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AN EMPIRICAL EVALUATION OF THE INFORMATION SIGNALLING AND FINANCIAL DISTRESS HYPOTHESES

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Abstract

This study empirically tests two theories put forth to explain the existence of convertible debt which exhibit a significant premium between conversion value and call price.

We reject the Information Signalling hypothesis of Harris and Raviv. Our results suggest that management does not use the premium as a mechanism for signalling investors.

We validate the Financial Distress hypothesis of Jaffee and Shleifer. Our results suggest that management allows the premium to develop in order to decrease the likelihood of a failed conversion. This is important since the concept of cost avoidance pervades the literature on convertible debt calls.

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 far 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, Ingersoll (1977b), 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 (1977a). Theory does not predict premiums large enough to agree with those actually observed. Buetow and Buell (1995) formulated a more reasonable premium which more accurately accounts for the tradeoff between shareholder value and the likelihood of a failed conversion. Using this premium, they developed a more efficient convertible call policy for maximizing shareholder value. Asquith (1995) suggests that the call premium is a function of stock price volatility.

Harris and Raviv (1985) developed the Information Signalling hypothesis to explain why a firm does not call its bonds as soon as the conversion value exceeds the call price. Using the sequential equilibrium concept of Kreps and Wilson (1982), they explained both the premium and the negative returns at the announcement of the call found by Mikkelson.[3] Due to informational asymmetry between the firm and the investor, the firm conveys private information through its call policy. A firm with favorable information (i.e., upward revision of future cash flows) will usually delay calling its bonds and forcing conversion while a firm with unfavorable information (i.e., downward revision of future cash flows) will usually call the bond and force conversion. Ofer and Natarajan (1987)

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and Singh, Cowan and Nayar (1991) present empirical results which corroborate the information signalling hypothesis. However, their results are refuted by Campbell, Ederington, and Vankudre (1991) and Barclay and Smith (1995).[4]

Dunn and Eades (1989) found that management can increase 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 shares, 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[5] 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.

Jaffee and Shleifer (1990) developed the Financial Distress hypothesis to explain why a firm does not call its bonds as soon as the conversion value exceeds the call price. A firm calls its convertible debt with the intention of forcing conversion. A forced conversion fails if the conversion value of the bond falls below the call price during the notice period, and the firm has to actually purchase the issue at the call price.[6] In addition to paying more for the bond than it is worth, other costs associated with a failed conversion are also realized. Jaffee and Shleifer suggest that the existence of these costs is responsible for the premium. Their theory suggests the more volatile the price of the stock, the larger the premium and the longer the bond be kept in the premium region in order to minimize the likelihood of a failed conversion. They offered no empirical support for their conclusions. Instead they use plausible delay costs, underwriting costs, and financial distress costs, and showed that delay of a forced conversion is a firm's most cost effective alternative. They concluded that it is the firm's efforts to avoid a failed conversion that best explains the existence of the premium. Our study offers the first empirical evaluation of this theory.

Asquith and Mullins (1991) concluded that the cash flow incentive (i.e., after tax interest versus dividend) on the part of both management and investors is the primary explanation of 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) managerial compensation could be adversely affected by the call, (2) future capital needs could be adversely affected by the loss of bondholder goodwill, (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.

The outline of the paper is as follows. Section II states our objectives. Section III describes the data used for our analysis. Section IV and V present our methodology and results, respectively. Section VI contains our concluding remarks.

OBJECTIVES

Our study has two objectives: First, using a new approach, we empirically test the validity of the Information Signalling hypothesis of Harris and Raviv. Second, we empirically evaluate, for the first time, the Financial Distress hypothesis of Jaffee and Shleifer.

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*.[7]

In order to gain insight into the size of the premiums firms develop as part of their call policies, we separated the sample into five categories. Table 1 lists the number of bonds (N), the average premium, and standard deviation (SDEV) for each category.

Employing a five-step filtering rule, we constructed the final sample (S) of 53 bonds which was used to test the two hypotheses. Step 1 eliminated 50 bonds which had a conversion value less than or equal to the call price when the call was announced. 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 refinancing 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

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.

that were rated below investment grade for a number of reasons. 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	# Bonds Before	# of Bonds Eliminated	# 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. The final sample includes only those bonds with the necessary properties needed for the analysis.

Using the Compustat database, we obtained historical stock prices and dividends for each firm in the final sample, with the first observation being sixty months prior to when the bond was called. Then we tabulated the mean and standard deviation of the monthly prices and returns for each firm/bond.

METHODOLOGY

In order to test the Information Signalling hypothesis and the Financial Distress hypothesis, we define the *period* as the number of months from when the bond's conversion value enters the positive premium region (and remains there) to the time when the bond is called. We accept the Information Signalling hypothesis if the length of the *period* is positively correlated with the change in the stock price during the *period*. We accept the Financial Distress hypothesis if the length of the *period* is positively correlated with stock price volatility prior to the call.

Hypothesis 1: Information Signalling Hypothesis

According to the Information Signalling hypothesis, a firm's management uses its call policy and the premium as mechanisms to signal (potential) security holders. Management is more concerned with the firm's future profitability than with avoiding failed conversion costs. If management believes that future operations will produce significant profits, they will not call the debt to force conversion because the common shares will increase in value as profits increase. Furthermore, debtholders will subsequently convert their bonds voluntarily due to the rising stock price. Also, the strength of the positive signal being sent by management increases with the length of the *period*.

Conversely, if management believes that future operations will be less profitable than expected, they will call the debt to force conversion for fear of being unable to meet future interest payments. As a result, investors interpret the decision to call the bonds (or a short *period*) as a negative signal. A shorter *period* conveys less positive (more negative) information resulting in less appreciation (more depreciation) of the stock price.

The above sequence of events should result in a positive correlation between the length of the *period* and the average monthly returns. Or,

$$period \uparrow\rightarrow Premium \uparrow\rightarrow positive\,signal \uparrow\rightarrow Stock\,Price, P \uparrow\rightarrow \mu(r) \uparrow\rightarrow \rho(period, \mu(r)) > 0$$

where $\mu(r)$ is the mean monthly returns and ρ is the correlation coefficient.[9]

In order to test the Information Signalling hypothesis, we calculate the length of the *period* for a firm, the monthly stock returns and the average monthly return. We repeat the process for each firm in the final sample and then calculate the correlation coefficient between the length of the *period* and the average monthly return during the *period*. If the correlation coefficient is significant and positive, we will accept the Information Signalling hypothesis. The results are found in section V.

Hypothesis 1a: An Alternative Test of the Information Signalling Hypothesis

If management uses the premium as a signalling device, then the larger the premium (or longer the *period*), the more positive the information being conveyed. The positive information should produce higher stock prices. Therefore, the average returns during the *period* should be larger than those for the entire 60 month period.[10,11]

As an alternative approach for evaluating the Information Signalling hypothesis, we test the following:

$$\mu(R_{per}) - \mu(R_{ent}) \pounds 0$$

where R_{per} and R_{ent} are the monthly stock returns for the time that the bond is in the *per*iod region (i.e., positive premium) and for the *ent*ire 60 month period, respectively. We will accept the Information Signalling hypothesis if the average stock returns during the time the conversion value is in the *period* region are statistically larger than the average stock returns for the entire 60 month period.

Their exists an alternative interpretation that results in the same expected relationship between $\mu(R_{per})$ and $\mu(R_{ent})$. For the bond to have entered into the positive premium region, the stock must have risen considerably since issuance. Consequently, investors no longer view the stock as a speculative investment due to the significant appreciation of the stock price. More investors subsequently purchase the stock and bid the price up even higher and the original shareholder value increases. As a result, the *period* increases because management decides not to call the debt due to the large increase in the stock price and the increased likelihood of voluntary conversion.

If Hypotheses 1 and 1a are accepted, then Hypothesis 1a will be interpreted as a result of the Information Signalling hypothesis. However, if Hypothesis 1 is rejected and Hypothesis 1a accepted, then Hypothesis 1a will be interpreted as a result of the alternative explanation. This second case is easily explained. As the premium becomes increasingly large causing R_{per} to be larger than R_{ent} (i.e., acceptance of Hypothesis 1a), current shareholders become discontented with management.[12] As a result a sell off is initiated and the stock price depreciates causing a longer period to be negatively correlated with average stock returns (i.e., rejection of Hypothesis 1).

Hypothesis 2: Financial Distress Hypothesis

In their Financial Distress hypothesis, Jaffee and Shleifer infer that the more volatile the price of the underlying stock, the larger the premium required to reduce the likelihood of a failed conversion. Implied in the theory is

management's desire to avoid failed conversion costs. It follows that if premiums increase gradually, then a large premium coincides with a long *period*. If the Financial Distress hypothesis is correct, then a long *period* should coincide with a volatile stock. Therefore, the correlation between the length of the *period* and pre-call stock price volatility should be positive. Or,

$$\sigma(P) \uparrow \rightarrow Prob_i \uparrow \rightarrow \text{wait longer to reduce } Prob_i \rightarrow period \uparrow \rightarrow \rho(period, \sigma(P)) > 0$$

where $Prob_i$ is the likelihood or probability of a failed conversion for firm *i*.

To test the Financial Distress hypothesis, we employ a methodology similar to that used in testing the Information Signalling hypothesis. First, we calculate the length of the *period* in months. Then we compute the standard deviation of monthly stock prices up to the time of the call. For each firm in the sample, we develop three pieces of information (i.e., the *period*, the stock price volatility and the premium). Finally, we calculate the correlation coefficients between pairs of the three variables.

Hypothesis 2a: An Alternative Test of the Financial Distress Hypothesis

As an alternative method for testing the Financial Distress hypothesis, we calculate the correlation coefficient between the size of the premium and stock price volatility. We would expect the correlation to be positive.

The Financial Distress hypothesis and the Information Signalling hypothesis each attempt to explain the existence of the premium. The Financial Distress hypothesis, based on managerial cost avoidance, states that firm specific characteristics and the existence of failed conversion costs force management into establishing a positive premium. The Information Signalling hypothesis, on the other hand, presupposes that management uses the premium as a signalling device to convey news to security holders, with no reference to potential conversion costs. Though both are very different, it is plausible that both are valid simultaneously. That is, management uses the premium for both reasons. However, one would expect only one of these hypotheses to be valid. This is addressed further in section VI.

RESULTS

In this section we present the results of our testing of the Information Signalling hypothesis and the Financial Distress hypothesis.

Hypothesis 1: Information Signalling Hypothesis

The correlation coefficient between changes in stock price and the length of the *period* is negative and significant at the .01 level. The results, shown in Table 3, suggest that the Information Signalling hypothesis is not valid.[13]

TABLE 3
t-statistic for the Information Signaling hypothesis

$\rho(\mu(R), Period)$	t-statistic
-.385	-2.98*

*significant at the .01 level.

The negative correlation is opposite to what the Information Signalling hypothesis predicts. A possible explanation is that the longer the bond is in the *period* region, the more the premium increases. Furthermore, the value of the common shares increases by a slower rate than the convertible debt.[14] This negative effect on shareholder value dominates the information being signalled through management's delay of the call. As management allows the premium to reach higher levels, shareholders begin to sell their stock because they feel management is not acting in their best interest. As more and more shareholders sell their stock, the price falls, resulting in the negative correlation documented above. Therefore, we reject the Information Signalling hypothesis.

Hypothesis 1a: An Alternative Test of the Information Signalling Hypothesis

Contrary to our conclusion above, the results of the alternative hypothesis 1a, presented in Table 4, suggest that the Information Signalling hypothesis is valid. The monthly returns during the time the bond is in the *period* region (i.e., positive *premium*) are significantly larger than for the entire 60 month period.

TABLE 4
t-statistic for the Alternative Test of the Information Signalling hypothesis

$t - st.$ for $\mu(R_{per}) - \mu(R_{pre})$
5.07*

*significant at the .01 level.

Our two tests of the Information Signalling hypothesis have yielded conflicting results. However, if the alternative explanation given in section III for the results in Table 4 is accepted, then the observed premium is due to forces other than information signalling. Thus, we reject the Information Signalling hypothesis.

Hypothesis 2: Financial Distress Hypothesis

According to our results, shown in Table 5, the correlation coefficient between pre-call stock price volatility and the length of the *period* is positive and significant at the .01 level. As a result, we accept the Financial Distress hypothesis. Our findings suggest that a firm establishes the *premium* in order to avoid a failed conversion. This is an important result since many of the theories discussed in Section I rely heavily on the concept of avoiding failed conversion costs.

TABLE 5
t-statistic for the Financial Distress hypothesis

$\rho(\sigma(R), Period)$	t-statistic
.431	3.41*

*significant at the .01 level.

Hypothesis 2a: An Alternative Test of the Financial Distress Hypothesis

The correlation coefficient between stock price volatility and the size of the premium is positive and significant at the .01 level. The results of the alternative test, shown in Table 6, suggest that the more volatile the stock, the larger the premium a firm establishes in order to avoid a failed conversion. This finding, consistent with our results from testing hypothesis 2, further supports the validity of the Financial Distress hypothesis.

TABLE 6
Hypothesis 2a t-statistic for the Alternative Test of the Financial Distress hypothesis

$\rho(\sigma(P), Prem)$	t-statistic
.798	9.45*

*significant at the .01 level.

Table 7 summarizes the results from hypothesis 2. It presents an alternative representation of our findings from the evaluation of the Financial Distress hypothesis. The sample is broken down into quartiles of increasing volatility. Quartile 1 includes the bonds with the least volatile stocks and quartile 4 the most volatile. The average period length in months and the average premium size in percent from the call price was tabulated for each quartile. These are presented in columns 2 and 3 respectively. The table clearly illustrates the effects of stock price volatility on both period length and premium size. As volatility increases both of these variables also increase, as seen by moving down in the table. These results verify the results of Asquith (1995), who suggested that the call premium is related to stock price volatility.

TABLE 7
An alternative look at the results of Hypothesis 2

Quartile	Avg. Period (months)	Premium (%)
1 (least volatile)	8.85	31.29
2	15	41.39
3	16.75	51.84
4(most volatile)	32.9	157.35

CONCLUSIONS

In this study we have rejected the Information Signalling hypothesis and accepted the Financial Distress hypothesis. Our analysis of the Financial Distress hypothesis is the first attempt at empirically evaluating this theory. The results suggest that the primary reason for the premium is to avoid the cost associated with a failed conversion. This is important since many existing theories on convertible debt call policy use this as their basis.

It still appears that management is allowing premiums to become too large as indicated in Table 1. This policy is not maximizing shareholder value. Future research into a optimal call policy for convertible debt as in Buetow and Buell (1995) would benefit both corporate officers and investors. If management is supposed to be maximizing shareholder value, then why do they allow this policy to continue? Only future research can resolve this paradox.

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 (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 in the money convertible calls on existing common shares and found statistically significant negative average common stock returns (a two day return of -2.12 percent) at the announcement of the convertible debt calls. Cowan, Nayar and Singh (1993) found positive returns for out of the money convertible calls.

4. Crabbe and Helwege (1994) evaluate this for non-convertible callable debt.

5. A passive investor is one who does not convert his convertible security even when it is in his best interest to do so.

6. 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 possible changes in the conversion value over the same period.

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

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. This methodology assumes that a large premium occurs gradually, resulting in a positive relationship between the premium and the period. This is discussed further in the next section.

10. For those bonds in the final sample that were in the *period* region for longer than 60 months, we determined the *entire* period by taking another 60 month period prior to the conversion value entering the positive premium region.

11. In order to avoid a selection bias (Campbell et al. (1991)), we use the returns from the entire 60 month period rather than just the pre-period region.

12. Management is not maximizing current shareholder value when they allow large premiums to develop (see Ingersoll 1977a and b; Brennan and Schwartz 1980 for an expanded discussion).

13. The correlation between period length and premium size must be positive for this method to be valid. It was calculated to be .60 and significant at the .01 level.

14. 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 rather than increase at a slower rate (Ingersoll 1977a, b and Brennan and Schwartz 1980). However, this is rarely the case.

REFERENCES

[1] Asquith, P., "Convertible Bonds Are Not Called Late," *Journal of Finance* 50, 1995, pp. 1275-1289.

[2] Asquith, P. and D.M. Mullins, "Convertible Debt: Corporate Call Policy and Voluntary Conversion," *Journal of Finance* 46, 1991, pp. 1273-1289.

[3] Barclay, M., and C. Smith, "The Priority Structure of Corporate Liablities," *Journal of Finance* 50, 1995, pp. 899-917.

[4] Brennan, M.J. and E.S. Schwartz, "Convertible Bonds: Valuation and Optimal Strategies for Call and Conversion," *Journal of Finance* 32, 1977, pp. 1699-1715.

[5] Brennan, M.J. and E.S. Schwartz, "Analyzing Convertible Bonds," *Journal of Quantitative Analysis* 15, 1980, pp. 907-929.

[6] Brennan, M.J. and E.S. Schwartz, "The Case for Convertibles," *Chase Financial Quarterly*, 1982, pp. 27-46.

[7] Brigham, E.F., "An Analysis of Convertible Debentures," *Journal of Finance* 21, 1966, pp. 35-54.

[8] Buetow, G.W., and S.G. Buell, "An Alternative Call Policy for Callable-Convertible Debt," *Journal of Financial and Strategic Decisions*. 1995, pp. 27-41

[9] Campbell, C.J., L. Ederington, and P. Vankudre, "Tax Shields, Sample Selection Bias, and the Information Content of Convertible Bond Calls," *Journal of Finance* 46, 1991, pp. 1291-1324.

[10] Constantinides, G., and B.D. Grundy, "Call and Conversion of Convertible Corporate Bonds: Theory and Evidence," Working Paper, University of Chicago, 1985.

[11] Cowan, A., N. Nayar, and A. Singh, "Calls of Out of the Money Convertible Bonds," *Financial Management* 22, 1993, pp. 106-116.

[12] Crabbe, L, and J. Helwege, "Alternative Tests of Agency Theories of Callable Corporate Bonds," *Financial Management* 23, 1994, pp. 3-20.

[13] Dunn, K.B. and K.M. Eades, "Voluntary Conversion of Convertible Securities and the Optimal Call Strategy," *Journal of Financial Economics* 23, 1989, pp. 273-301.

[14] Harris, M. and A. Raviv, "A Sequential Model of Convertible Debt Call Policy," *Journal of Finance* 40, 1985, pp. 1263-1282.

[15] Ingersoll, J.E., "A Contingent Claims Valuation of Convertible Securities," *Journal of Financial Economics* 4, 1977a, pp. 289-322.

[16] Ingersoll, J.E., "An Examination of Corporate Call Policy on Convertible Securities," *Journal of Finance* 32, 1977b, pp. 463-478.

[17] Jaffee, D. and A. Shleifer, "Costs of Financial Distress, Delayed Calls of Convertible Bonds, and the Role of Investment Banks," *Journal of Business* 63, 1990, pp. S107-S124.

[18] Kreps, D. and R. Wilson, "Sequential Equilibria," *Econometrica* 50, 1982, pp. 863-894.

[19] Mikkelson, W.H., "Convertible Calls and Security Returns," *Journal of Financial Economics* 9, 1981, pp. 237-264.

[20] Ofer, A.R. and A. Natarajan, "Convertible Call Policies," *Journal of Financial Economics* 19, 1987, pp. 91-108.

[21] Singh, A.K., A.R. Cowan, and N. Nandkumar, "Underwritten Calls of Convertible Bonds," *Journal of Financial Economics* 29, 1991, pp. 173-196.

[22] Smith, C., "Investment Banking and the Capital Acquisition Process," *Journal of Financial Economics* 15, 1986, pp. 3-29.