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THE CHOICE BETWEEN CALLABLE AND NONCALLABLE BONDS

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Abstract

We examine the choice and the offer spreads between callable and noncallable bonds. We find significant differences by industry sector and therefore segment our results by financial and nonfinancial industries. For the financial sector, the popularity of callable and noncallable bonds is significantly related to the economic environment. Financial and high-grade nonfinancial callable bonds are also more likely to be issued via a shelf prospectus. Although firms that issue callable bonds do not consistently display the characteristics associated with severe agency problems, the issue choice for below-investment-grade nonfinancial and lower rated financial bonds, where we can expect agency problems to be more severe, is more consistent with agency theory than is the issue choice for higher rated bonds.

1 Introduction

In recent years, many observers have noted that the popularity of callable bonds is declining. For example, Kalotay (**2008**) and Banko and Zhou (**2010**) observe that the portion of callable bonds have been declining over the last 20 years and their popularity has shifted toward the below-investment-grade segment of the corporate bond market. However, no explanation is offered for this trend. In contrast, our more recent sample finds that new issues of callable bonds are becoming increasingly popular. Figure I shows that although only 20% of all newly issued, U.S. dollar, fixed-coupon corporate bonds were callable in 1995, year by year the popularity of callable bonds increased until 2006, when the popularity of callable bonds again decreased. We do not know why there is such a variation in the choice between callable and noncallable bonds. Therefore, we develop a set of hypotheses and test them in an attempt to explain why the popularity of call provisions changes.

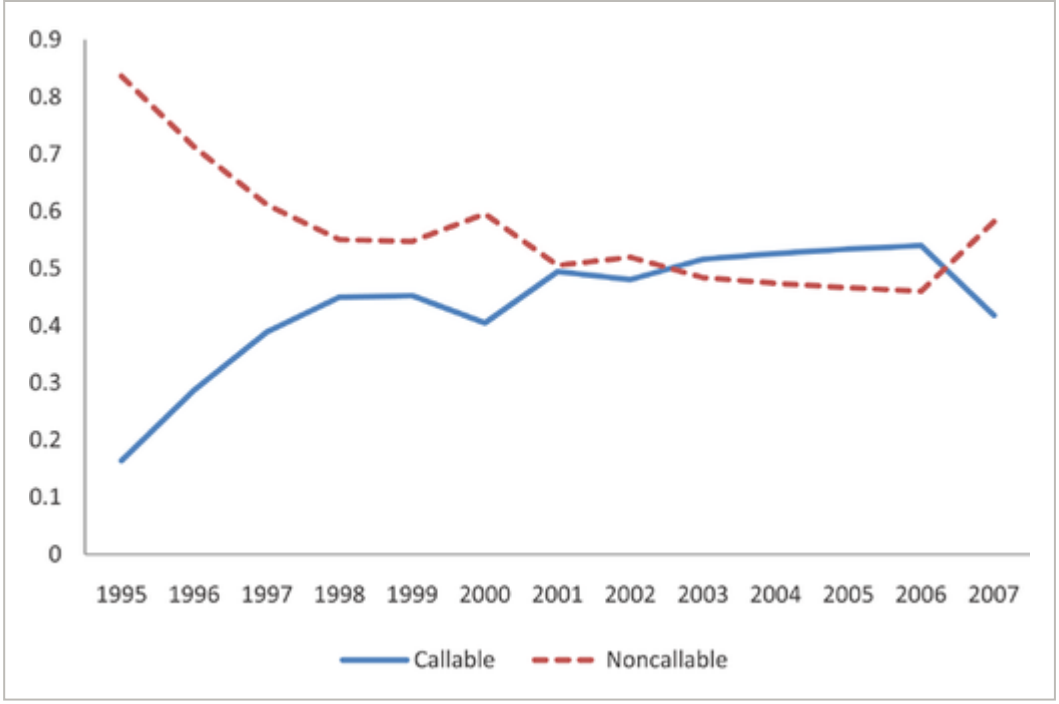

Figure I

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Proportion of All Newly Issued, U.S. Dollar, Fixed-Coupon Corporate Callable and Noncallable Bonds by Year from 1995 to 2007.

A call option empowers the issuer to take advantage of bondholders by repaying the debt in advance when market yields decline. When interest rates decrease, the call price is less than what the fair value of debt would have been absent the call option. Following Kraus (**1973**), finance has rejected financial gain as an explanation for call provisions because in an efficient market, gains to shareholders via refinancing at lower interest rates would be anticipated and expropriated by bondholders in terms of the initial call provision. Instead, Thatcher (**1985**), Kish and Livingston (**1992**), and Boreiko and Lombardo (**2011**) suggest agency can explain the use of call provisions. Although earlier empirical studies such as Crabbe and Helwege (**1994**) could not find empirical support for individual agency theoretic explanations for callable bonds, more recent work by Banko and Zhou (**2010**) and Chen, Mao, and Wang (**2010**) finds that call options are used to resolve a combination of asymmetric information, underinvestment, and risk-shifting agency problems.

Another argument suggests that some issuers can use callable bonds to hedge interest rate risk. In fact, Banko and Zhou (**2010**) find some evidence of this for investment-grade callable bonds. Recently, Choi, Jameson, and Jung (**2013**) observe that asymmetric information creates an incentive to issue callable debt even when market conditions do not support a separating equilibrium. This happens because information asymmetry that leads the market to overestimate the issuer's default probability also leads it to undervalue the call premium. Still, agency theoretic, asymmetric information, and hedging rationales for call provisions do not provide an explanation for the time-varying popularity of callable bonds.

This raises several interesting questions. Are there any economic factors that can explain the shifting popularity of callable bonds relative to noncallable bonds? If so, do firms that issue callable bonds take into account these factors and does this influence the preferred practice of issuing callable bonds? Do

firms that issue callable bonds display any characteristics associated with agency problems? Finally, do issuers pay a premium for the call feature?

This article is related to a series of studies that examine the motivation and offer spreads of different types of callable bonds. Daniels, Diro Ejara, and Vijayakumar (**2009**) examine the motivation and offer spreads of bond clawbacks, and Nayar and Stock (**2008**) study make-whole bonds. Clawbacks and make-whole bonds are special types of callable bonds that restrict the refunding of callable bonds to issues of equity (clawbacks) or adjusts the call price at the date of call (make-whole). Banko and Zhou (**2010**) revisit the agency theoretic explanations for callable bonds, and Chen, Mao, and Wang (**2010**) examine the refunding behavior of callable bonds. We add to this body of work by examining the time-varying popularity of ordinary callable bonds and the influence that the issue process, bond covenants, and economic environment have on the offer spread for callable and noncallable bonds and on the value of call premiums. Unlike most studies in this area, we include financial firms as a larger number of callable bonds are issued by financial firms than by industrial and utility bonds combined during our 1995–2008 sample period. We also include financial bonds in our sample because we wish to determine whether the financing of financial firms is subject to the same agency theoretic problems as industrial firms.

Other work includes the influence of the economic environment on the popularity of callable bonds, but evidence is fragmentary and contradictory. For example, Kish and Livingston (**1992**), Güntay, Prabhala, and Unal (2002), and Banko and Zhou (**2010**) find that the popularity is increasing, but Sarkar (**2001**) finds that the popularity of a call feature is decreasing in the level of interest rates. However, all of this work occurs during the time the call feature was being reengineered through the introduction of make-whole and clawback refinements to the call feature (see Goyal, Gollapudi, and Ogden **1998**; Nayar and Stock **2008**). Moreover, none of this work accounts for the full range of interest rate and credit risk environment variables. In contrast, we examine the impact of the economic environment by including proxies for the level, slope, and interest rate volatility of the term structure of interest rates, as well as the credit spread, on a large sample of financial and nonfinancial, callable and noncallable bonds, culled of make-whole, clawback, preferred share, convertible, and put features.

We find that the motivation for issuing callable versus noncallable bonds varies by industry. Controlling for annual time effects, we discover that the popularity of callable bonds relative to noncallable bonds is related to the economic environment more for financial than nonfinancial firms. Specifically, the likelihood of new issues of callable bonds decreases in the level and slope of the term structure and in the credit spread for financial bonds. In contrast, the likelihood of nonfinancial callable bonds decreases in the credit spread only. As noted earlier, some authors find that the popularity of the call feature increases in interest rates. These different results can be related to the cost of the call feature as, consistent with option pricing theory, we find that call premiums rise with interest rates and with interest rate volatility. Therefore, as the level and volatility of the term structure rise, the cost of a call feature rises so that new issuers can reconsider their choice to issue a callable bond based on the changing trade-off between the increased cost of the call feature and the hedging benefit of calling if interest rates later fall.

Because we find evidence that the demand for callable bonds is not random, it follows that firms can adjust the issuing process to take advantage of changes in the economic environment if these changes matter to them. We find that all financial and higher and medium investment credit grades of nonfinancial firms are more likely to issue callable bonds using institutional arrangements that allow

them to conveniently issue callable bonds in response to changes in the economic environment. However, after correcting for self-selection bias, we find that issuers of financial callable bonds pay around 48 basis points more relative to noncallable bonds for the option to call a bond before maturity. Moreover, the call premium rises with the level of interest rates, volatility, and maturity but falls with improvements in credit rating. Clearly, our results support Kraus (**1973**) in that issuers of callable bonds do not appear to save on interest costs by issuing callable bonds.

We find mixed evidence that firms use callable bonds to deal with agency problems. On the one hand, lower rated and less profitable financial firms and lower rated nonfinancial firms, the types of firms most likely to experience severe agency problems, are more likely to issue callable bonds. On the other hand, callable bonds are also more likely to be issued by more profitable nonfinancial firms, a type of firm not normally thought of as subject to severe agency problems. We find similar mixed evidence in the literature. Consistent with agency theory, Banko and Zhou (**2010**) and Kish and Livingston (**1992**) find that smaller and lower rated bonds are more likely to contain a call feature, but inconsistent with agency theory and consistent with our results, Banko and Zhou find that more profitable firms, particularly those with a moderate rating, are more likely to issue callable bonds. We go one step further than the literature and include proxies for restrictive and security covenants that can potentially address agency problems. Consistent with agency theory, callable nonfinancial bonds are more likely to contain restrictive covenants. In contrast, financial callable bonds, though likely to include enhanced security provisions, are also unlikely to contain restrictive covenants. When examined by broad credit classes, we find more consistent support for agency theory for below-investment-grade nonfinancial bonds and lower rated financial bonds, the type of bond that is most subject to severe agency problems. Specifically, for below-investment-grade nonfinancial bonds, smaller firms are more likely to issue callable bonds with restrictive covenants. Similarly, for lower rated financial bonds, less profitable firms are more likely to issue callable bonds with enhanced security covenants. Still, there is a slight flaw in this conclusion in that for both sets of firms, callable bonds are more likely issued via a competitive than a negotiation process, suggesting there are investors that are sanguine about agency issues.

2 Reasons for Issuing a Callable Bond

We do not know why the popularity of call provisions varies through time. Clearly, there is more to the dynamics of the callable bond market that we can explain. Below, we divide our hypotheses concerning callable bonds into two sets: those based on the economic environment and those based on agency problems. Table 1 provides a summary of our hypotheses.

Table 1. Summary of Hypotheses

Factors/Variables	Callable Bonds
Economic environment	
LEVEL	Positive/negative
SLOPE	Negative
VOLATILITY	Positive/negative
CREDIT SPREAD	Negative

Factors/Variables	Callable Bonds
SHELF	Positive
Agency	
PRIVATE	Positive
SIZE	Negative
ROA	Negative
RATING	Negative
SECURITY	Positive
RESTRICT	Positive
COMPETITIVE	Negative

Note

The hypothesized relations between bond issue characteristics and issues of ordinary callable and noncallable bonds.

2.1 Economic Environment

Changes in the economic environment can explain the time-varying popularity of callable versus noncallable bonds because changes in the level, slope, and volatility of the term structure and changes in the credit spread imply that the costs and benefits of call provisions can vary. As we later show, a rise in the level of interest rates increases the value of the call option embedded in the callable bond, making new issues of callable bonds more expensive. Therefore, as interest rates rise, callable bond issues are discouraged as call premiums rise. Alternatively, the call feature can be used to hedge interest rate risk. If interest rates mean revert, the potential that interest rates will fall and the bond will be called over the life of the bond increases as interest rates increase. Consequently, as interest rates increase, the popularity of call features will rise as more firms are likely to benefit from calling them before maturity. As a result, we cannot sign the relation between the level of interest rates and the popularity of the call feature as the relation will depend on two offsetting factors. As interest rates rise, call features will be more costly but can also be more beneficial for hedging interest rate risk.

Fama (**1984**), Hardouvelis (**1988**), and Mishkin (**1988**) all find that increases in forward rates are associated with higher future spot rates of interest. Estrella and Mishkin (**1997**) find that increases in the slope of the term structure are associated with increases in anticipated inflation. Estrella and Mishkin (**1998**) and Ang, Piazzesi, and Wei (**2006**) also find that decreases in the slope of the term structure foreshadow poor economic conditions. This suggests that an increase in the slope of the term structure, signaling a rise in forward rates, can foreshadow economic events that can lead to a rise in interest rates. Therefore, as the slope of the term structure rises, callable bond issues can be less popular as fewer firms expect to benefit by calling them.

As we later show, a rise in interest rate volatility increases the value of the call option embedded in the callable bond, making new issues of callable bonds more expensive. Therefore, as interest rate volatility rises, callable bond issues are discouraged as call premiums rise. Similar to the interest rate

level, however, higher volatility also increases the hedging potential for call provisions. Again, therefore, we are unable to sign this relation as it depends on the trade-off between the cost and the potential hedging benefit of the call provision.

Callable bonds can benefit from a narrowing of the credit spread because if corporate bond yields fall as credit conditions improve, the option to call moves toward being in the money. Van Horne (**2001**) suggests there is a credit cycle that is related to the economic cycle. Moreover, Martell (**2008**) finds that domestic corporate spreads are related to a lagged component of sovereign spreads. This implies that as credit spreads widen (narrow), calling the bond is unlikely (likely) as credit conditions weaken (strengthen) and so callable bonds are less (more) popular as issuers are unlikely (likely) to benefit.

Shelf-registered bonds are those that can be issued conveniently in response to market events as most of the detailed information requirements are already filed with regulatory authorities. If firms wish to respond to economic conditions, their ability to do so will be enhanced by employing shelf-registered bonds. As we suggest above, changes in the economic environment can influence the decision to issue a callable bond. Therefore, if changes in the economic environment do influence the choice for issuing a callable bond, firms are likely to issue callable bonds via shelf registration.

2.2 Agency Problems

It is well noted in the literature (see, e.g., Thatcher **1985**; Robbins and Schatzberg **1986**; Kish and Livingston **1992**; Boreiko and Lombardo **2011**) that small, modestly profitable, low-credit-rating firms suffer from agency problems. Therefore, if callable bonds are used to alleviate agency problems, these small, low-profit, and low-credit-rating firms will favor callable bonds. Kwan and Carleton (**2010**) also find that small, lower rated firms include restrictive covenants in bond issues and are more likely to issue bonds privately. As small, low-profit, and low-credit-rating firms will likely have restrictive access to capital because of agency problems, we expect that when they issue callable bonds they will likely issue them privately. Because investors in bonds of small, low-profit, and low-credit-rating firms likely require higher security and restrictive covenants to protect their investment from agency problems, we expect that callable bonds will likely contain restrictive and high-security covenants. As this suggests that the callable bond contract is complex, new issues of callable bonds are likely to be sold via negotiation rather than competitive bid. [1]

3 Data Selection

We use the Mergent's Fixed Investment Securities Database (FISD). The FISD consists of detailed cross-sectional information on issue characteristics of all bonds the National Association of Insurance Commissioners (NAIC) had on its books as of January 1, 1995, and all bonds that it bought up to and including May 27, 2008. Each of the approximately 100,000 bond issues is identified by its international securities identification number (ISIN) and includes information on the maturity date, offering date, rating date, rating, rating type, broad industry category, and type of call provision.

From the FISD, we select all bonds that were issued on or after January 1, 1995, because before that date the NAIC had to backdate old issues to add them to the database. It is possible that bonds that matured before January 1, 1995, were not included so use of these backdated bonds may introduce unknown survivorship bias. We select all bonds that belong to the industrial, financial, and utility industries and eliminate Treasuries, other government and agency bonds, and preferred shares. Therefore, our sample contains corporate bonds only. We select only fixed-coupon bonds as we wish

to concentrate on the straightforward choice between callable and noncallable bonds. On examining these corporate bonds for rating type, we find that Duff & Phelps do not rate many bonds within each rating category. Moreover, virtually all bonds rated by Duff & Phelps are also rated by one of the other mainstream rating agencies, so we disregard Duff & Phelps ratings. However, we consider all Standard & Poor's (S&P), Moody's, and Fitch rated bonds because they rate a large number of bonds in all industry categories.[2] We keep only bonds with a rating date within one year of the offering date to ensure that the bond under study has the same rating it had on the date it was offered. To report the characteristics of the sample by rating we convert S&P, Moody's, and Fitch letter ratings into numerical equivalents from 21 (AAA) to 1 (C or D).[3]

From this initial selection of bonds, we select two subsamples: ordinary callable bonds and noncallable bonds. Ordinary callable bonds are flagged as callable but do not contain a put, conversion, make-whole, or claw-back provision. Similarly, noncallable bonds do not contain any of these provisions including an ordinary call provision.[4] We note that convertible bonds can be used to deal with agency problems, and in fact Daniels, Diro Ejara, and Vijayakumar (**2009**) find evidence to support this assertion. Other types of call features such as make-whole and clawback are studied by Goyal, Gollapudi, and Ogden (**1998**), Powers and Sarkar (**2006**), Nayar and Stock (**2008**), and Daniels, Diro Ejara, and Vijayakumar (**2009**). We are interested in whether ordinary call features are related to changes in economic circumstances and we have nothing to add concerning the use of convertible, make-whole, or clawback bonds. We disregard these securities as they are complex, sometimes containing a put feature and typically containing an ordinary call feature, making it difficult to separate the motivations for including ordinary call features in convertible, make-whole, and clawback bonds and obscuring the relation between changes in the economic environment and the popularity of issues of ordinary callable bonds.

We then collect additional security-specific information such as the offer spread and match the security's CUSIP with the issuing firm to collect company data, such as the return on assets, for the year the security was offered. These selection procedures leave a total sample of 5,776 bonds consisting of 2,748 ordinary callable (hereafter callable) and 3,028 noncallable bonds. We note that this sample size is comparable to other recent studies investigating bonds using the FISD including Daniels, Diro Ejara, and Vijayakumar (**2009**), 6,978 bonds; Banko and Zhou (**2010**), 2,109 bonds; and Nayar and Stock (**2008**), 336 bonds. Table 2 reports the details of the callable and noncallable bond subsamples.

Table 2a reveals three notable characteristics of our sample of callable and noncallable bonds. First, examining the subsamples of bonds by industry, we note that although callable and noncallable bonds are popular in all industries, there is a noticeable concentration of callable bonds in the financial industry. With the exception of Kish and Livingston (**1992**), most studies of callable bonds neglect callable financial bonds. Second, except for the utility industry, callable and noncallable bonds have the same average ratings, both being somewhat higher in the finance sector and somewhat lower in the industrial sector. Even in the utility industry, the difference in the average rating is minor, callable bonds having a somewhat lower average rating of A– and noncallable bonds having a higher rating of A+. Third, we note that in all industries, noncallable bonds tend to have much shorter scheduled maturities than their callable bond counterparts. Because the actual maturity of callable bonds is likely to be shorter than the scheduled maturity, one should be cautious in drawing conclusions about differences in scheduled maturity.

Table 2a. Cross-Sectional Sample Characteristics

Grade	Industrial			Utility			Financial		
	Ordinary Call	Noncallable	Subtotal	Ordinary Call	Noncallable	Subtotal	Ordinary Call	Noncallable	Sub
AAA	167	81	248	12	23	35	104	79	183
AA+	0	14	14	0	0	0	24	40	64
AA	5	70	75	0	2	2	265	16	281
AA–	18	101	119	3	27	30	119	27	146
A+	5	128	133	6	33	39	32	281	313
A	247	160	407	5	78	83	763	79	842
A–	3	237	240	0	77	77	180	259	439
BBB+	3	226	229	2	74	76	127	60	187
BBB	5	211	216	4	50	54	235	208	443
BBB–	3	103	106	2	26	28	171	19	190
BB+	9	67	76	0	5	5	28	7	35	116
BB	12	45	57	0	3	3	21	2	23	83
BB–	22	31	53	0	4	4	2	4	6	63
B+	34	28	62	1	6	7	6	6	12	81
B	45	15	60	1	2	3	6	1	7	70
B–	33	8	41	0	2	2	3	0	3	46
CCC+	10	2	12	0	1	1	1	0	1	14
CCC	2	0	2	0	0	0	0	0	0	2
CCC–	1	0	1	0	0	0	0	0	0	1
CC	1	0	1	0	0	0	0	0	0	1
Total	625	1,527	2,152	36	413	449	2,087	1,088	3,175	5,776
Rating	A–	A–	A–	A+	A–	A–	A	A	A	A–
Maturity	15.55	9.31	11.12	24.77	11.60	12.65	14.00	4.58	10.77	11.05

Note

This table reports the number of bond issues by industry, type, and rating from January 1, 1995, to May 8, 2008.

Table 2b reports the time-series characteristics of our sample. Issue activity remained steady until about the second half of 2007 when there were fewer issues of callable and noncallable bonds. The number of new issues of industrial callable bonds increased in 2001 and remained a popular funding choice for industrial bonds until 2007. Similar trends are seen for new issues of financial callable bonds except that callable bonds became more popular two years earlier and in most years there were very few below-investment-grade financial callable bonds.

Table 2b. Time-Series Bond Sample Characteristics

Year	Industrial				Utility				Financial				Total
	NC		Callable		NC		Callable		NC		Callable		
	IG	BIG	IG	BIG	IG	BIG	IG	BIG	IG	BIG	IG	BIG	
1995	215	10	15	9	62	0	8	0	129	0	26	0	474
1996	168	31	7	31	37	1	4	1	81	1	24	2	388
1997	134	28	4	25	57	1	3	0	80	8	29	17	386
1998	173	29	7	12	52	1	4	0	110	0	50	2	440
1999	128	11	4	8	29	0	1	0	125	3	100	1	410
2000	76	6	4	2	32	5	4	0	64	2	106	0	301
2001	174	16	65	15	47	0	1	0	160	2	88	0	568
2002	90	9	46	7	24	0	7	0	104	0	294	2	583
2003	44	16	107	26	17	1	1	0	89	0	433	3	737
2004	28	14	78	10	8	3	0	1	51	2	429	1	625
2005	40	15	38	14	10	2	0	0	30	1	165	35	350
2006	27	7	55	9	8	6	1	0	25	0	158	0	296
2007	28	4	26	1	6	2	0	0	19	1	118	4	209

Note

This table reports the number of bond issues by industry, type, and rating from January 1, 1995, to May 8, 2008. NC refers to the number of noncallable bonds, IG refers to the number of investment-grade bonds, and BIG refers to the number of below-investment-grade bonds.

Table 2c reports the characteristics of the firms that issued callable and noncallable bonds in our sample. Although there is no obvious time trend in the characteristics of the firms by industry, it is clear that, on average, financial firms are larger, have more debt, are less liquid, and are less profitable

than nonfinancial firms. These industry differences motivate us to investigate separately financial bonds and nonfinancial bonds.

Table 2c. Firm Sample Characteristics

Year	Nonfinancial					Financial				
	Size	DR	QR	ROA	Rating	Size	DR	QR	ROA	Rating
1995	11,861	29.61	0.61	4.78	BBB+	299,031	43.98	0.88	3.29	A
1996	21,057	33.23	0.80	4.73	BBB+	131,785	51.48	1.69	4.17	A
1997	98,285	34.81	0.72	5.15	BBB+	139,256	44.82	1.08	2.73	BBB+
1998	187,100	32.80	0.68	5.23	BBB+	370,368	45.97	0.80	2.71	A
1999	111,475	35.57	0.80	4.78	A–	1,478,999	49.72	0.85	2.39	A
2000	98,742	33.74	0.70	5.06	A–	1,256,054	61.97	1.05	1.71	A
2001	79,774	29.72	0.80	6.70	A	1,048,724	52.68	0.87	3.01	A
2002	32,811	32.59	0.79	6.35	A+	675,351	63.45	5.93	1.10	A–
2003	186,533	47.09	1.56	5.14	A	253,553	53.52	2.00	1.39	A
2004	1,079,728	60.85	15.75	4.03	A–	399,534	43.73	1.41	0.84	A
2005	828,759	54.44	7.99	4.66	BBB+	778,090	51.27	2.72	1.16	BBB+
2006	1,154,330	68.76	14.61	3.60	A–	1,637,735	41.47	1.61	1.14	AA–
2007	304,852	46.87	1.62	5.79	A	3,607,091	22.39	1.02	1.24	AA–
2008	9,911,514	30.44	0.65	5.66	BBB+	12,036,500	32.79	0.80	5.23	A+

Note

This table reports the characteristics of bond issues by industry, type, and rating from January 1, 1995, to May 8, 2008. All statistics are equally weighted averages for the issue year. Size is based on actual nominal values in thousands of dollars. The debt ratio is the total-debt-to-total-assets ratio, the quick ratio (QR) is the ratio of current assets (excluding inventories) to current liabilities, and ROA is the return on assets. Except for the QR, all financial ratios are expressed in percent.

4 Model Development

The FISD contains variables that indicate the presence of the full range of bond covenants including restrictive bond features and the security level. There is also an indicator for whether the bond was sold by competitive bids or by negotiation. As bond market and company-level data are not available from the FISD, we employ three additional sources of information. Treasury market information is collected from the Federal Reserve Bank of New York and other bond market information is collected from Datastream. We also collect company-level information from Bloomberg. The Bloomberg

database contains financial statement information that can be linked to the FISD bond information via the nine-digit CUSIP numbers.[5]

We collect the 1- and 10-year constant maturity Treasury interest rates from the Federal Reserve Bank of New York, Table H15. We proxy the level of the term structure as the 1-year rate and the slope of the term structure as the difference between the 10-year and 1-year constant maturity rates. Figure II reports that during the 1995–2008 sample period, there appears to be two interest rate cycles pivoting around 2000 and 2007 where the level of interest rates achieved a peak and the slope began to increase during the year.

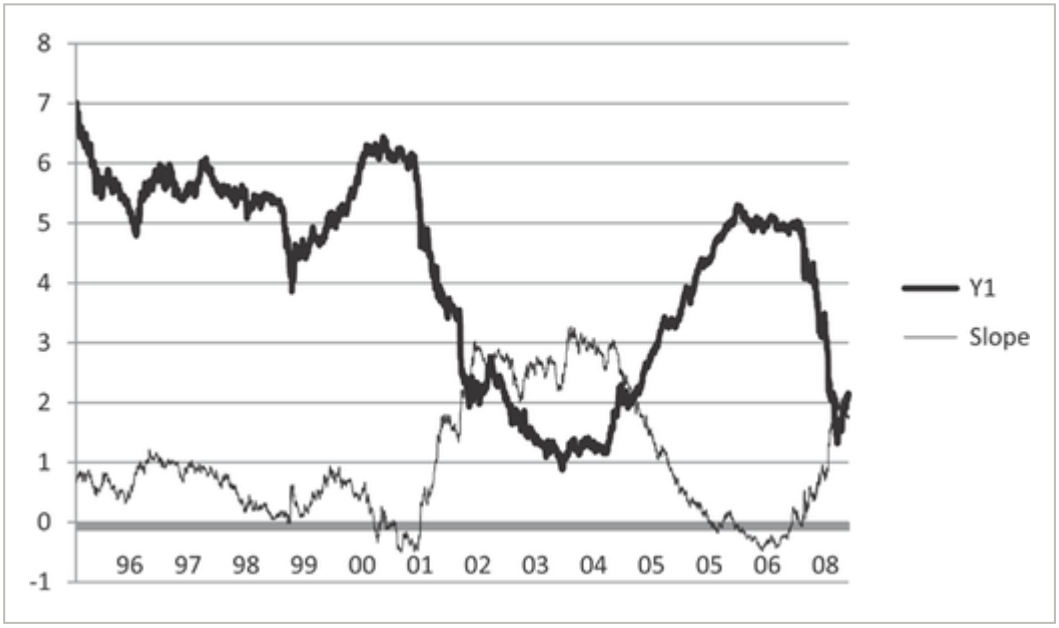

Figure II

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Level and Slope of the Treasury Term Structure As Depicted by the 1-Year and the Difference between 10-Year and 1-Year Treasury Yields As Reported by the Federal Reserve Bank of New York, Table H15.

We collect at the money five-year cap rates and the yield on the Merrill Lynch high-yield index from Datastream. At-the-money caps represent the implied volatility from five-year interest rate caps and are our proxy for interest rate volatility. The difference between the yield on the Merrill Lynch high-yield index and the one-year Treasury rate is our proxy for the credit spread on the bond market.

We wish to determine the variables that influence the popularity of callable bonds and the offer spread of callable and noncallable bonds. As we discuss in Section II, firms can self-select callable bonds according to the economic environment and agency problems hypotheses so we must adjust our inquiry for self-selection bias. Heckman (**1979**) provides the methodology for dealing with self-selection bias by treating the problem as a case of an omitted variable. We follow Heckman's two-stage procedure by first running a probit selection equation to extract the inverse Mills ratio and then use the inverse Mills ratio as an independent variable in an offer spread regression. The inverse Mills ratio then proxies for the unexplained factors that led to the selection of a given bond type, thereby accounting for the influence of self-selection.

Our selection equation investigates determinates of the popularity of callable bonds relative to noncallable bonds, and the offer spread equation, corrected for self-selection bias, investigates

determinates of the offer spread of bonds. The selection equation is:

$$\begin{aligned} P(CB = 1)_i = F(&\text{Constant} + \text{LEVEL}_i + \text{SLOPE}_i + \text{VOLATILITY}_i \\ &+ \text{CREDIT SPREAD}_i + \text{SHELF}_i + \text{PRIVATE}_i + \text{SIZE}_i + \text{R} \\ &+ \text{RATING}_i + \text{SECURITY}_i + \text{RESTRICT}_i + \text{COMPETITIV} \\ &+ \text{ISSUE AMOUNT}_i + \text{MATURITY}_i + \text{YXX}_i + \varepsilon_i), \end{aligned} \tag{1}$$

where *i* refers to a given bond and CB equals 1 if the bond is callable, and 0 otherwise. All variables are defined in Table 3 and, except for ISSUE AMOUNT, MATURITY, and YXX, are designed to test our hypotheses discussed in Section II and summarized in Table 1. The control variables ISSUE AMOUNT and MATURITY are included in the selection equation because the amount and maturity of an issue can have a bearing on whether a callable or noncallable bond issue is chosen. We include annual dummies YXX to control for time-series effects evident in Figure II for all years except the 2000 and 2007 pivot years and 2008 as there are very few observations for that year. We estimate (1) using maximum likelihood probit regressions for the full sample of 5,776 observations. The standard errors are corrected for heteroskedasticity and we extract the inverse Mills ratio from (1).

Table 3. Variables and Definitions

Variable	Definition
OFFER SPREAD	Offer yield less yield on a comparable maturity Treasury bond
Economic environment	
LEVEL	1-year Treasury yield
SLOPE	Difference between the 10-year and 1-year Treasury interest rates
VOLATILITY	Interest rate implied volatility as measured by 5-year at-the-money caps
CREDIT SPREAD	Credit spread as measured by the difference between the average yield on the Merrill Lynch high-yield index and the 1-year Treasury yield
SHELF	Dummy variable that equals 1 if the bond is a shelf-registered bond according to Rule 415, and 0 otherwise
Agency	
PRIVATE	Dummy variable that equals 1 is the bond is a private Rule 144a issue, and 0 otherwise
SIZE	Log of the issuing company's assets
ROA	Return on assets of the issuing company expressed in percent
RATING	21-point rating scale where AAA is 21, AA+ is 20, and so on until CCC– is 3, CC is 2, and C/D is 1
SECURITY	Coded from 1 to 7 in increasing order of security: junior subordinate (7), junior (6), subordinate (5), none (4), senior subordinate (3), senior (2), senior secure (1)

The offer spread equation contains the variables that we expect to determine the offer spread:

$$(Y_i - Y_m) = \text{Constant} + \beta\text{SECURITY}_i + \beta\text{RESTRICT}_i + \beta\text{RATING}_i + \beta\text{SHELF}_i + \beta\text{PRIVATE}_i + \beta\text{COMPETITIVE}_i + \beta\text{SIZE}_i + \beta\text{TDR}_i + \beta\text{QR}_i + \beta\text{ROA}_i + \beta\text{LEVEL}_i + \beta\text{SLOPE}_i + \beta\text{VOLATILITY}_i + \beta\text{CREDIT SPREAD}_i + \beta\text{CALLABLE}_i + \beta\text{MILLSOC}_i + \beta\text{YXX}_i + \varepsilon_i. \quad (2)$$

The dependent variable (Y_i – Y_m) is the offer spread, which is the difference between the offering yield for a given corporate bond *i* and the yield on corresponding maturity *m* Treasury bond, and MILLSOC is the estimated inverse Mills ratio from (1). We include a dummy variable CALLABLE that equals 1 if the bond is callable, and 0 otherwise. The coefficient of CALLABLE measures the extra yield required by a callable relative to a noncallable bond once the effect of self-selection is accounted for. Kraus (**1973**) suggests this coefficient will be positive.

5 Selection and Offer Spreads of Financial Bonds

With the exception of Kish and Livingston (**1992**), no other researchers that we are aware of include financial bonds in their sample. Kish and Livingston find that dummy variables for FINANCIAL and UTILITY bonds are insignificant, implying that including these different types of bonds in their sample is innocuous. As shown in Table 2c, however, financial firms are distinct from nonfinancial firms so we separately examine financial and nonfinancial bonds.

Table 4 reports the result of the selection equation 1 and sheds light on what determines the characteristics and type of bond a financial firm will issue. Columns 1 and 2 report the coefficients and standard errors, respectively, for the overall sample, and they control for credit risk by RATING whereas the remaining two pairs of columns report the coefficients and standard errors for the above-average-grade HIGHER (AAA to A) and below-average-grade LOWER (A– and lower) bonds, respectively. This partition of the data into these particular rating bands is dictated by the dearth of financial bonds rated below investment grade as shown in Table 2a. When we attempt to estimate our models for the below-investment-grade financial bond subsample (BB+ and lower), the selection model (1) did not converge and no reliable estimates could be obtained. The regressions seem to explain the data reasonably well with a pseudo R^2 of 82.1% for the overall sample. Moreover, 8 of 12 coefficients representing hypotheses summarized in Table 1 are significant for the overall sample. The control variables ISSUE AMOUNT and MATURITY show that relative to straight bonds, financial callable bond issues are larger and of a longer scheduled maturity for all regressions.

Table 4. Selection Model for Callable and Noncallable Financial Bonds

Variable	All	SE	HIGHER	SE	LOWER	SE
Constant	−5.597***	1.601	−11.167	25.891	−5.282**	2.397
LEVEL	−0.261*	0.138	0.049	0.217	−0.703***	0.267
SLOPE	−0.642***	0.151	−0.116	0.309	−0.816***	0.249
VOLATILITY	−0.002	0.021	0.006	0.046	−0.033	0.030
CREDIT SPREAD	−0.336***	0.060	−0.454***	0.096	−0.151*	0.091

Variable	All	SE	HIGHER	SE	LOWER	SE
SHELF	1.422***	0.257	3.181***	0.493	0.915**	0.396
PRIVATE	−0.548	0.362	N/A	N/A	−0.583	0.473
SIZE	−0.018	0.032	−0.159***	0.045	0.056	0.054
ROA	−0.169***	0.019	−0.194***	0.034	−0.169***	0.026
RATING	−0.048***	0.020	N/A	N/A	N/A	N/A
SECURITY	0.821***	0.203	1.337	4.305	0.742***	0.234
RESTRICT	−1.361***	0.195	−2.972***	0.345	−0.213	0.279
COMPETITIVE	1.207	0.091	N/A	N/A	11.867***	0.528
ISSUE AMOUNT	0.069**	0.030	0.168***	0.052	0.074*	0.045

Note

This table reports the results of a probit regression of callable versus noncallable financial bonds on variables that determine the popularity of ordinary callable and noncallable bonds. All variables are defined in Table 3. HIGHER and LOWER are higher (AAA to A) and lower (A– and lower) grade bonds, respectively. SE is standard error.

*** Significant at the 1% level.

** Significant at the 5% level.

* Significant at the 10% level.

5.1 Economic Environment

Support for the notion that the popularity of the call feature is time varying is provided by the year dummies. Before the 2000 pivot in the structure of interest rates, the call feature was relatively unpopular but after that point there is modest evidence that the call feature is more popular. The first five variables, from LEVEL to SHELF, examine the influence of the economic environment on bond issue choice. Overall, four of the five proxies for the economic environment are statistically significant. The lower the level and slope of the term structure and the narrower the credit spread, the more likely it is that financial callable bonds are issued. Moreover, financial callable bonds are more likely to be issued via shelf prospectus. Evidently, the popularity of callable bonds does vary as the economic environment changes and financial firms do tend to issue callable bonds using a process that allows them to conveniently respond to changes in the economic environment.

We note that Kish and Livingston (**1992**) and Güntay, Prabhala, and Unal (**2002**) find evidence that the popularity of call features increases with the level of interest rates, whereas Sarkar (**2001**) finds that the popularity of call features decreases in the level and volatility of interest rates. We later discover that the statistically significant inverse relation between the popularity of callable bonds and the level of interest rates is confined to the finance industry. Therefore, a likely reason why Güntay, Prabhala, and Unal find a different relation is because they examine nonfinancial bonds only, and Kish and Livingston (**1992**) combine financial and nonfinancial bonds in different portions than we do, leading

to contradictory results. Also, Sarkar (**2001**) and Kish and Livingston (**1992**) do not adjust for time-series effects.

Within broad credit partitions, we find that support for the economic environment hypothesis is strongest in the lower partition of credit ratings. Specifically, the popularity of lower grade financial callable bonds decreases in the level and slope of the term structure and credit spreads and are more likely than noncallable bonds to be issued via shelf prospectus. Still, the economic environment hypothesis receives support for higher rated financial bonds as well, as higher rated financial callable bonds are more likely issued via a shelf prospectus when the credit spread narrows.

5.2 Agency Problems

Firms that suffer most from agency problems are expected to be smaller, lower rated, and modestly profitable and have restricted access to capital, and therefore they tend to issue bonds privately. Moreover, if callable bonds are used to respond to agency problems, callable bonds should contain restrictive covenants and stronger security features that can further mitigate agency problems. Overall, Table 4 shows that that lower rated (RATING) and less profitable (ROA) financial firms do tend to issue callable bonds with stronger SECURITY covenants. However, if callable bonds are a response to agency problems, one would expect that the bond will contain restrictive covenants in an attempt to control agency issues. In fact, we find the opposite as callable financial bonds are less likely to contain restrictive covenants (RESTRICT).

Looking at the results by broad rating partitions, we find there is more consistent support for the agency theoretic explanation for issuing callable bonds for lower rated financial bonds. Specifically, lower rated financial callable bonds are sold by less profitable (ROA) financial firms that are more likely to contain stronger SECURITY covenants. Still, lower rated callable financial bonds are more likely to be issued by COMPETITIVE bids. If callable bonds are a response to agency problems, one would expect the bond to be issued via negotiation rather than by competition so this suggests that at least some investors are sanguine about potential agency problems for lower rated financial bonds. Meanwhile, consistent with agency theory, higher rated financial callable bonds are sold by smaller (SIZE), less profitable financial firms. Inconsistent with agency theory, however, these higher rated callable bonds are unlikely to contain restrictive covenants.

This mixed support for agency theory is consistent with the literature that uses similar proxies. Consistent with agency theory, Banko and Zhou (**2010**) and Kish and Livingston (**1992**) find that smaller and lower rated bonds are more likely to contain a call feature. However, inconsistent with agency theory, Banko and Zhou find that more profitable nonfinancial firms, particularly those with a moderate rating, are more likely to issue callable bonds. Although we find that less profitable financial firms are more likely to issue callable bonds, we always find that at least one secondary characteristic of financial callable bonds, such as the use of restrictive covenants or the type of issue process, does not support agency theory.

5.3 Offer Spreads

Table 5 reports the results of the offer spread equation 2 and sheds light on what determines the offer spread for financial bonds. Columns 1 and 2 report the coefficients and standard errors, respectively, for the overall sample and controls for credit risk by RATING, and the remaining two sets of columns report the coefficients and standard errors for the higher (AAA to A) and lower (A– and

lower) grade bonds, respectively. One can judge the economic significance of each coefficient by noting that the coefficients are denominated in percent. For example, an issue via shelf registration (SHELF) can save an extra 40.3 basis points on average relative to all other issues.

Table 5. Offer Spreads for Callable and Noncallable Financial Bonds

Variable	All	SE	HIGHER	SE	LOWER	SE
Constant	2.795***	0.683	−1.171**	0.516	3.476***	0.984
SECURITY	0.049	0.104	0.020	0.049	0.117	0.124
RESTRICT	0.404***	0.103	0.289**	0.140	0.457**	0.188
RATING	−0.175***	0.006	N/A	N/A	N/A	N/A
SHELF	−0.403**	0.147	−0.078	0.101	−0.752**	0.337
PRIVATE	0.100	0.218	N/A	N/A	0.280	0.417
COMPETITIVE	−1.678***	0.160	N/A	N/A	−1.478***	0.338
SIZE	0.008	0.011	0.002	0.014	−0.112***	0.038
TDR	0.003***	0.001	−0.002**	0.001	0.014***	0.001
QR	0.013**	0.006	0.056***	0.008	−0.031**	0.014
ROA	0.002	0.015	−0.010	0.019	0.000	0.026
LEVEL	−0.044	0.041	0.189***	0.050	−0.346***	0.101
SLOPE	−0.130***	0.045	−0.005	0.049	−0.471***	0.114
VOLATILITY	0.012*	0.007	0.011	0.010	−0.003	0.011
CREDIT SPREAD	0.169***	0.025	0.170***	0.037	0.160***	0.034
	***		***		***	

Note

This table reports the variables that determine the offer spread for new issues of financial callable and noncallable bonds. The inverse Mills ratio (MILLSOC) reports the difference in the offer spread for ordinary callable bonds relative to noncallable bonds. All variables are defined in Table 3. HIGHER and LOWER are higher (AAA to A) and lower (A− and lower) grade bonds, respectively. SE is standard error.

*** Significant at the 1% level.

** Significant at the 5% level.

* Significant at the 10% level.

We control for time effects by including year dummies. This allows us to examine the overall influence of the economic environment and agency theory on the average offer spread on callable and noncallable bonds. Figure II shows that relative to the pivot dates of 2000 and 2007, interest rates

were lower. This is reflected in the structure of the year dummies, which shows that offer spreads were generally lower relative to these dates and significantly so before the year 2000 pivot date.

A special feature of (2) is the inverse Mills ratio coefficient, which adjusts for self-selection bias. In the case of financial bonds, the inverse Mills ratio is marginally significant. Once the effect of self-selection is accounted for, the CALLABLE coefficient means that issuers of callable bonds must pay a premium of 48 basis points for the flexibility to call the bond before maturity. This clearly suggests that investors demand and receive compensation for call risk, as suggested by financial theory. The call premium is highly significant for higher and lower rated bonds and indicates that call premiums are lower for higher rated bonds. This is in contrast to Ederington and Stock (**2002**), who find that the call premium is insignificant and of the wrong sign in explaining corporate bond yields. However, we later replicate Ederington and Stock's findings for our nonfinancial sample.

Nine of the remaining 14 slope coefficients are statistically significant. The offer spread decreases in RATING but increases in restrictive covenants (RESTRICT). The later coefficient suggests that investors recognize that restrictions are an imperfect solution to a problem of concern to investors and therefore require a higher offer spread despite their inclusion in the bond contract. Consistent with our results, Ederington and Stock (**2002**) generally find that yield spreads increase for lower rated nonfinancial bonds.

Employing a competitive bid (COMPETITIVE) and issuing via a shelf prospectus (SHELF) reduce the offer spread. Firms with higher debt burdens (TDR) pay a higher offer spread, but firms with higher liquidity (QR) also pay a higher offer spread. The latter result is not surprising as an increase in the quick ratio also implies that a larger portion of the financial firm's income-producing assets are tied up in low-yield assets. This raises the possibility that the firm is experiencing difficulty competing in its chosen market. Meanwhile, the offer spread increases in CREDIT SPREAD and VOLATILITY and decreases in the SLOPE of the term structure. Only Ederington and Stock (**2002**) look at the influence of level, slope, and volatility of the term structure on yield spreads. They find that the yield spread is increasing in volatility and decreasing in the level and slope of the term structure.

When the data are partitioned by broad rating bands, offer spreads on lower rated bonds are increasing in debt (TDR) and, in contrast to higher rated bonds, decreasing in liquidity (QR). Interestingly, the offer spread on lower rated bonds is decreasing in firm SIZE whereas SIZE does not appear to influence the offer spread for the overall sample or for higher rated bonds. Additionally, offer spreads on lower rated bonds are decreasing whereas offer spreads on higher rated bonds are increasing in the level of the term structure. Otherwise, when a coefficient is significant for either the lower or higher rating partition, it agrees with the overall results.

6 Selection and Offer Spreads of Nonfinancial Bonds

Table 6 reports the result of the selection equation 1 for nonfinancial bonds. Columns 1 and 2 report the coefficients and standard errors, respectively, for the overall sample and controls for credit risk by RATING, and the remaining three sets of columns report the coefficients and standard errors for the high-investment-grade HIG (AAA to AA–), medium-investment-grade MIG (A+ to BBB–), and below-investment-grade BIG (BB+ and lower) bonds, respectively. The regressions seem to explain the data reasonably well with a pseudo-R^2 of 46.1% for the overall sample. Moreover, 7 of 12 coefficients representing hypotheses summarized in Table 1 are significant for the overall sample. Like the earlier financial bond sample, the control variable MATURITY shows that nonfinancial callable bonds are of a

longer scheduled maturity than straight bonds for nearly all regressions, but in contrast to financial bonds, the control variable ISSUE AMOUNT shows that callable nonfinancial bonds are smaller than noncallable bonds.

Table 6. Selection Model for Callable and Noncallable Nonfinancial Bonds

Variable	All	SE	HIG	SE	MIG	SE	BIG	SE
Constant	3.599***	1.054	−2.668	5.012	−0.499	2.025	−2.394	2.689
LEVEL	−0.056	0.117	−0.696	0.448	0.200	0.202	−0.027	0.284
SLOPE	−0.199	0.124	−0.843*	0.449	0.135	0.258	0.116	0.288
VOLATILITY	0.033*	0.019	0.029	0.066	0.056*	0.034	0.044	0.054
CREDIT SPREAD	−0.160***	0.054	−0.285*	0.158	−0.150	0.101	−0.042	0.162
SHELF	0.257**	0.116	2.889***	0.504	0.317	0.295	−0.691***	0.250
PRIVATE	−0.053	0.135	N/A	N/A	−0.595*	0.360	−0.171	0.274
SIZE	0.002	0.024	−0.227*	0.133	0.192***	0.038	−0.378***	0.056
ROA	0.033***	0.007	0.128***	0.032	0.005	0.016	−0.009	0.009
RATING	−0.137***	0.014	N/A	N/A	N/A	N/A	N/A	N/A
SECURITY	−0.047	0.080	0.622	0.493	−0.485***	0.172	−0.036	0.159
RESTRICT	0.438***	0.099	−0.616	0.376	0.191	0.201	0.750***	0.260
COMPETITIVE	0.495*	0.262	3.282	3.292	0.695	0.516	0.984*	0.532
ISSUE AMOUNT	−0.352***	0.022	−0.228***	0.058	−0.330***	0.052	0.180*	0.106
MATURITY	0.754***	0.059	1.613***	0.236	1.029***	0.110	0.981***	0.194
	***				***			

Note

This table reports the results of a probit regression of callable versus noncallable nonfinancial bonds on variables that determine the popularity of ordinary callable and noncallable bonds. HIG, MIG, and BIG are higher (AAA to AA–), medium (A+ to BBB–), and below investment (BB+ and lower) grade bonds. SE is standard error. All variables are defined in Table 3.

*** Significant at the 1% level.

** Significant at the 5% level.

* Significant at the 10% level.

6.1 Economic Environment

Support for the notion that the popularity of the call feature is time varying is provided by the year dummies. Just like the financial bond sample, we find that before the year 2000 pivot in the structure of interest rates, the call feature was relatively unpopular but after that the popularity of the call feature grew. The first five variables, from LEVEL to SHELF, examine the influence of the economic

environment on bond issue choice. Overall, three of the five proxies for the economic environment are statistically significant. Clearly, the wider the credit spread, the more unlikely it is that nonfinancial callable bonds are issued. Interestingly, like Banko and Zhou (**2010**) and unlike our financial bond sample, we find that the popularity of nonfinancial callable bonds is increasing in interest rate volatility. Meanwhile, nonfinancial callable bonds are like financial callable bonds in that they are more likely to be issued via shelf prospectus. Evidently, nonfinancial firms issue callable bonds using a process that enhances their ability to respond to changes in the cost and benefits of the callable feature.

Within broad credit ratings, however, we only find support for the economic environment hypothesis for high-investment-grade bonds. Specifically, the popularity of high-investment-grade nonfinancial callable bonds decreases in the slope of the term structure and the credit spread and the callable bonds are more likely than noncallable bonds to be issued via shelf prospectus. Like Banko and Zhou (**2010**), we find that the popularity of callable bonds increasing in volatility is strongest for medium-investment-grade bonds. We find no evidence to support the economic environment hypothesis for medium- and below-investment-grade nonfinancial bonds. In fact, below-investment-grade nonfinancial callable bonds are less likely than straight bonds to be issued via a shelf prospectus. This suggests that some motivation other than a change in the economic environment is driving the popularity for issuing below-investment-grade callable nonfinancial bonds.

6.2 Agency Problems

Overall, Table 6 shows that that low-rated (RATING) nonfinancial firms tend to issue callable bonds with restrictive covenants (RESTRICT). However, all other characteristics of nonfinancial callable bonds do not support, and in some cases refute, the hypothesis that callable bonds are used to respond to agency problems. Callable bonds are more likely to be issued by more profitable rather than less profitable firms (ROA) that are thought to be less prone to agency problems. Moreover, if callable bonds are a response to agency problems, one would expect that the bond would be issued via negotiation as investors would wish to discuss the details of the bond covenants to secure protection from potential agency problems. Instead, nonfinancial callable bonds are more likely to be issued via COMPETITIVE bids, suggesting there is a pool of investors that are sanguine about the prospect of agency problems.

Looking at the results by broad rating bands, we find that although high- and medium-investment-grade nonfinancial callable bonds show mixed support, there is stronger support for below-investment-grade bonds for the agency theoretic explanation for issuing callable bonds. Specifically, below-investment-grade callable bonds are sold by smaller nonfinancial firms (SIZE) that are more likely to contain restrictive covenants (RESTRICT). Only one coefficient is inconsistent with agency theory. Specifically, below-investment-grade bonds are more likely to be issued by COMPETITIVE bids. Meanwhile, more profitable (ROA) and larger (SIZE) firms are more likely to issue high- and medium-investment-grade callable bonds, respectively. This mixed support for agency theoretic explanations is consistent with the literature that uses similar proxies. Consistent with agency theory, Banko and Zhou (**2010**) and Kish and Livingston (**1992**) also find that smaller and lower rated bonds are more likely to contain a call feature. However, inconsistent with agency theory, Banko and Zhou find that more profitable firms, particularly those with a moderate rating, are more likely to issue callable bonds.

6.3 Offer Spreads

Table 7 reports the result of the offer spread equation 2 and sheds light on what determines the offer spread for nonfinancial bonds. Columns 1 and 2 report the coefficients and standard errors, respectively, for the overall sample and controls for credit risk by RATING, and the remaining three sets of columns report the coefficients and standard errors for high-investment-grade (HIG; AAA to AA–), medium-investment-grade (MIG; A+ to BBB–), and below-investment-grade (BIG; BB+ and lower) bonds, respectively. Like Table 5, the coefficients are denominated in percent. Also like Table 5, we control for time effects by including year dummies. Figure II shows that relative to the pivot years of 2000 and 2007, interest rates were lower. This is reflected in the structure of year dummies that shows that offer spreads were generally lower relative to these dates.

Table 7. Offer Spreads for Callable and Noncallable Nonfinancial Bonds

Variable	All	SE	HIG	SE	MIG	SE	BIG	SE
Constant	4.223***	0.516	0.426	0.691	2.670***	0.525	−2.066	3.098
SECURITY	0.069	0.046	−0.130***	0.037	−0.017	0.052	0.402***	0.151
RESTRICT	0.054	0.038	0.167**	0.067	0.216***	0.032	0.291	0.296
RATING	−0.190***	0.009	N/A	N/A	N/A	N/A	N/A	N/A
SHELF	−0.151**	0.065	−0.483***	0.097	0.109	0.068	−0.613*	0.315
PRIVATE	0.651***	0.083	N/A	N/A	0.853***	0.086	0.676**	0.298
COMPETITIVE	−0.411**	0.181	−0.544***	0.084	−0.113	0.108	−0.827	0.543
SIZE	0.002	0.013	0.036	0.023	−0.023**	0.011	−0.244***	0.093
TDR	0.000	0.001	0.001	0.003	−0.001	0.001	0.004**	0.002
QR	−0.018***	0.005	−0.037	0.067	0.002	0.004	−0.151**	0.073
ROA	−0.006	0.005	−0.021**	0.009	−0.010**	0.004	−0.025**	0.011
LEVEL	−0.086	0.058	0.221***	0.073	−0.242***	0.045	0.282	0.474
SLOPE	0.068	0.073	0.258***	0.078	−0.032	0.054	0.593	0.442
VOLATILITY	−0.014	0.010	−0.001	0.012	−0.021**	0.009	0.061	0.079
CREDIT SPREAD	0.160***	0.027	0.116***	0.044	0.183***	0.023	0.238	0.186

Note

This table reports the variables that determine the offer spread for new issues of nonfinancial callable and noncallable bonds. The inverse Mills ratio (MILLSOC) reports the difference in the offer spread for ordinary callable bond relative to noncallable bonds. HIG, MIG, and BIG are higher (AAA to AA–), medium (A+ to BBB–), and below investment (BB+ and lower) grade bonds. SE is standard error. All variables are defined in Table 3.

*** Significant at the 1% level.

** Significant at the 5% level.

* Significant at the 10% level.

A special feature of (2) is the inverse Mills ratio coefficient, which adjusts for self-selection bias. In the case of nonfinancial bonds, the inverse Mills ratio is highly significant. In contrast to the financial bond sample, the CALLABLE coefficient is not statistically significant. Ederington and Stock (**2002**) also find that the call premium is insignificant and of the wrong sign in explaining corporate bond yields.

Six of the remaining 14 slope coefficients are statistically significant. The offer spread decreases in RATING. Ederington and Stock (**2002**) also generally find that yield spreads decrease for higher rated bonds. Employing a competitive bid (COMPETITIVE) reduces the offer spread but offering the bond as a PRIVATE issue requires a higher offer spread. Firms with higher liquidity (QR) pay a lower offer spread. Meanwhile the offer spread increases in CREDIT SPREAD. It is notable that once we include time dummies the LEVEL, SLOPE, and VOLATILITY of the term structure are insignificant. Only Ederington and Stock look at the influence of level, slope, and volatility of the term structure on yield spreads and find that the yield spread is increasing in volatility and decreasing in the level and slope of the term structure. However, they do not control for time effects.

We comment only on the differences from our main results when examining the results stratified by broad rating bands. For the highest credit quality bonds, offer spreads decrease in SECURITY but for below-investment-grade bonds, the offer spread increases in SECURITY. This suggests that provision of security for lower rated bonds is a necessity to issue a bond rather than a concession given to reduce funding costs. Restrictive covenants (RESTRICT) are costly for investment-grade bonds, suggesting that these covenants do not fully resolve agency problems. Larger nonfinancial firms (SIZE) can issue medium- and below-investment-grade bonds at a cheaper cost, indicating that investors do account for firm size when investing in lower rated bonds. Also, for below-investment-grade bonds, the offer spreads decrease in profitability (ROA) and liquidity (QR) but increase in leverage (TDR), clearly indicating that the financial condition of the firm is of significant interest to investors. This result is consistent with Ederington and Stock (**2002**) who find that the yield spread is decreasing in ROA for medium- and below-investment-grade bonds. Finally, the economic environment has a significant impact on the offer spreads of medium-investment-grade nonfinancial bonds after accounting for the effect of time trends. Specifically, offer spreads are decreasing in the LEVEL and VOLATILITY of interest rates but increasing in the CREDIT SPREAD.

7 Call Spreads

The final step is to examine the components of the call spread. To accomplish this task, we compute the difference in the offer spreads of pairs of callable and noncallable bonds. We always match by the exact same day of issue and by the industry category (financial and nonfinancial) and then by closest issue size, if possible. We find 270 matched pairs of callable and noncallable same-industry bonds and then estimate the following regression:

$$\begin{aligned}(YC_t - YNC_t) = {} & \text{Constant} + \beta\text{LEVEL}_t + \beta\text{SLOPE}_t + \beta\text{VOLATILITY}_t \\ & + \beta\Delta\text{CREDIT SPREAD}_t + \beta\Delta\text{ISSUE AMOUNT}_t + \beta\Delta\text{MA} \\ & + \beta\Delta\text{RATING}_t + \beta\Delta\text{SECURITY}_t + \beta\Delta\text{RESTRICT}_t + \beta\Delta\text{SH} \\ & + \beta\Delta\text{PRIVATE}_t + \beta\Delta\text{SIZE}_t + \beta\Delta\text{ROA}_t + \beta\Delta\text{TDR}_t + \beta\Delta\text{QR} \\ & + \beta\text{YXX}_t + \varepsilon_t.\end{aligned} \tag{3}$$

Note that (3) contains virtually all the variables in (1) and (2) as they all can potentially explain the difference between the offer spread on a callable and a matched noncallable bond. [6] Other than the Treasury term structure variables, specifically LEVEL, SLOPE, and VOLATILITY, and the year dummies, the variables are computed as the difference between the callable and noncallable bonds.

Table 8 reports the results of (3). As the LEVEL of the term structure and as interest rate implied VOLATILITY increase, call premiums increase, as suggested by option pricing theory. Call premiums increase in MATURITY and in stronger SECURITY and decrease in credit RATING.

Table 8. Analysis of Call Spreads

Variable	Coefficient	SE
Constant	−3.958***	1.739
LEVEL	0.390*	0.233
SLOPE	−0.083	0.262
VOLATILITY	0.070***	0.022
Difference in CREDIT SPREAD	0.009	0.169
Difference in ISSUE AMOUNT	0.000	0.000
Difference in MATURITY	0.020***	0.008
Difference in RATING	−0.146***	0.022
Difference in SECURITY	0.258*	0.151
Difference in RESTRICT	−0.249	0.180
Difference in SHELF	−0.477	0.317
Difference in PRIVATE	−0.125	0.457
Difference in SIZE	0.000	0.000
Difference in ROA	0.009	0.020
Difference in TDR	−0.006	0.004

Note

This table regresses the difference in offer spreads between matched pairs of same date and industry (financial or nonfinancial) new issues of callable bonds with noncallable bonds. SE is standard error.

*** Significant at the 1% level.

** Significant at the 5% level.

* Significant at the 10% level.

These results are consistent with the recent literature. Like our results, Samet and Obey (**2014**) find that call yields decrease in the rating. Specifically, Samet and Obey find that the call premium on

below-investment-grade bonds is approximately 40 basis points higher than investment-grade bonds, and Table 8 reports that the call premium on lower rated bonds is 14.6 basis points higher than on higher rated bonds. Also like our results, Kim and Stock (**2014**) find that yield spreads increase in volatility for both callable and noncallable bonds, and the effect of volatility on bond yields is weaker for callable bonds.

8 Conclusions

Our findings imply that answers to the questions raised in the Introduction do vary by industry. For financial bonds: (1) The popularity of callable bonds is influenced by changes in the term structure and the credit spread and are more likely to be issued via a shelf prospectus. (2) Callable bonds are unlikely to contain restrictive covenants, a characteristic that is not consistent with agency theory. (3) Firms that choose to issue callable bonds must pay a premium relative to straight bonds for the call feature. For nonfinancial bonds: (1) Only highly rated callable bonds are influenced by the credit spread and are more likely to be issued via a shelf prospectus. (2) Inconsistent with agency theory, more profitable firms sell high-investment-grade bonds and larger firms sell medium-investment-grade callable bonds. In contrast, smaller firms issue below-investment-grade callable bonds with restrictive covenants. Still, these firms issue these bonds via competitive bids. (3) We are unable to find a statistically significant call premium for nonfinancial callable bonds. Overall, we contribute to the understanding of the selection of the call feature, on the determinate of offer spreads of callable and noncallable financial and nonfinancial corporate bonds, and on the determinate of the call premium—an important corporate finance issue.

In more detail, we find that the motivation for issuing callable as opposed to noncallable bonds varies by industry. Controlling for annual time effects, we discover that the popularity of callable bonds relative to noncallable bonds is related to the economic environment more for financial than for nonfinancial firms. For financial firms, new issues of callable bonds decrease in the level and slope of the term structure and in the credit spread, using issue procedures that allow the firm to conveniently respond to changes in the economic environment. In contrast, only high-investment-grade nonfinancial callable bonds decrease in the credit spread using convenient issue procedures.

We find mixed support for agency explanations for issuing higher credit quality callable bonds and more consistent support for firms that issue lower credit quality callable bonds. If callable bonds are used to alleviate agency problems, we would expect that firms subject to severe agency problems would be more likely to issue callable bonds with secondary characteristics designed to alleviate agency problems. Contrary to agency theory, we find that more profitable and larger nonfinancial firms are more likely to issue high-investment-grade and medium-investment-grade nonfinancial callable bonds, respectively. Similarly, higher credit quality financial callable bonds are unlikely to contain restrictive covenants. However, the issuer and issue characteristics of lower grade bonds are more in line with agency theory. Specifically, smaller nonfinancial firms issue below-investment-grade callable bonds with restrictive covenants that can further alleviate agency problems. Moreover, less profitable financial firms are more likely to issue lower rated callable bonds with stronger security. Still, both financial and nonfinancial lower rated callable bonds are more likely sold by competitive bids, suggesting there are investors who are sanguine about agency issues.

Notes

1 Bonds sold by negotiation are underwritten issues where the lead underwriter often commits to a fixed selling price and attempts to profit from the difference between the price paid to the issuer and the price paid to eventual investors. Bonds sold by competitive bids are sold to a successful underwriter from among several who submit sealed bids. Competitive bids can lower the all-in cost of issuing debt if there is a lot of interest from potential underwriters. One method of encouraging interest from potential underwriters is to simplify the bond prospectus. Hence, the choice between negotiated and competitive bid issues can be related to the choice between detailed, complex contract terms tailored to a given firm's circumstance and a simplified prospectus to encourage active bidding to reduce issuing costs.
2 We disregard bonds that were not rated as only very few bonds, fewer than 20, have no rating by one of the three rating agencies, and it is not clear how these bonds can be included in later regressions where the credit ranking appears as a key independent variable.
3 All rating agencies have an almost identical rating system with eight broad rating categories, six of which are subdivided into three shades of ratings. At the lower end there appears to be a minor deviation where S&P has one lower rating D and Fitch has two additional lower ratings of DD and DDD than Moody's so that in total Moody's has 21, S&P 22, and Fitch 24 ratings. However this deviation is minor as very few bonds have a rating of D, DD, or DDD within one year of issue so we simply assign the same numerical rating of 1 to Moody's rating of C, S&P's ratings of C and D, and Fitch's ratings of C, D, DD, and DDD.
4 Make-whole and clawback bonds contain special call provisions that restrict the conditions and price on which a callable bond can be called. For details, see Goyal, Golapudi, and Ogden (**1998**) and Nayar and Stock (**2008**). We delete approximately 4,500 bonds from our sample that contain a make-whole, clawback, convertible, or put provision to ensure we are dealing with pure types of ordinary callable or noncallable bonds.
5 In performing the match of the Bloomberg data with the FISD database we gratefully acknowledge expert help from the staff of Bloomberg data. All of the subsequent matches made by CUSIPs were double checked by matching company names.
6 The sole exception is COMPETITIVE, where the differences in the matched bonds rarely gave a value different from zero.

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