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The Choice of Call Provision Terms: Evidence of the Existence of Agency Costs of Debt

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ABSTRACT

An examination of the provisions of bond issues reveals that most bonds prohibit firms from calling the issue during the initial years, after which time the bond can be called at the option of the firm. A substantial number of firms, however, also reserve the right to call the issue during this initial period for purposes other than refinancing at a lower coupon rate. The additional flexibility which accompanies the option of early redemption can be used to reduce the agency costs of debt associated with future investment opportunities, informational asymmetry, and the risk incentive problem. Using a sample of newly issued bonds, statistical tests are performed to show that there are, in fact, differences between firms which do and do not reserve the right of early redemption. This paper shows that these differences provide empirical evidence which is consistent with the hypothesis that firms use the option of early redemption to reduce agency costs.

ONE OF THE DECISIONS which a firm must make when it floats a bond issue concerns the use of a call provision. If a call provision is included in the bond, then the terms of the call provision must be specified such as the years to the first call, the initial call price, the call price in subsequent years, and the circumstances under which a call provision can be used.

Previous work in the area of call provisions focused on fluctuations in interest rates as the reason for their existence. It was shown by Krause [12], however, that in an efficient capital market any call provision decision based on interest rate uncertainty is irrelevant. Recent work in agency theory has shown that the existing contractual relationships between bondholders and stockholders may not be a zero-sum game. Under these circumstances, such financing decisions as capital structure, debt maturity, and call provisions may not be irrelevant.

An examination of the call provisions of currently outstanding bond issues reveals an institutional feature which is often overlooked. Many bonds have a standard call provision which restricts the firm from calling the issue for a stated number of years, followed by a period during which firms have the option to call the bond at a stated call price. Another group of bond issues, however, contain a two-tiered type of call provision which allows the corporation to call the bond, for purposes other than refinancing at a lower coupon rate, during the initial years of the life of the bond. After this initial period the firm has the option of calling the bond issue for any purpose.¹

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¹ The indenture provision for a two-tiered call provision is described in *Moody's Bond Survey*.

The use of this two-tiered call provision indicates that there are reasons other than interest rate changes for the use of call provisions. Recent papers by Bodie and Taggart [5] and Barnea, Haugen, and Senbet [3] have demonstrated that there are circumstances where the additional flexibility which accompanies the option of early redemption can be used to reduce the agency costs of debt associated with future investment opportunities, informational asymmetry, and the incentive of stockholders to shift risk to bondholders. The purpose of this paper is to show that there are, in fact, differences between the firms that use the two-tiered call provision and those using the regular call provision. Using a sample of newly issued bonds, statistical tests are performed which provide evidence that is consistent with the hypothesis that two-tiered call provisions are being used to mitigate the agency costs of debt.

In Section I, the sources of the agency costs of debt are presented, and the use of a call provision to reduce these costs is discussed. Hypotheses are developed from the theory as to the specific characteristics of firms that would be associated with agency costs of debt and the use of a two-tiered call provision. In Section II, a cross-section of bonds issued during a six-month period is examined. An empirical test is used in Section III to determine whether firms with large agency costs of debt choose the terms of their call provision to reduce these costs. The last section contains conclusions and a summary of the results.

I. Agency Costs of Debt

In general, agency theory deals with the implications of possible conflicts of interest between one party, the principals, who hire another party, the agents, to make decisions on the principals' behalf. Agency theory was initially applied to the capital structure problem by Jensen and Meckling [9]. This paper focuses on the agency relationship between the bondholders and the stockholders. The conflict between the interests of bondholders and stockholders over the preferred decisions by the management of the firm is not new. Indeed, virtually all bonds contain protective covenants to inhibit stockholders from reducing the value of the existing bondholders' claims on the assets of the firm. Some agency costs, however, are difficult to control since the specification of protective covenants would be either prohibitively expensive or impossible to monitor. One way to indirectly reduce agency costs is to choose an appropriate type of call provision on debt which has the effect of realigning shareholder incentives toward maximization of the total value of the firm. Call provisions can be used to reduce agency costs of debt due to: (1) future investment opportunities foregone; (2) informational asymmetry; and (3) the risk incentive problem.

A. Future Investment Opportunities

Using a time-state preference framework, Myers [15] showed that when there is risky debt outstanding, shareholders may not undertake future investment opportunities with a positive net present value because part of the benefit of the new investment can go to the bondholders in the form of a greater payoff under those states which produce bankruptcy and perhaps also in a reduction in the

probability of bankruptcy. The bondholders recognize that stockholders will not pursue all profitable opportunities and pay less for the bonds. Shareholders consequently bear these agency costs in the form of a reduced value of the firm.

One way to reduce the underinvestment by the firm is to allow shareholders to call the outstanding bonds at the time the investment is undertaken and reissue debt which reflects the improved prospects of the company. Under special circumstances, such as the example given by Bodie and Taggart [5], the suboptimal investment problem can be completely eliminated. Under more realistic circumstances, however, the call provision can only reduce a major portion of the problem. This is because the call price for most bonds is the face value plus a call premium. The payment of this amount to bondholders would generally result in some portion of the project value going to bondholders.²

B. Informational Asymmetry

Information asymmetry causes agency costs of debt when the firm is unable to reveal its true future cash flows to the purchaser of newly issued bonds. If the debt is perceived as risky and bondholders underestimate the expected cash flow from owning the bond, then the stockholders suffer a loss at the time of the sale of the bonds. Unlike the case of homogeneous expectations where the use of a call provision is a zero-sum game, the stockholders can gain from the inclusion of the call provision because the bondholders, due to their imperfect information, will underestimate the likelihood of a call. The two-tiered call provision can be used to increase these disparate valuations. After the true value of the firm has been revealed to the investment community, it is in the interest of stockholders to invoke the call provision and issue new debt which reflects the increased value of the firm.

C. Risk Incentive Problem

The risk incentive problem refers to situations in which stockholders can expropriate wealth from bondholders by increasing the risk of the firm. Such a possibility was first identified by Galai and Masulis [8] using the Black-Scholes option pricing model [4]. Barnea, Haugen, and Senbet [3] have shown the risk incentive or asset substitution problem can be reduced by adding a call provision to the bond. Because the value of the call provision to the equityholders declines as the value of the firm decreases, stockholders have less incentive to shift to high variance, low value projects after the debt is issued.

D. Testable Implications

The above summary of the literature suggests that firms with large agency costs of debt will benefit by retaining the right to call the bond at any time. The

² A recent paper by Stulz and Johnson [16] has shown that another way of reducing the underinvestment problem is for the firm to issue secured debt for financing the new investment. The use of secured debt allows shareholders to sell the new bondholders a larger claim to the payoffs of the new investment and thereby reduce the transfer of wealth to existing bondholders when new investment takes place.

two-tiered call provision would allow the firm to do this while still providing the investor with interest rate call protection. What characteristics of firms would, therefore, be associated with high agency costs and the use of this type of a call provision to mitigate these costs?

The agency cost due to future investment opportunities would be most prevalent in firms with high growth rates. It is, therefore, predicted that firms with an increase in the growth rate of long-term assets would use the two-tiered call provision to reduce the incentive for underinvestment by the firm.

The agency cost of debt due to informational asymmetry can be reduced by designing a call provision which is effective immediately after the revelation of the true nature of the firm. Firms subject to informational asymmetry would, therefore, tend to use the two-tiered call provision to permit exercise of the call option at the optimal time. The advantage over the standard call provision is that the firm can still provide the investor with interest rate call protection. Optimal timing of the exercise of a call provision is most important when bond values are more sensitive to the underlying value of the firm. Using the option pricing model to value debt, it can be shown that the change in the value of risky debt due to a given change in the value of the firm increases with the debt ratio and years to maturity. It is predicted, therefore, that firms with a high debt ratio, currently outstanding debt with long maturity, and a high probability of default would use the two-tiered call provision.

Agency costs of debt due to the risk incentive problem occur when there are changes in the standard deviation of the value of the firm. Using the option pricing model, it can be shown that changes in bond values are greater when the firm uses debt with long maturities and/or has a high debt to assets ratio. The theory, therefore, predicts that firms with these characteristics will use two-tiered call provisions.

In order for these agency costs to be present, the bonds must have some probability of default at some time during the period in which they are outstanding. This is because bonds, if riskless, have a certain payoff stream whose value is unaffected by either shareholders' actions or a change in the prospects of the firm. It is unreasonable to expect, however, that firms will issue only small amounts of riskless debt in order to avoid these agency costs since counteracting the agency costs of debt is the tax benefit from debt financing due to the deductibility of interest payments from taxable income. Firms can reduce the agency costs of debt by issuing bonds with a two-tiered call provision where the secondary option to call the bond for the purpose of refinancing at a lower interest rate carries a higher call price and gives the investor more years of call protection. It is predicted that firms using the two-tiered call provision will have an increase in the growth rate of assets, high debt ratios, poor levels of past profitability that indicate high default risk, and currently outstanding debt with a long maturity.

II. The Use of Call Provisions for Bonds

At this point, it is useful to look at some specific examples of the use of call provisions by firms. In May 1977, Florida Power and Light Company announced

that it was considering the redemption of \$63.7 million of its 10½ percent first mortgage bonds due in 2005. This bond contained a two-tiered call provision that protected investors from call for the purpose of refinancing at a lower interest rate until March 1, 1980 after which time the call price would be \$1097.50. The firm, however, indicated that it was considering early redemption for a purpose other than refinancing at a lower interest rate, and was therefore able to call the bonds at a bargain price of \$1016.50. The announcement of the possibility of the redemption caused the bond price to drop from \$1130 to \$1040. This can be contrasted to a tender offer where the firm not only pays a higher price but also has no direct control over the number of bonds redeemed.

In order to provide a more systematic examination of the use of call provisions, information was gathered on a cross-section of bonds that were issued by industrial and utility companies during the period from January 1, 1975 through June 30, 1975. No convertible bonds were included in the sample. Information about the new bond issues was obtained from the *Moody's Bond Survey*, and company-specific information was obtained from the Annual Industrial Compu-stat tape and Moody's manuals. A total of 118 bond issues were obtained that had all the necessary information available. Only three bonds had no call provisions, which were represented, for the purpose of this study, as bonds that cannot be called until the maturity date of the bond. A major distinguishing factor among the bonds was that a total of 79 bonds reserved the right to call the bond immediately for purposes other than refinancing at a lower interest rate. In addition, these bond generally also included a second date, after which time bonds could also be called for the purpose of refinancing. The other 39 bonds did not permit the bond to be called for any reason until after a single specified call date.

The bonds were divided into two groups on the basis of whether they used a regular or two-tiered call provision. An appropriate test statistic was used to determine whether there was any significant difference in the mean value of the terms of the bond issue for the two population groups. The results are presented in Table I.³ Bonds with the two-tiered call provision have on average a longer maturity and include call protection for refinancing at a lower interest rate for a longer time period along with a higher initial call price. This decreases the bondholders' perceived valuation of the call provision. It is interesting to note, however, that when this time period is viewed as a percent of total years to maturity, in line three of Table I, the regular call provision group offers the investor a larger proportion of call protection over the bond's stated life span.

From the terms of Table I, there appear to be two advantages of the two-tiered call provision over the regular call provision in reducing agency costs of debt. The first is that the firm can retain a call privilege during the entire life of the bond while still giving the investor protection from calls for the purpose of

³ The test statistic used depended on the properties of the underlying distribution of each variable. All variables except number five were assumed to be normally distributed. For the first four variables, an *F* ratio was used to test the null hypothesis of equality of sample variances of the two groups at a significance level of ten percent. Since this procedure indicated that group variances were equivalent, a *t*-test statistic was used. The zero-one collateral variable follows a binomial distribution. A comparison of the two observed frequencies was made using a test statistic that is asymptotically normal. For a description of this method, see Brownlee [6].

Table I
Terms of the Bond Issues

	Mean		Test Statistic
	Regular Call Provision	Two-Tiered Call Provision	
1. Years to maturity	9.5	24.5	15.0
2. Years to first call for refinancing at a lower interest rate	6.6	8.6	6.8
3. Percent of time period when bond is not callable for refinancing at a lower interest rate	73%	39%	12.0
4. Call price for the purpose of refi- nancing at a lower interest rate	100.2	105.2	16.0
5. Percent of bonds with collateral (Yes = 1, No = 0)	20%	40%	3.1

refinancing at lower interest rates. A second advantage is revealed by comparing a long-term two-tiered call provision bond with the issuance of a series of short-term regular call provision bonds over the same time span. Under these circumstances, the shorter-term bonds have a combined call protection period that is substantially longer than one issue of long-term debt. This leads to the conclusion that both types of bonds could have potentially used the two-tiered call provision. This paper looks at the distinguishing characteristics of the firms that actually used this type of call provision. Since the use of call provisions for purposes other than refinancing at a lower interest rate reduces the agency costs of debt, the following sections provide empirical tests of the hypothesis that two-tiered call provisions are used by firms with high agency costs of debt.

In Section I of the paper, hypotheses were developed on the characteristics of firms that would be associated with agency costs of debt. Table II contains various proxy measures, the mean value of each item for the two population groups, and a test statistic to determine whether there is any significant difference between the two groups.⁴

In general, the differences between the two groups are consistent with the hypothesis that firms using a two-tiered call provision face higher potential agency costs of debt. Agency costs are more severe for firms with higher bankruptcy risk. The variables of the cumulative profitability ratio and the debt ratio are used as proxies for default risk. The cumulative profitability ratio is defined as retained earnings divided by total assets and was used as a major discriminating variable in a study by Altman, Haldeman, and Narayanan [2] to identify the default risk of a firm. Firms using the two-tiered call provision have a significantly higher debt ratio and lower cumulative profitability ratio.

Firms with longer maturity debt issues also have higher agency costs of debt since management decisions can have a greater impact on the value of currently

⁴ As in Table I, an *F*-ratio test was used to test for equality of the sample variances. Only variable six had a significantly unequal sample variance. In order to test for the equality of means for this variable, the Welch procedure [17] was used. This test statistic has a *t*-distribution with degrees of freedom determined by an approximation.

Table II
Characteristics of Firms Using the Regular and Two-Tiered Call Provisions

Agency Cost Variable	Mean		Test Statistic
	Regular Call Provision	Two-Tiered Call Provision	
Future Growth Opportunities			
1. Unexpected Growth Rate ^a	0.2%	1.0%	0.6
Informational Asymmetry and Risk Incentive Problem			
2. Debt to Total Assets Ratio	24.9%	32.1%	2.5*
3. Cumulative Profitability Ratio ^b	0.33	0.25	2.6*
4. Average Maturity of Debt ^c Currently Outstanding	11.7	17.7	6.7*
Other			
5. Average Maturity of Debt Adjusted for Sinking Fund Provisions	9.9	13.6	4.3*
6. Average Duration of Debt Adjusted for Sinking Fund Provisions	6.5	7.4	1.8

* Significant at the 5% level for a two-tailed test.

^a The unexpected growth rate is the difference between the growth rate in gross plant in the five years following the bond issue and the growth rate during the five years preceding the bond issue.

^b The cumulative profitability ratio is defined as retained earnings divided by total assets.

^c A weighted average of remaining years to maturity on all outstanding debt issues is calculated from the data available in Moody's Manuals to obtain the average maturity variable.

outstanding debt. The results from Table II indicate that firms that use the two-tiered call provision have other outstanding debt with longer average maturity. Finally, the unexpected future growth rate, which is the difference between the growth rate in gross plant in the five years following the bond issue and the five years preceding the bond issue, can be viewed as a proxy for the underinvestment problem. Unfortunately, there appears to be no significant difference in this variable.⁵

Using these proxies for the agency costs of debt, there is evidence that firms use a complex financial contract with a two-tiered call provision to mitigate these costs. There are, however, other ways to reduce agency costs. Why, for example, did these firms use a two-tiered call provision with longer maturity rather than using shorter term debt? One potential reason is that this combination provides the firm with more control. The firm can call the bonds at any time to reduce

⁵ In order to find a proxy for future investment opportunities, the growth rates in net plant and long-term debt were also considered. In addition, various time periods were used in the calculation of these growth rates, such as the five years before, the five years after, and the ten-year period surrounding the bond issue. Similar results were obtained using these other proxies for growth opportunities.

the effect of agency problems. In addition the firm maintains more flexibility in timing the future rollover of this debt. In the case of the average short-term regular call provision bond, the firm not only finds itself facing the capital market more often, but also finds that it can only refinance in the relatively short three-year window during the last one-third of the bond's life. The other reasons for not shortening the life of the bond is that the bond maturity decision could be more directly influenced by other criteria than the desire to reduce agency costs. These criteria include the matching of the maturities of assets and liabilities and the desire to move to a target debt maturity structure.⁶

While it is true that long-term debt increases agency costs, this can be viewed as a financial agency problem. In contrast, operating agency problems are those where the existence of risky debt influences operating decisions such as the choice of new investment projects. In this paper, debt maturity is considered to be an exogenous variable, and the focus is on the use of call provisions to reduce the operating agency problems of debt.

III. A Discriminant Analysis of the Call Provision Decision

It has been shown that firms which exhibit characteristics thought to be associated with high agency costs of debt tend to use the two-tiered call provision. The test of the equality of group means used in Tables I and II, however, is a univariate one which only looks at how each individual variable varies with the form of the call provision. In this section, a discriminant analysis is used to look at the ability of these variables to jointly classify firms into groups on the basis of whether they use the regular or the two-tiered call provision. If the classification is successful, there is evidence that firms consider the agency costs of debt when they choose the form of the call provision. In order to develop a discriminant function for the call provision decision, it is necessary to restrict the variables to characteristics of the firm at the time of the bond issue. Any variables which are characteristics of the bond issue from Table I are not used since these are decision variables to be jointly determined by the firm at the time of the bond issue.

Based on the previous sections of the paper which discussed the sources of agency costs of debt, four variables were used in the discriminant analysis. These are listed below.

<u>Variable</u>	<u>Symbol</u>
Unexpected Growth Rate	Growth
Debt to Total Assets Ratio	Debt Ratio
Cumulative Profitability Ratio	Cum. Prof.
Average Maturity of Currently Outstanding Debt	Ave. Mat.

⁶ The literature in the debt maturity area is scant. For a theoretical development of factors influencing the optimal debt maturity strategy, see Morris [14]. One example of empirical work in this area is a paper by Johnson, Thatcher, and Thatcher [10]. The paper used a cross-sectional regression analysis to explain the years to maturity of newly issued bonds. The independent variables used include proxies for agency costs of debt, the level and term structure of interest rates, the variability of profits, and the life of the firm's fixed assets. While the paper uncovered some relationships, the results did not support the hypothesis that one set of factors, such as agency costs, dominates the debt maturity decision.

The unexpected growth rate, which is the difference between the growth rate in gross plant for the five years following the debt issue and the growth rate during the five years prior to the debt issue, is a proxy for agency costs due to informational asymmetry and underinvestment by the firm. The next two variables account for the likelihood of default. As firms use more debt and bonds become riskier, stockholder actions have more effect on bond payoffs, and the magnitude of agency costs from all sources is increased. The average maturity of outstanding debt serves as a proxy for the magnitude of agency costs from all three sources. When outstanding debt has a longer maturity, any changes in the value of the underlying assets of firm, whether induced by shareholders or the outside environment, has a larger impact on bondholders and hence there are greater potential agency costs of debt.

The estimated discriminant function is⁷

$$Z = 3.15 - 6.75 (\text{Growth}) - 0.12 (\text{Debt Ratio}) \\ + 1.99 (\text{Cum. Prof.}) - 0.30 (\text{Ave. Mat.}).$$

Each firm is classified by placing its variable scores in the equation and calculating a Z value. The Z value is analogous to the posterior probability of the firm belonging to a particular classification group. If the Z score is below zero, the posterior probability of the firm belonging to the two-tiered call provision group is greater than the probability of membership in the regular call group, and the firm would be classified in the two-tiered call group. Similarly, any firms with Z scores above zero would be classified in the regular call group.

Besides obtaining classification results, it is also useful to look at the discriminant coefficients determined by the model in order to see which factors are more important in determining the type of call provision that is used. Unfortunately, there is no definitive measure of variable importance. Table III contains the results of two methods along with the corresponding rankings. The first method is a univariate one which considers the importance of each variable independently. The univariate F -statistic is the F -statistic for initial entry of each variable into the model. The stepwise forward F is a multivariate method that measures the importance of each variable conditioned on other variables already in the discriminant function. It is the F -statistic that gave entry to the variable when a stepwise procedure was used to sequentially allow variables to enter the discriminant function.⁸

The results in Table III indicate that there is considerable consistency as to the relative importance of the variables. Clearly, the average maturity of currently outstanding debt is the most important variable. The negative coefficient on this variable indicates that, everything else being equal, firms with longer maturity debt outstanding and therefore larger agency costs of debt tend to use the two-tiered call provision. The second most important variable appears to be the

⁷ A test for homogeneity of the group covariance matrices was made. The result that the groups do not have significantly different covariance matrices meant that a linear discriminant function is appropriate. If this were not the case, a nonlinear classification analysis would need to be performed.

⁸ Three other commonly used multivariate measures of variable importance were also calculated. The conditional deletion F , standardized coefficient, and Mosteller-Wallace measure gave similar ranking results. For a description of these measures, see Eisenbeis [7].

Table III
Measures of Variable Importance

Variable	Univariate <i>F</i>		Stepwise Forward <i>F</i>	
	<i>F</i> -Value	Rank	<i>F</i> -Value	Rank
Average Maturity	45.3	1	45.3	1
Unexpected Growth Rate	0.4	4	3.2	2
Cumulative Profitability	6.8	2	1.7	3
Debt Ratio	6.1	3	0.001	4

unexpected growth rate which serves as a proxy for agency costs due to informational asymmetry and underinvestment by the firm. This is followed by the cumulative profitability and debt ratio variables which measure the effect of higher financial risk in creating agency costs of debt.

It is possible that the ranking of the last three variables may be affected by the fact that these variables are derived from accounting data and are, therefore, not exact measures of the underlying economic growth rate, profitability, and debt ratio of the firm. An additional problem with accounting data is that accounting methods can vary across firms and industries. If it is the case that accounting methods are correlated with membership in the call provision groups, then the interpretation of the variables would change. Because the sample firms include industrial and utility firms, the data was analyzed to see whether there was an industry effect in the choice of call provisions. The result is that none of the major industry groupings was found to favor one type of call provision over the other.

Because of the importance of the average maturity variable, other measures of the remaining maturity on currently outstanding debt were used in the discriminant analysis. The first alternative maturity measure adjusts the stated years to maturity on each outstanding bond issue for sinking fund payments. Most sinking fund provisions require the firm to pay a contractual percentage of the original principal in stated calendar years. A maturity measure adjusted for the sinking fund was obtained by calculating a weighted average maturity for each bond where the weights of the percentage of principal paid off in each year are multiplied by the number of remaining years until the payment. The group means for this variable are given in line five of Table II. Using this variable in the discriminant analysis for the average maturity produced results which were similar to those of Table III.⁹ The average maturity variable remains the most important variable, although it is less dominant than the previous results.

A third measure of average maturity is obtained by calculating the duration of each outstanding bond so that the average maturity variable has been adjusted for interest payments and required sinking fund provisions. The group means for this variable are reported in line six of Table III. The result indicates that firms using the two-tiered call provision still have, on average, longer maturity outstanding debt, but the difference is not as significant as with the other maturity measures. When the importance of variables in the discriminant analysis is

⁹ A full report of these results is available from the author on request.

Table IV
Results of the Discriminant Analysis

Actual Group Membership	Classified Group Membership		
	Two-Tiered Call	Regular Call	Total
Two-Tiered Call	69	10	79
Regular Call	16	23	39
Total	85	33	118

Percent Correctly Classified			
	Proportional		Test Statistic for Significance ^b
	Discriminant Function	Chance Model ^a	
Two-Tiered Call	87.3	66.9	3.85
Regular Call	59.0	33.1	3.44
Total	78.0	55.8	4.86

^a The expected proportion of correctly classified firms for each group is equal to $n_{ii}/n_{i.}$, where n_{ii} is the actual number of firms in group i and $n_{i.}$ is the total number of firms. The overall expected proportion of correctly classified firms is equal to $(n_{11}/n_{1.})^2 + (n_{21}/n_{2.})^2$.

^b The test statistic for significance is

$$\frac{d - p}{\sqrt{p(1 - p)/n}}$$

where d is the proportion of observations correctly classified by the discriminant function, p is probability of classification by chance, and n is the number of firms in the sample being classified.

compared, a different ranking is found. Using an average ranking of five measures of variable importance, the ranking is: (1) cumulative profitability ratio; (2) average duration of debt adjusted for sinking fund provisions; (3) unexpected growth rate; and (4) debt ratio.

In the previous results, discriminant analysis has been used to determine whether the hypothesized relationships between the magnitude of agency costs and the use of the two-tiered call provision exist in a sample of firms issuing new debt. A final test of whether these variables uncover significant differences between firms using the two types of call provisions is whether a discriminant function can be used to classify firms into the two groups. In order to preserve the original sample size, but still not use the same observations for development of the discriminant function and verification, the Lachenbruch U or jackknife method was used.¹⁰ This method withholds one observation at a time, develops a classification function, and uses this function to classify the left-out case.

The results of the jackknife classification using the initial average maturity measure are given in Table IV. The classification results are compared with the proportional chance classification model which randomly assigns firms to groups

¹⁰ This method is described in Lachenbruch and Mickey [13].

with probabilities equal to the actual group frequencies. The comparison, which appears in the second panel of Table IV, indicates that the discriminant function is better than the proportional chance criterion at a significance level of one percent.¹¹ The successful application of discriminant analysis in dividing firms into groups using the two-tiered and regular call provision is evidence consistent with the hypothesis that firms consider the agency cost of debt in designing call provisions.

IV. Conclusions

This paper has examined a sample of newly issued bonds to determine whether there is evidence that firms with large agency costs of debt use the two-tiered call provision. The two-tiered call provision is an example of a complex bond indenture that can be used to mitigate agency problems since it allows redemption at any time for purposes other than refinancing with debt at a lower interest cost. After examining the sources of agency costs of debt that can be reduced through the use of this call provision, it was hypothesized that firms using the two-tiered call provision would have the following characteristics: an increase in the growth rate of long-term assets, a high debt ratio, a low level of past profitability which indicates high default risk, and outstanding debt with long maturity. The sample of firms issuing new bonds was divided into two groups on the basis of the type of call provision used. Using discriminant analysis, it was shown that the above proxies for the existence of agency costs of debt can be used to classify the firms on the basis of whether or not they use a two-tiered call provision. This result is consistent with the hypothesis that two-tiered call provisions are being used to reduce the agency costs of debt. Empirical evidence has been provided that complex contracts are being used to mitigate agency problems.

¹¹ See Joy and Tollefson [11] and Altman and Eisenbeis [1] for a description of this method of assessing classification accuracy.

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