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REVISITING THE DETERMINANTS OF THE CORPORATE DEBT CALL OPTION: NEW EVIDENCE 1987-1996

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Abstract

Attaching a call feature to new debt for any reason was the norm for most of the twentieth century. For example, the majority of new bonds issued prior to 1986 contain a call provision. But over the past ten years, we observe that the number of call options on new debt is now a minority component. The intent of this study is to reproduce the work of Kish and Livingston (1992) for the period 1987-1996. The major structural change that occurred in the debt market warrants the reproduction of this study for the recent decade. For the 1977-1986 period, the ratio of callable to non-callable bonds is approximately 4:1, whereas the ratio during the 1987-1996 period approximates 0.5:1. A natural question arises as to why we have observed such a phenomenon in the financial world. Reproducing the study in the same manner offers insight into the reasoning behind a firm's decision to use a call feature on newly issued debt. Our empirical results indicate that the values that were important for the firm's decision making process (the level of interest rates, the debt rating, the probability of default, the number of years to maturity and the firm classification) are still valid in the latter time period tested. Of particular note, we found that the transfer of wealth externality issue as measured by our proxy, GROWTH, impacts the call option decision in the latter decade and not the former decade.

INTRODUCTION

Attaching a call feature to new debt for any reason was the norm for most of the twentieth century.[1] For example, the majority of new bonds issued prior to 1986 contain a call provision. But over the past ten years, we observe that the number of call options on new debt is now a minority component.[2] Prior research shows that firms include a call feature in the bond indenture for a number of reasons. One of the most common explanations is to hedge interest rate risk. When a firm requires capital for investment purposes and decides to issue debt to raise the capital, interest rates for borrowing may be at undesirable levels. With the option of issuing the high yield debt with a call provision, the firm adds the flexibility of being able to call the bonds based on the guidelines set forth by the call feature specification. When interest rates fall, the firm calls the issue. Funding for the repayment of principal and any call premium is provided by the issuance of new lower coupon bonds, an equity issue or accumulated cash. Although hedging interest rate risk is a common explanation as to why firms utilize the call feature, other motivations exist such as management flexibility, agency problems, maturity altering, and tax reasons. For instance, Kish and Livingston (1992) empirically examine these five determinants of the call feature on corporate non-convertible debt issues for the period 1977-1986.

Following the format as described by Kish and Livingston (1992), the intent of this study is to reproduce their work for the period 1987-1996. The major structural change that occurred in the debt market warrants the reproduction of this study for the recent decade. For the 1977-1986 period, the ratio of callable to non-callable bonds is approximately 4:1, whereas the ratio during the 1987-1996 period approximates 0.5:1.[3] A natural question arises as to why we have observed such a shift within the debt market during the late 1980's. Reproducing the Kish and Livingston (1992) study in the same manner tests whether the factors influencing the attachment of the call option on newly issued debt have changed overtime.

With such a structural change occurring around 1986, we postulate that the determinants of the call feature as found by Kish and Livingston (1992) ought to dissipate with the trend away from call features. Further, a replication of the study may suggest alternative explanations for call option usage. Our empirical results indicate that the values

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that were important for the firm's decision making process (the level of interest rates, the debt rating, the probability of default, the number of years to maturity and the firm classification) are still valid in the latter time period tested. Of particular note, we found that the transfer of wealth externality issue as measured by our proxy, GROWTH, impacts the call option decision in the latter decade and not the former decade.

LITERATURE REVIEW

Kish and Livingston (1992) recaps for the period 1977-1986 the topics associated with debt issues as outlined in Hess and Winn's (1962) study covering the period 1926 through 1959. Accordingly, the call feature is hypothesized to be motivated by flexibility, interest rates, agency problems, maturity, and tax considerations. Flexibility deals with management's ability to manage interest rate risk by enabling them to call bonds and re-issue new lower rate instruments. Additionally, call features allow managers to better control capital structure issues within their firms through adjusting the debt/equity mix, changing debt maturities, or eliminating unwanted bonds with available cash reserves. Support of the managerial flexibility hypothesis is offered by Pye (1966), Bowlin (1966), Kraus (1983), and Narayanan and Lim (1989).

The second hypothesized reason offered, the impact of interest rates, originates from the notion that options derive their value from the variability of the underlying assets. When interest rates are high the likelihood for future decline increases, giving the call option upside value. Looking at the level of interest rates may indicate the probability of firms using a call feature. If interest rates are at historical highs, firms with superior pricing expertise may procure significant profits by attaching a call option to newly issued bonds.[4] Therefore, the observance of a call option should vary with the level of interest rates. Kidwell (1976) and Kraus (1983), among others, offer support for the effect of interest rates on the issuance of callable debt.

Agency problems exist because of the difference in motivation between stockholders and bondholders. Non-callable debt creates a situation where part of the profitability of the firm goes to the bondholders, therefore causing stockholders to be less willing to take on new potentially profitable opportunities. Callable bonds, however, give stockholders the right to eliminate debt and thereby giving them exclusive rights to the profits of the firm. Agency problems also deal with the ability of management to signal inside information to the public. Thus results indicate that the call feature provides a simple cost effective mechanism for dealing with agency problems. Bodie and Taggart (1978), Barnea, Haugen, and Senbet (1980), and Allen, Lamy, and Thompson (1987), and Fischer, Heinkel, & Zechner (1989) support these agency claims.

Substitution of callable long-term debt for short-term non-callable debt has also been proposed for the inclusion of the call feature. The maturity length of the issued debt can serve as a signal for the credit quality of the firm. More risky firms tend to issue long term debt because re-issuing leads to re-evaluation and thus leaves the bad firm open to negative publicity. The results indicate that risky firms rarely enter into the short term debt market while safer firms will issue both long term and short term securities. For instance, see Kidwell (1976) and Morris (1976) for evidence of the maturity hypothesis.

The tax argument states that the debt issuer and the lender benefit from the tax rules. Exercising the call option results in a reduction of the tax liability for the issuing firm without the offsetting tax liability from the lender. Contradictory evidence exists on the statistical difference in the yields offered on callable and non-callable bonds when taxes are considered. For a review of the tax issues, see for example, Myers (1977), Boyce and Kalotay (1979), Marshall and Yawitz (1980), Kraus (1983), and Narayanan and Lim (1989).

DATA AND METHODOLOGY

Data was acquired from *Securities Data Company* for the 1977-1996 period. The information in the data set includes date of issue, size of issue, years to maturity, coupon rate, yield to maturity, firm classification, conversion provisions, debt ratings, total debt outstanding, total assets, initial call premium (%), initial call price, CUSIP, and years of call protection. Tax rates, net income before taxes, total debt outstanding, and total assets are acquired from *Compustat* over the same time period. Weekly constant maturity Treasury yields are obtained from the St. Louis Federal Reserve FRED Database for the 1977-1996 period. The data set eliminates any convertibles, floating rate debt, and zero coupon bonds to better isolate the impact of the call feature. The empirical analysis is undertaken over the total period 1977-1996 and over two sub-periods (1977-1986 and 1987-1996). Because we are interested in the reasoning for the decline in the usage of the call feature for the latter period, identical tests are run on both sub-periods for comparative purposes.

Summary descriptors for the regression variables by time (1977-1996, 1977-1986, and 1987-1996) are shown in Table 1 and the variables are defined in Table 2. The entire set contained 5,538 observations while the 1977-1986 period contained 1,367 observations and the 1987-1996 period included 4,171 observations. The early period shows higher means and variability for all variables except for moderate ratings, the debt/asset ratio, growth, and taxes.

TABLE 1
Summary Descriptors

	1977-1996 (n = 5538)					1977-1986 (n = 1367)					1987-1996 (n = 4171)				
Statistics	Mean	Med	σ	Max	Min	Mean	Med	σ	Max	Min	Mean	Med	σ	Max	Min
CALL	0.50	0.00	0.50	1.00	0.00	0.50	1.00	0.50	1.00	0.00	0.50	0.00	0.50	1.00	0.00
UNCER	0.63	0.55	0.30	1.90	0.13	0.92	0.84	0.37	1.90	0.28	0.53	0.51	0.20	0.93	0.13
LEVEL	7.11	6.68	2.27	16.22	4.17	9.68	9.44	2.44	16.22	5.68	6.28	6.27	1.42	9.61	4.17
DA	1.49	0.50	48.31	0.73	0.29	0.40	0.34	0.24	0.97	0.22	0.66	0.56	0.10	0.76	0.33
MARKET	0.26	0.14	0.29	1.00	0.00	0.41	0.36	0.28	1.00	0.00	0.21	0.07	0.27	1.00	0.00
GROWTH	0.09	0.01	0.35	1.00	-0.45	0.04	-0.06	0.34	0.21	-0.45	0.11	0.01	0.35	0.31	-0.33
MAT	10.49	8.00	9.49	99.90	1.00	13.25	10.00	9.54	99.90	1.00	9.55	7.00	9.34	100.00	1.00
MTAX	23.63	32.05	5.69	39.68	20.10	28.53	36.99	1.99	43.42	26.12	31.23	31.42	7.79	37.59	30.32
Frequencies	Callable		Non-callable			Callable		Non-callable			Callable		Non-callable		
	#	%	#	%		#	%	#	%		#	%	#	%	
Ratings:															
HIGH	1236	0.22	4302	0.78		540	0.40	827	0.60		696	0.17	3475	0.83	
MODERATE	3717	0.67	1821	0.33		670	0.49	697	0.51		3047	0.73	1124	0.27	
LOW	585	0.11	4953	0.89		157	0.11	1210	0.89		428	0.10	3743	0.90	
Classifications:															
FINANCE	3136	0.57	2402	0.43		536	0.39	831	0.61		2600	0.62	1571	0.38	
INDUSTRIAL	686	0.12	4852	0.88		230	0.17	1137	0.83		456	0.11	3715	0.89	
UTILITY	1716	0.31	3822	0.69		601	0.44	766	0.56		1115	0.27	3056	0.73	

To ascertain the validity of the five hypotheses in the determination of the call feature over the 3-sample periods: 1977-1996, 1977-1986, and 1987-1996, methodology similar to that used by Kish and Livingston (1992) is employed. Specifically, we use a t-test to determine differences in the means between call and non-callable debt securities and between periods. In addition, a logit analysis is used to test the impact of variables used to proxy the factors hypothesized to determine the use of call feature. Logit analysis is used because of the bivariate nature of the dependent variable tested.[5] A value of 1 is assigned if a call feature is used and a zero if the bond is non-callable. Maximum likelihood techniques are used to derive the coefficients on the independent variables that best fit the data in the sample. The error term is assumed to follow a logit distribution.

In addition, the attributes of the data set require appropriate state based sampling procedures. Because the data samples are binary in nature with skewed distributions due to the existence or non-existence of a call, modifications to the traditional procedure are necessary. The empirical investigation into the determination of the call feature on corporate debt follows the suggestions of Sen, Shome and Morgan (1990), Palepu (1986), and Press and Wilson (1978). The results of the 2 sub-periods are compared to determine the effects of a structural break in the market for corporate bond call features.

In the reduction of the observations to equal samples of both callable and noncallable bonds, a bias may be created where the elimination of certain data points leaves behind a sample that is not representative of the original data set. To audit this possibility, we employ a difference in means test. The t test enables us to investigate whether the true mean of one group is indistinguishable from the mean of another group. Our testing procedure examines t-values based two scenarios for the means, assuming both equal and unequal variances. To validate that the reduced sample is no different than the original sample, we have conducted a t test on each variable for each of the 20 years studied. The results of these tests are found in Table 3. Overall, the results are positive in that most of the variables in a given year found that the mean of the reduced sample is statistically the same as the mean from the overall sample data. Although a few exceptions are detected where the means of the variables are not statistically the same, we are confident that the few deviations will not have an impact on the testing equations.[6] The observations in the reduced sample for balanced sample sized distributions are equivalent to the observations in the complete sample.

TABLE 2
Variable Names And Definitions

Dependent Variable:		
CALL	=	A binary variable for the existence (1) or nonexistence (0) of a call feature on a debt issue.
Independent Variables:		
Flexibility factor		
UNCER	=	Average change in interest rates over the 52 weeks prior to the debt issue.
Interest rate factor		
LEVEL	=	The yield on 3 year treasury security.
Agency factors		
DA	=	Debt to asset ratio.
MARKET	=	The ratio of the new debt issue to the amount of debt outstanding.
GROWTH	=	Growth rate of assets during the year prior to the debt issue.
Ratings		
HIGH	=	A binary variable for debt ratings AAA or AA.
MODERATE	=	A binary variable for debt ratings A or BBB.
LOW	=	A binary variable for debt ratings BB or lower.
Base case: LOW		
Tax factor		
MTAX	=	The marginal corporate tax rate of the issuing firm.
Maturity factor		
MAT	=	Maturity of the debt issue in years.
Firm classifications		
FINANCE	=	A binary variable for financial firms.
UTILITY	=	A binary variable for utility firms.
INDUSTRIAL	=	A binary variable for industrial firms.
Base case: FINANCE		

The functional form for testing the impact of the hypothesized relationships with the call option and the expected signs of the coefficients of the independent variables follow directly from the method used by Kish and Livingston (1992), specifically:

Equation 1

CALL = *f* (*Flexibility factor*: *UNCER* (+); *Interest rate factor*: *LEVEL*(+); *Agency factors*: *Rating* (*HIGH* (-), *MODERATE* (-), *LOW-base case*), *DA* (+), *MARKET* (+), *GROWTH* (+); *Maturity factor*: *MAT* (+); *Tax factor*: *MTAX* (+); and *Firm classification* (*INDUSTRIAL*(-), *UTILITY* (+), *FINANCE-base case*).

The hypothesis pertaining to managerial flexibility suggests that a firm's management issues callable debt because of the uncertainty of interest rates over time. The variable UNCER represents the variability of interest rates in the market and is calculated using the standard deviation of the 3-year constant maturity treasury yields for the twelve months prior to the date of issuance on the debt. The expected sign on the coefficient is positive because the more variable interest rates are likely to be, the more benefit a firm acquires from the issuance of a call feature.

TABLE 3
Reduction of Observations for Balanced Sample Size Estimation

Year	Var	Unc	Level	High	Mod	DA	Mrkt	Grth	Mat	Mtax	Util	Ind
1977	≠	0.30	0.05	-0.18	-1.01	-0.25	0.32	-0.09	-2.45	1.71	-1.40	1.89
	=	0.29	0.06	-0.18	-1.01	-0.24	0.30	-0.09	-2.19	1.70	-1.45	1.79
1978	≠	0.56	0.17	0.03	-0.26	-0.40	0.32	0.86	-0.02	0.85	-0.26	2.09
	=	0.60	0.18	0.03	0.26	-0.44	0.33	0.82	-0.02	0.84	-0.27	1.99
1979	≠	-0.46	0.60	-1.21	0.42	0.00	0.26	0.02	-1.71	0.42	-0.21	0.20
	=	-0.45	0.58	-1.33	0.43	0.00	0.23	0.03	-1.82	0.21	-0.22	0.21
1980	≠	0.07	0.50	0.27	-0.47	1.58	-1.09	0.23	0.56	-2.08	0.83	-1.24
	=	0.08	0.52	0.26	-0.47	1.46	-1.05	0.25	0.58	-1.55	0.81	-1.25
1981	≠	-0.03	-0.24	1.50	-1.70	-0.20	0.06	1.68	0.23	-0.36	-0.45	0.56
	=	-0.03	-0.25	1.35	-1.60	-0.21	0.06	1.60	0.21	-0.37	-0.47	0.55
1982	≠	1.50	-1.04	0.81	-0.22	1.52	-0.21	-0.11	-0.07	2.58	0.06	-0.84
	=	1.39	-1.03	0.80	-0.22	1.43	-0.20	-0.11	-0.07	2.58	0.06	-0.84
1983	≠	1.77	-1.73	0.82	-1.11	0.53	-1.14	1.10	0.68	1.00	1.54	-0.59
	=	1.78	-1.74	0.82	-1.11	0.53	-1.14	1.09	0.68	1.00	1.53	-0.59
1984	≠	-1.33	-0.10	1.28	-1.99	1.02	-0.47	1.06	0.59	0.82	0.10	-0.11
	=	-1.33	-0.10	1.34	-1.96	1.03	-0.47	1.11	0.62	0.87	0.10	-0.11
1985	≠	1.09	-0.52	-0.29	0.57	0.56	0.04	1.12	0.52	-0.93	1.17	-0.87
	=	1.09	-0.52	-0.29	0.57	0.56	0.04	1.11	0.52	-0.88	1.16	-0.87
1986	≠	-0.27	-0.32	1.25	-1.62	-0.65	0.82	1.79	0.80	0.97	-0.80	1.55
	=	-0.27	-0.32	1.25	-1.62	-0.64	0.82	1.79	0.81	0.89	-0.79	1.55
1987	≠	0.90	2.05	0.43	-0.72	0.72	-1.01	1.89	-1.05	-1.26	-0.12	-1.19
	=	1.11	1.66	0.52	-0.74	1.06	-1.34	2.22	-0.90	-1.20	-0.12	-1.24
1988	≠	-0.01	-0.24	-1.04	-0.19	-0.06	0.12	-0.54	-0.34	-0.36	0.12	0.20
	=	-0.01	-0.25	-0.98	-0.19	-0.06	0.12	-0.51	-0.32	-0.38	0.12	0.20
1989	≠	0.62	1.19	-0.98	1.17	-1.44	0.52	1.45	0.16	0.55	-0.99	1.65
	=	0.57	1.14	-0.96	1.13	-1.40	0.52	1.40	0.17	0.50	-0.82	1.79
1990	≠	1.47	-0.58	-0.90	0.72	1.45	-0.18	1.34	1.11	0.79	-0.92	-0.15
	=	1.30	-0.58	-0.93	0.74	1.43	-0.17	1.18	1.01	0.64	-1.05	-0.15
1991	≠	-1.23	-0.12	0.39	-0.17	0.29	0.28	-0.52	-1.47	1.02	0.23	-1.51
	=	-1.23	-0.12	0.38	-0.17	0.27	0.27	-0.53	-1.70	0.84	0.22	-1.56
1992	≠	0.94	0.47	-0.68	0.82	1.74	-0.99	0.64	-0.82	0.10	-0.47	-0.24
	=	0.93	0.47	-0.69	0.83	1.74	-1.02	0.64	-0.83	0.11	-0.48	-0.24
1993	≠	-0.85	-0.77	-0.25	0.76	0.50	0.27	-0.39	1.13	1.18	0.40	-0.20
	=	-0.85	-0.77	-0.25	0.76	0.50	0.27	-0.39	1.09	0.99	0.40	-0.20
1994	≠	1.60	1.71	-0.35	0.18	-0.24	0.50	0.45	-0.41	-0.44	-0.02	0.21
	=	1.61	1.69	-0.35	0.18	-0.20	0.49	0.44	-0.42	-0.45	-0.02	0.21
1995	≠	0.00	0.42	-0.75	0.92	-1.09	-1.21	0.11	-0.66	-1.27	0.77	0.13
	=	0.00	0.42	-0.76	0.92	-1.09	-1.22	0.11	-0.66	-1.38	0.76	0.13
1996	≠	1.35	1.01	0.00	1.00	-1.00	0.54	0.37	1.11	-0.69	-0.98	0.14
	=	1.35	1.01	0.01	1.00	-1.00	0.54	0.38	1.11	-0.69	-0.98	0.14

Note: Difference in means test (t-test). The test computes the t statistic based on the assumption that the variance is unequal (≠) and equal (=). BOLD numbers indicate that the variable is not statistically the same in the 77-86 decade as in the 87-96 decade.

The interest rate hypothesis states that firms will benefit from a call feature based on the probability that interest rate levels will change. If a firm issues debt when interest rate levels are high, the probability that they will fall in the future is great. It then makes sense that the firms should issue that debt with a call option. The variable LEVEL is expected to have a positive sign because the higher the interest rates, the more likely firms will issue a call feature to capture the downside potential of the interest rates. A measure for the overall interest rate level, LEVEL, is proxied by the 3-year constant maturity treasury rate one month prior to the issuance of the debt.

Agency factors associated with the call features imply that a firm's management will signal the market based on the firm's future investment prospects. The ratings variables are used as a proxy for the signaling hypothesis. The variables HIGH, MODERATE, and LOW are dummy variables indicating how the debt issue was rated according to the Standard and Poor's rating system. If the variable is rated AA or higher, the variable HIGH is assigned a 1 and a 0 otherwise. If the debt issue is rated A through BBB, the variable MODERATE is assigned a 1, 0 otherwise. Finally, if the debt issue is rated BB or lower, the variable LOW is assigned a value of 1 and 0 otherwise. Since LOW is utilized as the base case, the expected sign for both HIGH and MODERATE is negative. It is hypothesized that the lower the rating, the more likely a firm's management is to issue a call feature on newly issued debt.

Another aspect of the agency hypothesis is that a firm's managers, who have inside information on the probability of default, are more likely to use a call feature. A firm's management desires to retain the ability to call the debt in the case of capital restructuring or for the elimination of restrictive bond covenants. The probability of default is proxied through the debt to asset variable (DA) and the ratio of the new debt to the amount of existing debt outstanding (MARKET). Specifically, the DA variable is calculated using the total asset and total debt levels in the year prior to the bond issue. The greater the probability of default, the more likely is the firm to issue the call feature so that both measures are predicted to have a positive sign.

To capture the externality issue of the agency hypothesis, we utilize a growth variable. GROWTH is calculated based on the rate of growth of the firm's assets by examining the amount of assets in the year prior to the issue as compared to the level of assets two years prior to the debt issue. The logic states that the greater the growth potential, the greater the effect of the externality and thus the more transfer of wealth from shareholders to bondholders will be. The variable GROWTH is expected to have a positive sign.

A variable for maturity of the debt issue in years, MAT, is included to capture the notion that the longer the bond has until maturity, the more likely it will be called. The expected sign for the maturity variable is positive. The variable MAT is simply the number of years the bond has until final maturity. The tax hypothesis asserts that the firm's tax rate will increase the likelihood that the firm's management will issue a bond with a call feature. Therefore the expected sign is for MTAX, the marginal corporate tax rate of the issuing firm, is positive. The debate as to the validity of the tax hypothesis still rages.

A variable to include the possibility of firm type being a factor on the determinant of a call feature is also included. Utility firms traditionally issue bonds with a call feature. The variables INDUSTRIAL, UTILITY, and FINANCE (base case) are zero-one binaries and are included to examine such behavior. The dummy variable FINANCE is included to indicate firms classified as finance firms where a 1 is assigned if the firm falls into that category and a 0 otherwise. UTILITY is used to assess whether a firm is classified as a utility firm. Finally, INDUSTRIAL is another zero-one dummy variable where a 1 indicates that the firm is classified as an industrial firm. For the 1987-1996 period, this variable may have a more significant impact due to the structural changes in that industry. Because of deregulation, we postulate that utility firms are issuing significantly less debt. The observation in the decline of the utility debt may provide an explanation for the reduction in the number of call features issued.

ANALYSIS AND RESULTS

We hypothesize that the testing ought to show that the determinants of the call feature that held in the Kish and Livingston (1992) study still holds, but with less empirical strength due to structural break in the callable bond market over this period. That is the anticipated results ought to show some of the same characteristics for the call feature over the 1987-1996 period as held during the 1977-1986 period, yet the tests ought to indicate less relevance.

Testing takes two forms, a means test and logistic regression. The means test is adopted to test whether a statistically significant difference between callable and noncallable exists for each of the given variables. Calculating a t statistic on each independent variable helps determine whether a given characteristic, represented by the independent variable, is a particular characteristic of a callable bond or a noncallable bond. The implicit null hypothesis, when calculating the t statistic, is that the means of the two variables are the same. In this case, the test indicates whether the mean of a given independent variable is the same for callable bonds as it is for non-callable

TABLE 4
Mean Value Of Summary Statistics For Logit Regression Variables

1977-1996	Debt type		t statistic	
Variable	Callable	Noncallable	Unequal	Equal
*UNCER	0.6182	0.6363	2.2449	2.2446
LEVEL	7.1016	7.1246	0.3768	0.3768
*HIGH	0.1489	0.2971	13.4676	13.4581
MODERATE	0.6675	0.6748	0.5795	0.5795
DA	0.8246	2.1420	1.0176	1.0146
*MARKET	0.3231	0.2043	-15.6368	-15.6513
*GROWTH	0.1050	0.0703	-3.7359	-3.7355
*MAT	13.7344	7.2637	-26.9507	-26.9874
MTAX	26.1189	21.1636	-0.3241	-0.3242
*UTILITY	0.1767	0.0713	-12.0503	-12.0633
*INDUSTRIAL	0.3405	0.2794	-4.9187	-4.9195
1977-1986	**Debt type**		**t statistic**	
Variable	Callable	Noncallable	Unequal	Equal
UNCER	0.9046	0.9305	1.3052	1.3056
LEVEL	9.7040	9.6635	-0.3074	-0.3075
*HIGH	0.2700	0.5221	9.8529	9.8623
*MODERATE	0.5443	0.4351	-4.0582	-4.0581
*DA	0.3677	0.4264	4.6318	4.6414
*MARKET	0.5369	0.2814	-18.6201	-18.5948
GROWTH	0.0460	0.0437	-0.1207	-0.1208
*MAT	17.3438	9.0868	-17.7908	-17.7136
MTAX	23.5924	33.5504	0.9315	0.9241
*UTILITY	0.2758	0.0590	-11.2344	-11.1834
*INDUSTRIAL	0.4761	0.4027	-2.7395	-2.7391
1987-1996	**Debt type**		**t statistic**	
Variable	Callable	Noncallable	Unequal	Equal
*UNCER	0.5229	0.5412	3.0158	3.0146
LEVEL	6.2362	6.3045	1.5496	1.5494
*HIGH	0.1086	0.2244	10.1684	10.1496
*MODERATE	0.7085	0.7523	3.1875	3.1885
DA	0.9766	2.6961	1.0039	0.9974
*MARKET	0.2520	0.1794	-8.6341	-8.6506
*GROWTH	0.1246	0.0789	-4.2801	-4.2792
*MAT	12.5370	6.6766	-21.3970	-21.4555
MTAX	34.8053	27.9986	-0.3350	-0.3354
*UTILITY	0.1438	0.0753	-7.1221	-7.1349
*INDUSTRIAL	0.2954	0.2396	-4.0715	-4.0733

*Indicates a statistically significant difference between the callable and noncallable samples for this variable.

bonds. If a statistically significant difference is found, we can conclude that callable bonds differ in a particular characteristic from noncallable bonds. Such results give an indication of why a firm may choose to issue a callable bond over a noncallable bond or vice versa. The results of the means test, presented in Table 4, show that within the first sub-period, 1977-1986, ratings, debt/asset ratio, MARKET, maturity, and firm classification are significant. In the second sub-period, 1987-1996, uncertainty of interest rates and growth are also significant, but debt/asset ratio is insignificant.

Testing is broken down into two ten-year sub-samples (1977-1986 and 1987-1996). The former period is performed to compare results with the Kish and Livingston (1992) study and to assess whether a structural break occurred in the callable bond market during the late 1980s. The 1977-1986 decade produced results that are similar to the Kish and Livingston (1992) study in many ways, yet some of the results are slightly differentiated. We presume that the differences are due to the usage of different data samples. Because we are interested in assessing a structural break in the market for callable debt, we need to examine the latter decade, 1987-1996 to determine if any changes exist in the determinants of the call feature. Because other market influences have appeared during the latter decade, the estimation model for the 1987-1996 decade will have less empirical validity.

The variable UNCER is used to test the validity of the hypothesis that the more variable interest rates are the more likely a firm will issue debt that contains a call feature. For the uncertainty of interest rates impacting the use of the call feature, the means test indicates that there is a statistical difference between the means of the callable bond and the noncallable bond for this variable during the entire period and the sub-period 1987-1996, but not for the 1977-1986 period. To capture any gains from changes in interest rates, the variable LEVEL is included to specify the benefits of using a call feature when the level of interest rates are high. If interest rates are high at the time of issuance, the firm is likely to include a call feature so that they can take advantage of any decline in rates over time. Although we expect that the higher the interest rates, the more likely a firm will issue debt that contains a call feature, the means tests indicate that there is no statistical difference between the mean of the LEVEL variable for a callable bond and a noncallable bond for any of the 3 test periods.

The security of firm's future prospects gives rise to one of the agency relationships whereby a firm will attempt to signal the market based on the future earnings expectations. As such, the rating variables are included to proxy the signaling hypothesis. The lower the rating the more likely firms will be to use a call feature. The means tests indicate that there is a statistically significant difference in the number of callable bonds and noncallable bonds in both the HIGH and MODERATE rating categories for both sub-periods.

To capture the agency problem of inside information on the probability of default, we use the debt to asset ratio, specified by the variable DA, to proxy this agency relationship. The DA variable is expected to have a positive sign because it is more likely that a firm will use a call feature if the probability of default is high. The call feature enables management to restructure the capital components or eliminate restrictive bond covenants. Although showing the correct sign, the means tests indicate that there is no statistical difference between the mean of the debt to asset ratio for callable and noncallable bonds over the total period and over the second sub-period 1987-1996. Within the first sub-period, 1977-1986, the debt to asset ratio shows that the variable is significantly different for callable and noncallable bonds. The variable market is also used to proxy the default risk hypothesis. The anticipated sign on the MARKET variable is positive, conveying that the higher the new debt to existing debt level is, the more likely the firm will default, in which case, the firm desires a call feature for restructuring or removal of inhibiting bond covenants. The means testing shows that the mean of the MARKET variable on callable bonds is statistically different than the mean on noncallable bonds within all three samples.

In addition to the aforementioned agency relationships, an additional agency hypothesis is tested to measure the externality issue inherent in the diversion of interests between stockholders and bondholders. The means tests indicate that there exists a statistically significant difference in the mean of the growth variable for callable and noncallable bonds for the total period and the sub-period 1987-1996. Within the 1977-1986 period, the means test shows that no statistical difference in means occurs in callable and noncallable bonds.

Many researchers corroborate that the longer the debt issue's initial maturity, the more reason firms have to attach a call feature. The reasoning suggests that the further out until maturity, the more opportunity for favorable changes in interest rates. The firm anticipates such prospects and hopes to preclude some benefits by taking advantage of advantageous changes in interest rate behavior. MAT ought to display a positive sign. The means test demonstrates a statistically significant difference in the mean of the maturity of callable bonds relative to the mean maturity of noncallable bonds for all three periods.

The tax hypothesis pertaining to the determination of callable and noncallable bonds is highly debatable. Evidence exists that claims that a higher tax rate would induce a firm to issue a bond with a call feature, while others claim that lower tax rates cause firms to issue callable debt. No significant documentation for either case persuades us to lean in one direction or another. Thus our anticipation of the sign of the variable MTAX is vague. Because of

the lack of testimony, we do not expect to find significant results for the tax hypothesis. Indeed, the means test illustrates that there is no statistically significant difference between the mean of the callable debt as opposed to the noncallable debt for all three-test periods.

For informational purposes, we are interested in whether the firm type would lend predictability to call feature usage. Historically, utility firms have been the primary users of the call feature. It is this relationship that we attempt to capture in the firm classification variables. The inclusion of three dummy variables into the study is executed in order to capture the effect of firm type. The FINANCE variable is deemed the base case variable. The results are positive in that the means test reveals that both UTILITY and INDUSTRIAL have significantly different means when examining the callable bond population relative to the noncallable bond population for all three test periods.

To further test the notion that there exists a difference in the variables between the 1977-1986 and 1987-1996 periods, we construct a t test that calculates the difference in the means of each of the variables between the two decades. The t-test lends support that all the factors proposed to effect the call decision during the latter decade are also present in the former decade but not by the same magnitude. The null hypothesis of the t-test examines whether the true means of two groups of observations are the same. As with the other t-tests performed, the t-test computes the t statistic based on the assumption that the variances of the two groups are equal and whether they are unequal. A large t statistic indicates that the variables in the two groups, 1977-1986 and 1987-1996, are statistically different. Such results lend credence to our hypothesis that the five hypotheses used to explain the call feature in the earlier decade are not sufficient in explaining the call feature since the structural break.

The results of this test are provided in Table 5 where the t statistic and the probabilities are given for both the equal and unequal variance scenarios. As demonstrated, the t statistics for all the variables, except DA, have very high t values and probabilities indicating a significance level of 1%. The DA results reveal a variable whose mean in the former decade is statistically identical to the mean in the latter decade. However, the results for the DA variable with unequal means are statistically significant at the 10% or better level, while the equal variance means are in fact insignificant. With such strong results, we are confident that a difference in the estimation of the call feature does exist for the two-decade testing period.

TABLE 5
Difference in Means Test

Independent variables estimated during 1977-1986 period versus Independent variables estimated during 1987-1996 period[a]

	Unequal Variances		Equal Variances	
Variable	**t-test**	**Prob > |T|**	**t-test**	**Prob > |T|**
*UNCER	31.5984	.0001	38.4834	.0001
*LEVEL	48.8186	.0001	57.6007	.0001
*HIGH	20.1880	.0001	22.7189	.0001
*MODERATE	-21.6011	.0001	-22.8834	.0001
DA	-1.8644	.0623	-1.2971	.1947
*MARKET	26.9635	.0001	27.8989	.0001
*GROWTH	-5.3782	.0001	-5.4104	.0001
*MAT	13.5972	.0001	13.6488	.0001
*MTAX	-3.4178	.0006	-2.3775	.0175
*UTILITY	5.2364	.0001	5.5556	.0001
*INDUSTRIAL	14.4635	.0001	15.2137	.0001

Note: Tests the hypothesis that the true means of the two groups (decade 1977-1986 versus 1987-1996) are the same. The test computes the t statistic based on the assumption that the variances of the two groups are equal and also computes the t statistic based on the assumption that the variances are unequal.

*Indicates that we can reject the null hypothesis that the means of each variable are the same at the 10% or better significance level.

The logit regression function as specified in equation (1), is used to measure the ability of the independent variables to describe the dependent variable, CALL. The logit regression equation helps determine the validity of the five hypotheses by testing the predictive powers of the independent variables in explaining the change in the dependent variable (i.e., CALL equals 1 if debt is callable and 0 otherwise). The independent variables are used as proxies to represent the five hypotheses. The logit regression allows us to analyze the five theories concurrently, indicating the validity of all five possible hypotheses for the determination of the call feature. The results of the logistic regression estimation equation are displayed in Table 6 (1977-1996) and Table 7 (1977-1986 and 1987-1996).

All tests are performed on the entire balanced sample data set, which includes all callable and noncallable bonds that were issued during the 1977-1996 period. The data from the two sub-samples, 1977-1986 and 1987-1996, are then tested. The data sub-sets are also of balanced sample sizes. The balanced sample sizes ensure that an equal number of callable and noncallable bonds are used for each testing period.

The logit regression indicates that the variable UNCER shows no significant impact on the firm's decision on whether to issue callable bonds for any of the test periods. The regression results also indicate the incorrect sign, but the results are insignificant and thus indicate that UNCER has little to no impact on the issuance of callable debt within each of the three periods. It is reasonable to conclude that the variability of interest rates may not have an impact on the firm's decision making process. Our overall conclusion for this variable is that it plays no critical role in the estimation of the call feature before or after the structural break.

Unlike the uncertainty of interest rates, the logistic regression equation shows that the level of rates is significant and is of the expected sign for all three-test periods. We can conclude that a firm's management did use the level of interest rates in their decision to issue callable debt or not. Furthermore, the outcome matches that found by Kish and Livingston (1992). As previously noted, the level of interest rates is the most common explanation for call feature usage in the popular literature. Therefore, we can justify that the level of interest rates, not only has been a significant factor in the determination of the call feature, but also continues to be a constituent in the post structural break decade.

As for the ratings variables, HIGH and MODERATE, the logit results demonstrate that both variables are significant and are of the correct sign within all three periods. The risk level of a particular issue does impact the manager's decision to issue callable versus noncallable bonds. We conclude that the ratings variable is used as a proxy for the management of the firm to signal the market as to future firm prospects.

In addition, the logistic regression shows that the variable DA is insignificant. Thus we fail to find support that the capital structure as represented by DA plays a role in the management's decision making process for the determination of callable debt. This result differs from that in the Kish and Livingston (1992) study.

The logit regression indicates that while the MARKET variable has the correct expected sign, it is not significant for the total period, but is significant for both sub-periods. This offers weak support of the notion that the anticipated default probability is a factor when deciding whether a call feature should be employed. The Kish and Livingston (1992) study concurs with these results as their evidence suggests a significant impact of the MARKET variable over the 1977-1986 period.

The means tests results support those of the logistic regression, which indicates that the growth variable is statistically significant in the determination of call feature usage for the total period and the second sub-period 1987-1996. The variable also provides the anticipated expected sign. This helps confirm that this variable plays a significant role in the determination of the call feature. Within the 1977-1986 period, the logit regression shows that the GROWTH variable is of the wrong sign and is statistically insignificant. The results coincide with the Kish and Livingston (1992) study over the same time period, demonstrating that the GROWTH variable was not a significant factor in 1977-1986. Since during the 1977-1986 period, the rate of growth of assets was not deemed to be an important factor in the determination of the call feature, yet the 1987-1996 decade reflects an importance of such a variable. The consequence of these factors lends support to the structural break notion.

The logistic regression results support the contention that the variable MAT is of the anticipated sign and is statistically significant for all three periods, indicating the maturity hypothesis is credible. The MAT results coincide with the Kish and Livingston (1992) study. We conclude that the maturity hypothesis is a determining factor in the call feature use. In addition, the results from the logistic regression show that the MTAX variable is insignificant and therefore we conclude that the tax hypothesis is not a contributing factor in the determination of call feature usage for all three-test periods. The calculations are in agreement with the Kish and Livingston (1992) study.

The logistic regression provides weak support in that although both variables are significant for all 3-test periods, the UTILITY coefficient shows the wrong sign in both the total period and the sub-period 1987-1996. This may indicate a structural shift in the utility classification of firms. We determine that the firm classification specification is an indicator of the probability that the firm's management will issue bonds that include a call feature. The results

in the Kish and Livingston (1992) study were also mixed. Our reasoning for the inclusion of the firm type variable is to reveal that utility firms have historically been the primary issuers of callable debt. Due to deregulation during the 1990s, we expected to find a differing impact of the firm type over the two decades studied. In fact, when comparing the two decades, we expose a difference with respect to the utility firms. The 1977-1986 decade shows that the UTILITY variable while significant has the expected positive sign. The positive sign indicates that a firm's manager is more likely to issue a callable bond. Prior to deregulation, we would expect the firm to issue callable bonds as they have historically done so under regulated environments. On the other hand, the 1987-1996 decade shows that the variable UTILITY is still significant, yet has a negative sign. The negative sign insinuates that utility firms are more likely to issue a bond without a call feature, supporting our conjecture that deregulation has eliminated the need for callable bonds in the sector of the economy.

Although we found several variables in each testing period to be significant, we have not yet determined whether the overall model is significant in each of the data subsets (1977-1986, 1987-1996). Tables 6 and 7 indicates the overall model's χ^2 value and its associated probability, which indicates that both subsets are significant and specify an appropriate relationship between the dependent and independent variables.

Although the individual variables and the model as a whole are found to have some significance, we also desire to assess the predictability of those variables on the determination of the call feature. The stated hypotheses still hold true, but how well the model fits the sample data is yet to be determined. To compare the two decades on the basis of correctly predicted probabilities, we look to the concordance and discordance ratios in Table 7. The 1977-1986 statistics show that the model correctly classified the callable and non-callable bonds in 85% of the observed responses and incorrectly specified in 14.8% of the cases. The 1987-1996 model, although highly correct, was

TABLE 6
Logistic Regression Estimation Equation

Sample Period: 1977-1996

Variable	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate
*INTERCEPT	1.1465	0.1689	46.0842	0.0001	
UNCER	-0.1626	0.1255	1.6771	0.1953	-0.0268
*LEVEL	0.0461	0.0173	7.0861	0.0078	0.0578
*HIGH	-3.2886	0.1606	419.2423	0.0001	-0.7550
*MODERATE	-2.6670	0.1446	245.6485	0.0001	-0.5870
DA	-0.0096	0.0111	0.7476	0.3873	-0.2554
MARKET	0.2341	0.1457	2.5804	0.1082	0.0372
*GROWTH	0.4339	0.0894	23.5248	0.0001	0.0826
*MAT	0.1105	0.0049	503.7897	0.0001	0.5780
MTAX	1.8400	2.4260	0.5800	0.4463	0.0579
**UTILITY	-0.1995	0.1203	2.7512	0.0972	-0.0362
*INDUSTRIAL	-0.8808	0.0927	90.2394	0.0001	-0.2245

Model χ^2 = 1217.395
Probability = 0.0001

Association of Predicted Probabilities and Observed Responses

Concordant = 78.5%	Somers' D = 0.573
Discordant = 21.2%	Gamma = 0.574
Tied = 0.2%	Tau-a = 0.287

Note: See Table 2 for a complete description of the variables. The model is estimated using firms that issued straight callable and noncallable bonds during any given year in the estimated time period. The prediction signs indicate a positive (+) sign if a callable bond is more likely to be issued and a negative (-) sign if a noncallable is more likely. The base case in the ratings variables is LOW. The base case in the firm classification variables is FINANCE.

*Variable is significant at the 1% or better significance level.
**Variable is significant at the 10% or better significance level.

TABLE 7
Logistic Regression Estimation Equation

Sample Period: 1977-1986

Variable	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate
*INTERCEPT	-2.2661	0.5139	19.4426	0.0001	
UNCER	-0.1402	0.1949	0.5174	0.4720	-0.0283
*LEVEL	0.0833	0.0292	8.1176	0.0044	0.1121
*HIGH	-1.4833	0.2833	27.4113	0.0001	-0.3999
*MODERATE	-0.8399	0.2539	10.9392	0.0009	-0.2315
DA	0.1059	0.3384	0.0980	0.7542	0.0130
*MARKET	2.8905	0.3242	79.4938	0.0001	0.4529
GROWTH	-0.0975	0.2008	0.2356	0.6274	-0.0183
*MAT	0.1167	0.0106	121.8813	0.0001	0.6138
MTAX	-0.0350	0.1030	0.1178	0.7314	-0.0387
*UTILITY	0.7717	0.2404	10.2999	0.0013	0.1594
**INDUSTRIAL	-0.3668	0.1742	4.4332	0.0352	-0.1004

Model χ^2 = 495.574
Probability = 0.0001

Association of Predicted Probabilities and Observed Responses

Concordant = 85.0%	Somers' D = 0.702
Discordant = 14.8%	Gamma = 0.703
Tied = 0.1%	Tau-a = 0.351

Sample Period: 1987-1996

Variable	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate
*INTERCEPT	1.9496	0.2438	63.9294	0.0001	
UNCER	-0.2134	0.1948	1.1994	0.2734	-0.023015
*LEVEL	0.0912	0.0285	10.2430	0.0014	0.071647
*HIGH	-4.1202	0.2128	374.7990	0.0001	-0.847243
*MODERATE	-3.2034	0.1914	280.0948	0.0001	-0.783610
DA	-0.0122	0.0128	0.9039	0.3417	-0.373276
*MARKET	-0.7206	0.1862	14.9818	0.0001	-0.108544
*GROWTH	0.5088	0.1040	23.9550	0.0001	0.096953
*MAT	0.1207	0.00585	411.4619	0.0001	0.618411
MTAX	2.299	2.853	0.6490	0.4205	0.083040
*UTILITY	-0.4483	0.1470	9.2974	0.0023	-0.077145
*INDUSTRIAL	-1.1892	0.1210	96.5902	0.0001	-0.290159

Model χ^2 = 891.370
Probability = 0.0001

Association of Predicted Probabilities and Observed Responses

Concordant = 79.4%	Somers' D = 0.590
Discordant = 20.4%	Gamma = 0.592
Tied = 0.2%	Tau-a = 0.295

unable to correctly categorize the responses in as many instances as the previous decade. The concordance rate for the latter period is 79.4% while the discordance rate is 20.4%. This evidence shows that the latter period model does not have the same predictive abilities as the former period model, which lends credence to our hypothesis that other factors are playing a role in the latter period that we have not captured in the model.

In addition, we can look at the R^2 figures for the two models to determine the models overall strength in determining how well the independent variables explains the dependent variable. In other words, are the independent variables which we have specified to be the indicators of the call feature adequately explaining the full variation in the dependent variable? The R^2 is also listed in Table 7. The R^2 for the 1977-1986 period is 0.702 while the R^2 for the 1987-1996 period is 0.590. This states that the independent variables can explain 70.2% of the variation in the dependent variable in the 1977-1986 decade. Similarly, the independent variables can only explain 59.0% of the variation in the dependent variable for the 1987-1996 period. This gives additional indication that we lack variables in the latter period that would help explain the determinants of the call feature in the more recent decade.

CONCLUSION

The intention of this study is to determine if the structural break in the callable bond market had an impact on the determinants of the call feature as specified by Kish and Livingston (1992). As such, we perform the identical tests both before and after the structural break to assess any differences in the variables or the model. When directly comparing the two subsets, we find that some differences do exist between the stated time periods. In examining the 1977-1986 period, we find the contributing variables to the decision making process are LEVEL, HIGH, MODERATE, MARKET, MAT, UTILITY, and INDUSTRIAL. We show that the level of interest rates, the debt rating, the default probability, the length of time to maturity and the firm classification all play an important role when a given firm chooses to issue callable or straight debt. The 1987-1996 period indicates that the relevant variables are LEVEL, HIGH, MODERATE, MARKET, GROWTH, MAT, UTILITY, and INDUSTRIAL where bold indicates which variables are the same in both sub-periods. The factors that are important for the firm's decision making process are the level of interest rates, the debt rating, the probability of default, the transfer of wealth externality issue, the number of years to maturity and the firm classification. Of particular note, we found that the GROWTH variable is of impact in the latter decade and not the former decade. The results indicate that the model, as specified in the 1977-1986 decade, for the determination of the call feature still holds in the 1987-1996 decade. In other words, the hypotheses that were determined in the earlier time period still hold validity in the later years.

ENDNOTES

1. The call feature on a corporate debt issue is a simple tool used by management to protect against future adversities. For a specified period of time, the call feature enables the firm to draw in previously issued bonds. When the firm decides to call in a debt issue, a premium is paid to the bondholders for giving up the right to retain the security until maturity. Investors are willing to purchase assets with call features because the bonds are offered with a higher yield than comparable non-callable bonds. The increased yield is compensation for the risk that the bond may be terminated before the original maturity date.

2. One explanation for the reduced issuance of callable debt is the simultaneous the development of complex valuation methods proliferated into mainstream finance during the 1980s. If bond investors are now able to accurately price the call options attached to corporate debt the bargain prices enjoyed by corporate issuers may now be eliminated.

3. According to the data gathered from Securities Data Corporation, the structural change in the callable bond market occurred in 1986. At that time the number of newly issued non-callable bonds exceeded the number of callable bonds.

4. The impact of interest rates on the inclusion of the call option only makes sense under the premise that bond managers can predict interest rate movements with more accuracy than the common bondholder. Without this ability, the call feature is a zero sum game where the benefit to the firm of the call feature is exactly offset by the loss to the investor.

5. For binary response models, the response, Y can take on one of two values, 1 if the bond contains a call feature, zero if not. If x is the vector of explanatory variables then $p = Pr(Y = 1 \mid x)$ is the response probability modeled by SAS. The logistic model produced follows the form:

   $$Logit(p) = \log(p/(1-p)) = \alpha + \beta' x$$

   where α is the intercept parameter and β is the vector of slope parameters.

Press and Wilson (1978) provide reasoning for the preference of logistic regression models with maximum likelihood estimators over traditional linear discriminate analysis. The rationale for such statistical techniques is determined by the relationship of the variables. When at least one of the variables is qualitative, multivariate normality is eliminated. Under such conditions, logistic regression with maximum likelihood estimators provides superior results. In our analysis, logistic regression with maximum likelihood estimators is preferred due to the number of independent dummy variables. In addition, the binary dependent variable provides further reasoning for the use of such estimation techniques because of the non-normal nature of the estimated equation.

6. UNCER in 1983; the variable LEVEL in 1983,1987, and 1994; the variable MODERATE in 1984; the DA variable in 1992; the GROWTH variable in 1986 and 1987; MAT in 1979; the variable INDUSTRIAL in 1977 and 1978.

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