S_i, an exercise price of S_c+1, and the Black-Scholes model. In Section V, we show that these trading strategy costs are considerably less than the failed conversion costs.

Summary

Each premium-probability pair has three trading strategy costs associated with it (i.e., one for each failed conversion cost). For high $Prob_i$[17], the firm enters the trading strategy in order to ensure the avoidance of failed conversion costs. If S_i does not fall to S_c by the end of the call notice period, this strategy costs the firm CTS_{ij}. For low $Prob_i$, the firm may elect not to enter into the trading strategy in an attempt to avoid all costs. However, allowing the premium to become larger in order to reduce $Prob_i$ is not in the best interest of current shareholders. Management may also select a strategy anywhere between these two extremes.

Substituting the four price levels from equations (1) through (4) into equation (6), we calculate the corresponding premiums. We then tabulate the corresponding probabilities. Finally, using equation (9) we find the cost of each trading strategy. Each premium-probability pair has three trading costs associated with it corresponding to the three different failed conversion costs.

Using the premium-probability pairs, we evaluate the accuracy of the 20 percent premium. In addition, using S^* (equation A.8) and equation (6) to define the premium at which a bond should be called, we develop an optimal call policy on a firm-by-firm basis. The next section presents the results.

RESULTS

Our model has four objectives: [1] to evaluate the economic justification of the 20 percent rule-of-thumb premium; [2] to test if different bond categories, each with unique financial characteristics, reflect different call policies; [3] to establish a more efficient framework for an optimal call policy in terms of firm-specific characteristics; [4] to develop a cost-effective trading strategy giving management an alternative to the trade-off between maximizing shareholder wealth and minimizing the probability of a failed conversion.

TABLE 3
t-statistics From Evaluation Of The 20% Premium

Category	t-statistic	Category	t-statistic
Original Sample	4.33#	Below Investment Grade	3.33#
Final 53 Sample*	2.88#	No Negative Premiums*	6.78#
Investment Grade	3.07#	Greater than 200 bp Drop	.19

Original Sample = (All)
Final 53 Sample = (S)
Investment Grade = (IG)
Below Investment Grade = (BIG)
No Negative Premiums = (NoNeg)
Greater than 200 bp Drop = (Grtr>2)

# denotes a 99% significance level.
* denotes a one-tail test.

The results, shown in Table 3, indicate that current call policies do not reflect the 20 percent rule-of-thumb premium still cited in the literature (Asquith and Mullins 1991). The premium of the (Grtr>2) category is the only premium that is not statistically different from the 20 percent value. It is possible that these firms may be more concerned with reducing interest payments than with following an optimal call policy. It is probably coincidental that the premium associated with this category is not statistically different from the 20 percent value. To say that management is not concerned with an optimal call policy is not the same as saying they are not concerned with shareholder value. Management is trying to increase shareholder value if they are refinancing existing debt at lower interest rates.

Before testing whether the different bond categories reflect different call policies, we need to evaluate whether the variances of the separate categories are equal or not. By using an F-test (i.e., H_o: $s^2{}_y = s^2{}_x$), we find that only two of the comparisons have variances that are equal, (All,NoNeg) and (BIG,Grtr>2). This implies that we can use the same t-statistic in all of the comparisons except these two which require a different t-statistic.[18]

Table 4 contains the t-statistics resulting from our comparisons of the premiums of the different bond categories.

TABLE 4
t-statistics From Comparison Of Different Categories' Premiums

	All	S	IG	BIG	NoNeg	Grtr>2
All	X	1.89*	1.12	1.24	2.03*	2.50#
S	X	X	1.18	2.25*	1.29	2.72#
IG	X	X	X	1.80*	0.00	2.60#
NoNeg	X	X	X	X	3.40#	1.80*
Grtr>2	X	X	X	X	X	4.20#

# denotes a 99% significance level.
* denotes a one-tail test.

The value at the intersection of column x and row y, cell (x,y), represents the t-statistic from evaluating whether the average premium of category x equals the average premium of category y. For example, the (1.89) in cell (S,All) is the t-statistic from evaluating whether the average premium of the final sample (S) is equal to the average premium of the original sample (All). If the t-statistic is significant, we conclude that the average premiums are not equal. Because the matrix is symmetric, there are no values below the diagonal.

Sixty-seven percent (10 of 15) of the t-statistics are significant at the 95 percent level. This suggests that these different bond categories reflect different call policies. Not surprisingly, since firms from different categories have different financial characteristics, they need different premiums to avoid failed conversion costs.

Perhaps of greater interest are the five comparisons that are not significantly different. Each pair of categories in these comparisons share some of the same bonds (i.e., they overlap). For example, the original sample (All) consists of either Investment Grade (IG) or Below Investment Grade (BIG) bonds. The two overlaps produce insignificant t-statistics of 1.12 and 1.24, respectively. Simply stated, when categories are not mutually exclusive, they will not have statistically different premiums.

Another interesting result is that the average premium of the sample of bonds which were called after a 200 bp drop in interest rates (Grtr>2) is statistically different from the average premium of all other categories. This is expected since the (Grtr>2) bonds were called to take advantage of a large change in interest rates rather than to force conversion. Management was not concerned with the size of the premium but only with refinancing the debt.

Figure 1, which breaks down the premiums by stock price level,[19] shows that many of the premiums associated with the optimal call policy, S^*, fall within the 10 to 15 percent range and that none of the optimal premiums are above 20 percent. This strongly suggests that a 20 percent premium is far too high and that the optimal premium should be between 5 and 15 percent.

The premiums associated with the other two stock price levels, S_1 and S_2, range from 5 to over 50 percent. Considering the wide range of stock price volatilities within the sample, this broad spectrum of premium levels is not surprising.

FIGURE 1
Stock Price Levels And Associated Premiums

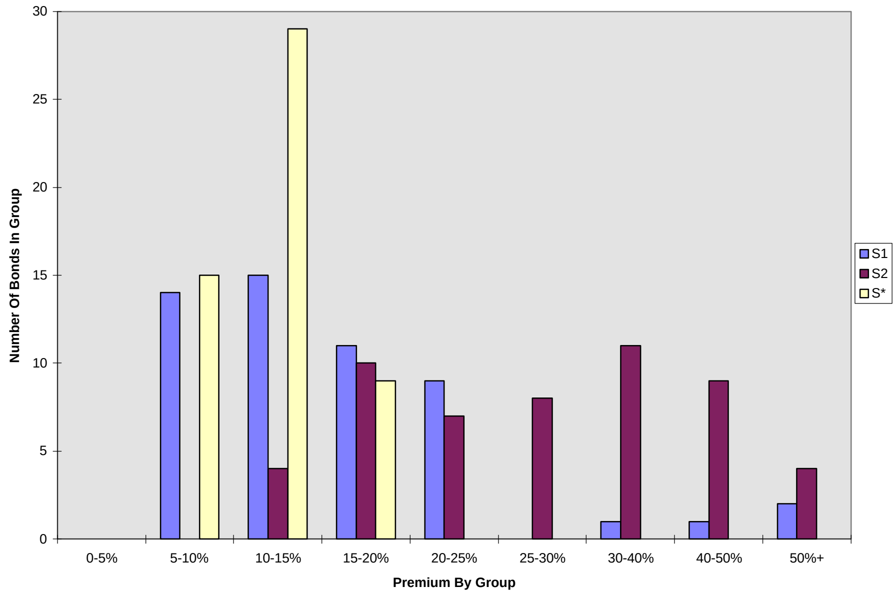
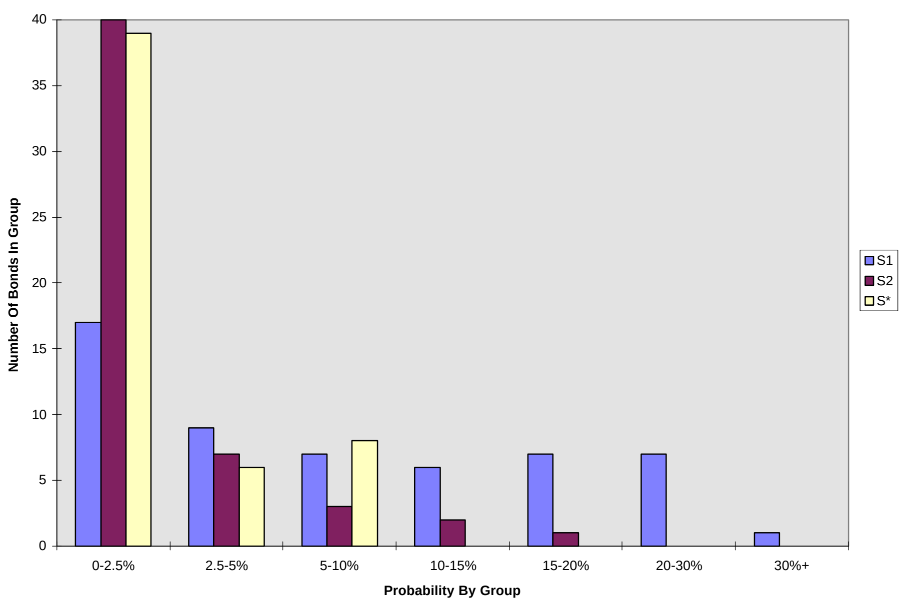


Figure 2,[20] which relates premium levels to the probability of a failed conversion, indicates that all of the 20 percent premiums (S_3) fall below the 10 percent probability level. The low probabilities associated with the 20 percent premium strongly imply that 20 percent is too large. In fact, our results suggest an average optimal premium of 11.92 percent.

Our results show that most firms allow the premiums to grow to far more than 20 percent before calling their convertible debt. Obviously, if 20 percent is too high and sub-optimal, then the premiums established by current call

FIGURE 2
Premium Levels With Associated Probabilities



policies must also be sub-optimal. Considering the probability levels corresponding to the stock price level S_2 (premium of $Prem_2$), this becomes even more evident. The average value for $Prem_2$ is 35.92 percent while the average probability of a failed conversion is only 1.92 percent. $Prem_2$ is considerably smaller than the average premium of the final sample and most of the other premiums of Table 1. Since a higher premium is associated with a lower probability of failed conversion, the premium levels established by current call policies are associated with probabilities of less than 1.92 percent. By allowing its premium to become so large that the probability of a failed conversion essentially zero, a firm is not acting in the best interests of its shareholders. If the firm uses the optimal call policy suggested here, its premium level would be substantially smaller with a more reasonable probability of a failed conversion.

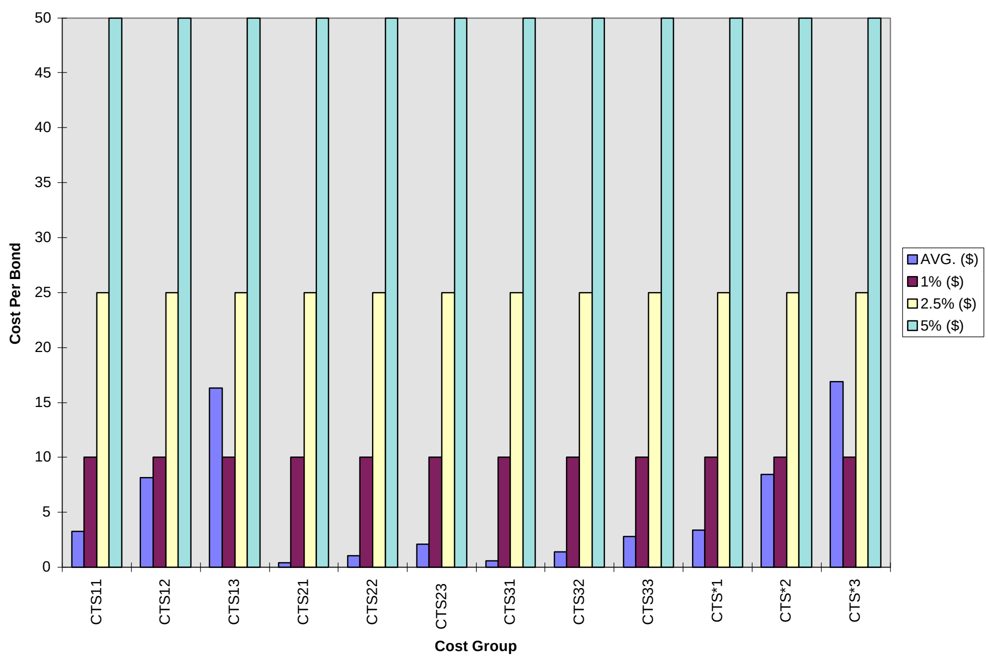
The results clearly demonstrate the inefficiency of current call policies. In formulating its call policy, a firm should utilize S^*, the stock price level associated with the optimal premium. This premium allows for an efficient tradeoff between shareholder value and the probability of a failed conversion. Furthermore, if the firm enters into the suggested trading strategy, it has additional means of increasing shareholder value.

Using equation (9), we calculate the cost of the trading strategy (CTS_{ij}) for each premium. CTS_{ij} represents the cost of the trading strategy per bond for price level S_i and cost level C_j. Figure 3, which shows the average trading strategy costs for the sample contrasted with the approximated failed conversion costs, clearly illustrates that trading strategy costs are significantly less than failed conversion costs. In fact, the actual difference is probably even greater because of an upward bias of the trading strategy costs and a downward bias of the failed conversion costs.

Macbeth and Merville (1979 and 1980) have shown that the Black-Scholes model overvalues options that are significantly out-of-the-money. As a result, when the Black-Scholes model values an out-of-the-money put option at more than zero, the payoff or profit from the trading strategy (equation (8)) may be biased downward which could cause the cost of the trading strategy (equation (9)) to be biased upward. In these cases, the results of the model are conservative when compared to the actual values.

Due to the inability to quantify all the possible sources of failed conversion costs, the failed conversion costs shown in Figure 3 may be biased downward. If the actual failed conversion costs were available, the difference between the failed conversion costs and the trading strategy costs would be even greater.

FIGURE 3
Trading Strategy Costs Verses Failed Conversion Costs
Grouped By Cost Level And Stock Price Level



CONCLUSIONS

The study has produced four interesting and useful conclusions: [1] The 20 percent rule-of-thumb premium is too large to be optimal; [2] The average premiums of current call policies are also too large to be optimal, thereby suggesting that firms are not maximizing shareholder value; [3] The premium defining the optimal call policy is significantly lower than the premiums currently being used and is based upon firm-specific characteristics; [4] Trading strategy costs are substantially less than approximated failed conversion costs.

The results overwhelmingly refute the 20 percent premium level as a rule-of-thumb and also show that current call policies are not maximizing current shareholder value. We offer an optimal call policy and premium for each firm in the sample. In addition, we present a trading strategy giving management an alternative to the tradeoff between maximizing shareholder wealth and minimizing the probability of a failed conversion.

Our findings corroborate the concept of cost avoidance that pervades the literature. However, the results suggest that firms are taking this to the extreme, and in doing so, are not maximizing shareholder value. They should allow premiums to develop, but not to the levels seen in practice. Currently, firms are allowing premiums to become too large, apparently being more concerned with avoiding a failed conversion than with maximizing shareholder value.

Our optimal call policy model, which is based on firm-specific characteristics, allows management a more practical and efficient way of dealing with the tradeoff between maximizing shareholder value and minimizing the probability of a failed conversion. The model offers exciting possibilities for future research and applications.

ENDNOTES

1 The premium is equal to the conversion value minus the call price.

2. The costs incurred by the firm may include (1) underwriting costs; (2) opportunity costs if the capital is withdrawn from retained earnings (that is, future positive net present value projects may have to be foregone); (3) increased interest payments if current market rates exceed the bond’s rate; (4) bankruptcy costs; and (5) costs of violating bond covenants (Jaffee and Shleifer 1990).

3. Mikkelson (1981) analyzed the effect of convertible calls on existing common shares and found statistically significant negative average common stock returns (two day return of -2.12 percent) at the announcement of convertible debt calls.

4. The term passive investor is used to describe the owner of a convertible security who does not convert even when it is in his best interest to do so.

5. The effect of changes in interest rates on the value of the bond throughout the notice period is assumed to be negligible when compared to the possible change in the conversion value over the same period.

6. For a bond to be included in the sample, there had to be at least 10 percent of the original issue outstanding at the time of the call.

7. Due to the extensive computation required to evaluate the model, a smaller sample was required. The filtering process also ensures that only firms with the required characteristics are included in the final sample.

8. A decrease in interest rates of 200 basis points or more was considered significant. The same results were reached using a decrease in interest rates of 20% or more.

9. The Drexel Burnham Lambert fiasco, bankruptcy concerns, and the flight to quality were just few of the events which affected high yield bonds during this period.

10. When the conversion value of the outstanding debt is larger than the value of existing shares, the value of current shareholder wealth will actually decrease instead of increase at a slower rate. However, this is rarely the case.

11. In order for a profit to result when a failed conversion occurs, the exercise price of the option must be greater than S_c (as defined in equation 5). For simplicity, we used an exercise price of $S_c + 1$.

12. The return of a stock during period t, R_t, is defined as $(P_{t+1} - P_t) / P_t$. If P_{t+1} is the price of the stock after the announcement, P_t the price of the stock before announcement, and R the -2 percent return, the constants shown in equations 1 through 3 follow.

13. The equivalent percentage value is found using $Prem = (1.0204 \times S_i - S_c / S_c)$ where the variables are the same as defined above.

14. The constant $1.0204 = (.98)^{-1}$.

15. Singh et al. documented that the mean underwriting costs resulting from a failed conversion were 4.2% of the par value of the outstanding issue with a standard deviation of 1.8%.

16. See footnote 2.

17. $Prob_i$ is the probability of a failed conversion for firm i.

18. For unequal variances:

$$t = (\overline{Prem_x} - \overline{Prem_y}) / \sqrt{\frac{s_x^2}{n_x} + \frac{s_y^2}{n_y}}$$

where $\overline{Prem_x}$ and $\overline{Prem_y}$ and are the average (or mean) premiums for categories x and y; n_x and n_y are the respective number of bonds; s_x and s_y are the standard deviations.

If the two variances are equal,

$$t = (\overline{Prem_x} - \overline{Prem_y}) / \sqrt{\{ [\frac{n_x s_x^2 + n_y s_y^2}{n_x + n_y - 2}][\frac{1}{n_x} + \frac{1}{n_y}] \}}$$

where the variables are the same as above.

19. The 20 percent premium (S_3) is not included since all of the bonds fall into the same premium group.

20. The optimal premium level, S^*, is not included since all these probabilities are equal 10 percent and, therefore, fall into the same probability group.

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APPENDIX

To calculate the probability levels and the optimal price level, we used the following relationship:

Equation A1

$$z = \frac{r_j^c - \mu_{rj}}{\sigma_{rj}}$$

where z is the standard normal value; r_j^c is the continuously and normally distributed return associated with a drop in stock price from S_i to S_c by the end of the notice period for bond j; μ_{rj} is the mean monthly return for bond/firm j; and σ_{rj} is the standard deviation of the monthly returns for bond j. We also used:

Equation A2

$$r_j^d = \frac{S_c - S_i}{S_i} = \frac{S_c}{S_i} - 1 < 0$$

where r_j^d is the discrete and lognormally distributed return associated with a drop in stock price[1] from S_i (equations 1 through 3) to S_c (equation 5) by the end of the notice period. We transformed the lognormally distributed return r_j^d into a normally distributed return r_j^c using:

Equation A3

$$r_j^c = ln(1 + r_j^d)$$

By substituting A.2 into A.3, we computed the following:

Equation A4

$$r_j^c = ln(\frac{S_C}{S_i})$$

Using equation A.4 in conjunction with equation A.1, we calculated the z-value. Using the z-value and the standard normal table, we calculated the different probability values for each S_i.

We found the optimal price level, S^*, in an analogous fashion. By referring to a standard normal table and using a one-tail test, we found the standard normal value associated with a 10 percent probability. Since we are dealing with a drop in stock price, the returns are negative and the appropriate z-value is -1.282. Using equation A.1, we obtained the following relationship:

Equation A5

$$-1.282 = \frac{r_j^c - \mu_{rj}}{\sigma_{rj}}$$

which resulted in the following:

Equation A6

$$r_j^c = (-1.282)\,\sigma_{rj} + \mu_{rj} < 0$$

1. A failed conversion only takes place when there is a drop in stock price. A forced conversion is guaranteed when there is an increase in stock price throughout the notice period. Consequently, the development is for a decrease in stock price only.

where both σ_{rj} and μ_{rj} are known values calculated using a 60 month period prior to the call for each bond in the final sample. Again note that r_j^c is a negative value due to the drop in stock price (S_i to S_c) by the end of the notice period. However, because we used the return to calculate S^*, the value of r_j^c needed is of the same magnitude but opposite in sign. Or,

Equation A7

$$r_j^{c+} = 1.282\,\sigma_r - \mu_r > 0$$

Finally, we used equations A.4 and A.7 (replace r_j^c with the value calculated in A.7, r_j^{c+}) to calculate the value of S^*,

Equation A8

$$S^* = S_c e^{r_j^{c+}}$$

Equation A.8 yields the stock price level that defines the optimal call premium.