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**The Choice between Non-Callable and
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Abstract

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

JEL classification: G24, G32, G38, K12, K22

Keywords: Callable bonds, Non-callable bonds, Call premiums

1. Introduction

In recent years, many observers note 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 towards 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 1 shows that while only 20% of all newly issued, US dollar, fixed coupon corporate bonds are callable in 1995, year by year the popularity of callable bonds increases until 2006 from where the popularity of callable bonds decreases again. We do not know why there is such a variation in the choice between callable and non-callable bonds. Therefore, we develop a set of hypothesis and test them in an attempt to explain why the popularity of call provisions change.

<<Figure 1 about here>>

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 since in an efficient market, gains to shareholders via refinancing at lower interest rates would be anticipated and expropriated by bondholders in the terms of the initial call provision. Instead, Thatcher (1985), Kish and Livingston (1992), and Boreiko and Lombardo (2011) suggest agency explanations can explain the use of call provisions. While earlier empirical evidence 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) find 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 generates an incentive to issue callable debt even when market conditions do not support a separating equilibrium. This happens because an 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 for callable bonds.

This raises several interesting questions. Are there any economic factors that can explain the shifting popularity of callable bonds relative to non-callable bonds? If so, do firms that issue callable bonds take into account these factors and does this influence the preferred practise for 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 paper is related to a series of studies that examines the motivation and the offer spreads of different types of callable bonds. Daniels, Ejara and Vijayakumar (2009) examine the motivation and offer spreads of bond claw backs, while Nayar and Stock (2008) study make whole bonds. Claw backs and make whole bonds are special types of callable bonds that restrict the refunding of callable bonds to issues of equity (claw backs) 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 the economic environment has on the offer spread for callable and non-callable bonds and for the value of call premiums. Unlike most studies in the subject area, we include financial

firms as a larger number of callable bonds are issued by financial firms than industrial and utility bonds combined during our 1995 through 2008 sample period. We also include financial bonds in our sample because we wish to determine if the financing of financial firms are also 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), Guntay et. al (2002) and Bank 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 that the call feature was being re-engineered through the introduction of the make whole and claw back refinements to the call feature. 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 non-financial, callable and non-callable bonds, culled of make whole, claw back, preferred share, convertible and put features.

We find that the motivation for issuing callable as opposed to non-callable bonds varies by industry. Controlling for annual time effects, we discover that the popularity of callable bonds relative to non-callable bonds is more related to the economic environment for financial rather than non-financial 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 non-financial callable bonds are decreasing in the credit spread only. As noted earlier, some authors find that the popularity of the call feature is increasing 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 rises, 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 relative to the hedging benefit of calling if interest rates later fall.

Since we do 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 changes in the economic environment does matter to them. We find that all financial and higher and medium investment credit grades of non-financial 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 relative to non-callable bonds for the option to call a bond prior to 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 non-financial firms, just 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 non-financial 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 like our results, Banko and Zhou (2010) 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 in that we include proxies for restrictive and security covenants that can potentially deal with agency problems. Consistent with agency theory, callable non-financial bonds are more likely to contain restrictive covenants. In contrast, financial callable bonds, while 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 non-financial bonds and lower rated financial bonds, just the type of bond that is most subject to severe agency problems. Specifically, for below investment grade non-financial 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 rather than a negotiation process suggesting that there are investors that are sanguine about agency issues.

In the next section we review the reasons for issuing callable bonds. Section 3 discusses the data and the sample selection while section 4 develops a model that examines the selection and the offer spreads of callable bonds relative to non-callable bonds. We then present our empirical findings in section 5 with a focus on financial bonds and in section 6 with focus on non-financial bonds. Section 7 examines the components of call spreads while section 8 concludes our study.

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, at present, explain. Below, we explain our hypotheses concerning callable bonds into two sets of hypotheses, the

economic environment and agency problems. Table 1 provides a summary of our detailed hypothesis.

<< Please insert Table 1 about here >>

A. Economic Environment

Changes in the economic environment can explain the time varying popularity of callable versus non-callable bonds because changes in the level, slope and volatility of the term structure and changes in the credit spread implies 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, then 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 while Estrella and Mishkin (1998) and Ang et al. (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, signalling 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 bonds 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 so again we are unable to sign this relation as it depends upon 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 towards in the money. Van Horne (2001) suggests that there is a credit cycle that is related to the economic cycle. Moreover, Martel (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, then 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, then firms are likely to issue callable bonds via shelf registration.

B. Agency Problems

It is well noted in the literature (see Thatcher (1985), Robbins and Schatzberg (1986), Kish and Livingston (1992), Boreiko and Lombardo (2011) as examples) that small, modestly profitable, low credit rating firms suffer from agency problems. Therefore, if callable bonds are used to alleviate agency problems, then small, low profit and low credit rating firms will favour 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 small, low profit and low credit rating firms issuing callable bonds will likely issue them privately. Because investors in bonds of small, low profit and low credit rating firms will 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. Since 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

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 eventual investors. Bonds sold by competitive bids are sold to a successful underwriter from among several who submitted 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 vs. competitive bid issues can be related to the choice between detailed, complex contract terms tailored to a given firm's circumstance vs. a simplified prospectus to encourage active bidding to reduce issuing costs.

3. Data Selection

We use the Mergent® Inc's Fixed Investment Securities Database FISD. The FISD consists of detailed cross sectional information on issue characteristics of all bonds that the National Association of Insurance Commissioners NAIC had on their books as of January 1, 1995, and all bonds that they bought up to and including May 27, 2008. Each of the approximately 100,000 bond issues is identified by the ISIN number 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 prior to that date the NAIC had to backdate old issues in order to add them to the database. It is possible that bonds that have since matured prior to January 1, 1995 were not included so use of these backdated bonds can introduce some unknown survivorship bias. We select all bonds that belong to the industrial, financial, and utility industries while we eliminate Treasury, 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 among callable and non-callable bonds. On examining these corporate bonds for rating type we find that Duff and Phelps do not rate many bonds within each rating category. Moreover, virtually all bonds rated by Duff and Phelps are also rated by one of the other mainstream rating agencies, so we decide to neglect Duff and Phelps ratings. However, we consider all Standard and Poor's, Moodys and Fitch rated bonds because they rate a large number of bonds in all industry categories.² We only keep bonds with a rating

² We neglect bonds that were not rated as only very few bonds, less 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.

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 Standard and Poors, Moodys 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 sub samples, the ordinary callable and the non-callable bond sub samples. Ordinary callable bonds are bonds flagged as callable but do not contain a put, conversion, make whole or claw back provision whereas non-callable bonds are bonds that 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 (2009) finds evidence to support this assertion. Other types of call features such as make whole and claw back features have been studied by Goyal et al. (1998), Powers and Sarkar (2006), Nayar and Stock (2008) and Daniels et al. (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

³ All rating agencies have an almost identical rating system with eight broad rating categories, six of which are sub divided into three shades of ratings. At the lower end there appears to be a minor deviation where Standard and Poors has one lower rating D and Fitch has two additional lower ratings of DD and DDD than Moodys so that in total Moodys has 21, Standard and Poors 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 one to Moodys' rating of C, Standard and Poors' ratings of C and D, and Fitch's ratings of C, D, DD and DDD.

⁴ Make whole and claw back bonds are bonds that contain special call provisions that restrict the conditions and price upon which a callable bond can be called. For details see Goyal et al (1998) and Nayar and Stock (2008). We delete approximately 4,500 bonds from our sample that contain a make whole, a claw back, a convertible, or a put provision to ensure we are dealing with pure types of ordinary callable or non-callable bonds.

or claw back bonds. We chose to neglect 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 claw back 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 that 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 non-callable bonds. We note that this sample size is comparable to other recent studies investigating bonds using the FISD including Daniels et al. (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 non-callable bond sub samples.

<< Please insert Table 2a, 2b and 2c about here >>

Table 2a reveals three notable characteristics of our sample of callable and non-callable bonds. First, examining the sub samples of bonds by industry, we note that while non-callable and callable 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, ordinary callable and non-callable bonds have the same average ratings both being somewhat higher in the finance and somewhat lower in the industrial industry sectors. Even in the utility industry, the difference in the average rating are minor, callable bonds having a somewhat lower average rating of A- and non-callable bonds having a higher rating of A+. Third, we note that in all industries, non-callable bonds tend to have much shorter scheduled maturities than their callable bond counterparts. Since 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 2b report the time series characteristic of our sample. Issue activity remained steady until about the second half of 2007 when there were fewer issues of callable and non-callable 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 2c reports the characteristics of the firms that issued callable and non-callable bonds in our sample. While 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 non-financial firms. These industry differences motivate us to separately investigate financial bonds and non-financial bonds.

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 soliciting competitive bids or by negotiation. As bond market and company level data is 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 one and ten 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 one year rate and the slope of the term structure as the difference between the ten year and one year constant maturity rates. Figure 2 reports that during the 1995 to 2008 sample period, there appears to be two interest rate cycles pivoting around the years 2000 and 2007 where the level of interest rates achieved a peak and the slope began to increase during the year.

<<Figure 2 about here>>

We collect at the money 5 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 non-callable bonds. As we discuss in section 2, 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 (1979) two stage procedure by first running a probit

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.

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 non-callable bonds and the offer spread equation, corrected for self-selection bias, investigates determinates of the offer spread of bonds. The selection equation is:

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

where i refers to a given bond and $CB = 1$ if the bond is callable, zero 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 2 and summarized in Table 1. The control variables **ISSUE AMOUNT** and **MATURITY** are included in the selection equation because the amount and the maturity of an issue can have a bearing as to whether a callable or a non-callable bond issue is chosen. We include annual dummies **YXX** to control for time series effects evident in Figure 2 for all years except for the 2000 and 2007 pivot years and for 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).

<<Please insert Table 3 about here>>

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

$$\begin{aligned}
(Y_i - Y_m) = & \text{CONSTANT} + \beta\text{SECURITY}_t + \beta\text{RESTRICT}_t + \beta\text{RATING}_t \\
& + \beta\text{SHELF}_t + \beta\text{PRIVATE}_t + \beta\text{COMPETITIVE}_t + \beta\text{SIZE}_i + \beta\text{TDR}_t + \beta\text{QR}_t \\
& + \beta\text{ROA}_t + \beta\text{LEVEL}_i + \beta\text{SLOPE}_i + \beta\text{VOLATILITY} + \beta\text{CREDIT SPREAD}_t \\
& + \beta\text{CALLABLE}_t + \beta\text{MILLSOC}_t + \beta\text{YXX} + \varepsilon_i
\end{aligned} \tag{2}$$

The dependent variable $(Y_i - Y_m)_i$ is the offer spread, that is the difference between the offering yield for a given corporate bond i and the yield on corresponding maturity m Treasury bond, MILLSOC is the estimated inverse mill's ratio from (1). We include a dummy variable CALLABLE that is one if the bond is callable, zero otherwise. The coefficient of CALLABLE will measure the extra yield required by a callable relative to a non-callable 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 paper that we are aware of includes financial bonds in their sample. Kish and Livingston (1992) 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 non-financial 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 the type of a bond a financial firm will issue. Columns 1 and 2 reports the coefficients and standard errors respectively for the overall sample and controls 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. The regressions seem to explain the data reasonably well with a pseudo R-square of 82.1% for the overall sample. Moreover, eight of twelve 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.

<< Please insert Table 4 about here >>

A. Economic Environment

Support for the notion that the popularity of the call feature is time varying is provided by the year dummies. Prior to the 2000 pivot in the structure of interest rates, the call feature is 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 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 Guntay et al. (2002) find evidence that the popularity of call features increase with the level of interest rates whereas Sarkar (2001) find that the popularity of call features decreases in the level and the 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 only. Therefore, a likely reason why Guntay et al. (2002) find a different relation is because they examine non-financial bonds only, and Kish and Livingston (1992) combine financial and non-financial bonds in different portions than us 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 the credits spread and are more likely than non-callable bonds to be issued via shelf prospectus. Still, the economic environment hypothesis receives support for higher rated financial bonds as well since higher rated financial callable bonds are more likely issued via a shelf prospectus when the credit spread narrows.

B. Agency Problems

Firms that suffer most from agency problems are expected to be smaller, lower rated and modestly profitable firms that have restricted access to capital and so tend to issue bonds privately. Moreover, if callable bonds are used to respond to agency problems then 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) 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 that 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 that the bond will 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 also 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 but inconsistent with agency theory, Banko and Zhou (2010) find that more profitable nonfinancial firms, particularly those with a moderate rating, are more likely to issue callable bonds. While 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.

C. Offer Spreads

Table 5 reports the result of the offer spread equation (2) and sheds light on what determines the offer spread for financial bonds. Columns 1 and 2 reports the coefficients and standard errors respectively for the overall sample and controls for credit risk by RATING whereas the remaining two pairs of columns report the coefficients and standard errors for

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

<< Please insert Table 5 about here >>

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 non-callable bonds. Figure 2 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 prior to the 2000 year pivot date.

A special feature of (2) is the inverse mill's ratio coefficient which adjusts for self-selection bias. In the case of financial bonds, the inverse mills ratio is marginally significant. Once the impact 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 prior to maturity and clearly suggests that investors demand and receive compensation for call risk just as financial theory suggests. 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 (2002) for our nonfinancial sample.

Nine of the remaining fourteen 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 the investors and so require a higher offer spread in spite of their inclusion in the bond contract. Consistent with our results, Ederington and Stock (2002) generally find that yield spreads increase for lower rated non-financial bonds.

Employing a competitive bid (COMPETITIVE) and issuing via a shelf prospectus (SHELF) reduces 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 later result is not surprising as an increase in the quick ratio also implies a larger portion of the financial firm's income producing assets are tied up into low yield assets raising the possibility that the firm is in difficulty in competing in its' chosen market. Meanwhile the offer spread increases in the 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 finding that the yield spread is increasing in volatility and decreasing in the level and slope of the term structure.

When the data is 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, they agree with the overall results.

6. Selection and Offer Spreads of Non-Financial Bonds

Table 6 reports the result of the selection equation (1) for non-financial bonds. Columns 1 and 2 reports the coefficients and standard errors respectively for the overall sample and controls for credit risk by RATING whereas the remaining three pairs 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-square of 46.1% for the overall sample. Moreover, seven of twelve coefficients representing hypotheses summarized in Table 1 are significant for the overall sample. Like the earlier financial bond sample, the control variable MATURITY show that non-financial 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 non-financial bonds are smaller than non-callable bonds.

<< Please insert Table 6 about here >>

A. 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 prior to the 2000 pivot in the structure of interest rates, the call feature was relatively unpopular but after that point 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 non-financial callable bonds are issued. Interestingly, like Banko and Zhou (2010) and unlike our financial bond sample, we find that the popularity of non-financial callable bonds is increasing in interest rate volatility.

Meanwhile, non-financial callable bonds are like financial callable bonds in that they are more likely to be issued via shelf prospectus. Evidently, non-financial firms also issue callable bonds using an issue 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 non-financial callable bonds decreases in the slope of the term structure and the credits spread and are more likely than non-callable 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 the medium investment grade. Otherwise, we find no evidence to support the economic environment hypothesis for medium and below investment grade non-financial bonds. In fact, below investment grade non-financial callable bonds are less likely than straight bonds to be issued via a shelf prospectus. This suggests that some other motivation than a change in the economic environment is driving the popularity for issuing below investment grade callable non-financial bonds.

B. Agency Problems

Overall, Table 6 shows that that low rated (RATING) non-financial firms do tend to issue callable bonds with restrictive covenants (RESTRICT). However, all other characteristics of non-financial 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) who 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 will be issued via negotiation as investors will wish to discuss the details of the bond covenants in order to secure protection from potential agency problems. Instead, non-financial callable bonds are more likely to be issued

via COMPETITIVE bids suggesting that 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 while higher and medium investment grade non-financial 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 non-financial 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 firms (SIZE) are more likely to issue high investment grade 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 but inconsistent with agency theory, Banko and Zhou (2010) find that more profitable firms, particularly those with a moderate rating, are more likely to issue callable bonds.

C. Offer Spreads

Table 7 reports the result of the offer spread equation (2) and sheds light on what determines the offer spread for non-financial bonds. Columns 1 and 2 reports the coefficients and standard errors respectively for the overall sample and controls for credit risk by RATING whereas the remaining three pairs 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. Like Table 5, one can judge the economic significance of each coefficient by noting that the coefficients are denominated in per cent. Also like Table 5, we control for time effects by

including year dummies. Figure 2 shows that relative to the pivot dates of 2000 and 2007, interest rates were lower. This is reflected in the structure of year dummies which shows that offer spreads were generally lower relative to these dates.

<< Please insert Table 7 about here >>

A special feature of (2) is the inverse mill's ratio coefficient which adjusts for self-selection bias. In the case of non-financial 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 fourteen slope coefficients are statistically significant. The offer spread decreases in RATING. Ederington and Stock (2002) also generally find that yield spreads decreases 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 the 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 (2002) look at the influence of level, slope and volatility of the term structure on yield spreads finding 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 are a necessity to

even 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 non-financial 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 of investors. This result is consistent with Ederington and Stock (2002) who find that the yield spread is decreasing in the ROA for medium investment and below investment grade bonds. Finally, the economic environment has a significant impact on the offer spreads for medium investment grade non-financial bonds once the impact of time trends is accounted for. Specifically, offer spreads are decreasing in the LEVEL and in the 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 non-callable bonds. We always match by the exact same day of issue and by the industry category (financial and non-financial) and then by closest issue size, if possible. We find 270 matched pairs of callable and non-callable same industry bonds and then run the following regression.

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

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 non-callable bond.⁶ Other than the treasury term structure variables, specifically the LEVEL, SLOPE and VOLATILITY, and the year dummies, the variables are computed as the difference between the callable and the non-callable bond.

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

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 and (3) firms that choose to issue callable bonds must pay a premium relative to straight bonds for the call feature. For non-financial 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 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 also issue these bonds via competitive bids and (3) we are

⁶ The sole exception is COMPETITIVE where the differences in the matched bonds rarely gave a value different from zero.

unable to find a statistically significant call premium for non-financial callable bonds. Overall, we contribute to the understanding of the selection of the call feature, on the determinate of offer spreads of callable and non-callable financial and non-financial 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 non-callable bonds varies by industry. Controlling for annual time effects, we discover that the popularity of callable bonds relative to non-callable bonds is more related to the economic environment for financial rather than non-financial firms. For financial firms, new issues of callable bonds decreases in the level and slope of the term structure and in the credit spread using issue procedures that allows the firm to conveniently respond to changes in the economic environment. In contrast only high investment grade non-financial callable bonds are decreasing in the credit spread and use 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 further alleviate agency problems. Contrary to agency theory, we find that more profitable and larger non-financial firms are more likely to issue high investment grade and medium investment grade non-financial 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 non-financial 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 non-financial lower rated callable bonds are more likely sold by competitive bids suggesting that there are investors who are sanguine about agency issues.

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Table 1

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

<i>Factors/Variables</i>	<i>Callable Bonds</i>
Economic Environment	
LEVEL	Positive/Negative
SLOPE	Negative
VOLATILITY	Positive/Negative
CREDIT SPREAD	Negative
SHELF	Positive
Agency	
PRIVATE	Positive
SIZE	Negative
ROA	Negative
RATING	Negative
SECURITY	Positive
RESTRICT	Positive
COMPETITIVE	Negative

Table 2a Cross Sectional Sample Characteristics

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

Grade	<i>Industrial</i>			<i>Utility</i>			<i>Financial</i>			<i>All</i>
	Ordinary Call	Non- Callable	Sub Total	Ordinary Call	Non- Callable	Sub Total	Ordinary Call	Non- Callable	Sub Total	Grand Total
AAA	167	81	248	12	23	35	104	79	183	466
AA+	0	14	14	0	0	0	24	40	64	78
AA	5	70	75	0	2	2	265	16	281	358
AA-	18	101	119	3	27	30	119	27	146	295
A+	5	128	133	6	33	39	32	281	313	485
A	247	160	407	5	78	83	763	79	842	1332
A-	3	237	240	0	77	77	180	259	439	756
BBB+	3	226	229	2	74	76	127	60	187	492
BBB	5	211	216	4	50	54	235	208	443	713
BBB-	3	103	106	2	26	28	171	19	190	324
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				2
CCC-	1	0	1	0	0	0				1
CC	1	0	1	0	0	0				1
Total	625	1527	2152	36	413	449	2087	1088	3175	5776
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

Table 2b Time Series Bond Sample Characteristics

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

Year	<i>Industrial</i>				<i>Utility</i>				<i>Financial</i>				Total
	NC IG	BIG	Callable IG	Callable BIG	NC IG	BIG	Callable IG	Callable BIG	NC IG	BIG	Callable IG	Callable 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
2008	6	0	0	0	1	1	0	0	1	0	0	0	9
Total	1331	196	456	169	390	23	34	2	1068	20	2020	67	5776

Table 2c Firm Sample Characteristics

This table reports the number of bond issues by industry, type and rating during the period January 1, 1995 to May 8, 2008. Size is in \$ thousands. 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.

Year	<i>Non-Financial</i>					<i>Financial</i>				
	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+
Grand Total	258,513	38.10	2.58	5.18	A-	805,063	49.85	2.00	1.76	A

Table 3
Variables and Definitions

<i>Variable</i>	<i>Definition</i>
OFFER SPREAD	Offer yield less yield on a comparable maturity Treasury bond
	Economic Environment
LEVEL	The one year Treasury yield
SLOPE	The difference between the 10-year and one year Treasury interest rates
VOLATILITY	Interest rate volatility as measured by five year at the money caps.
CREDIT SPREAD	The credit spread as measured by the difference between the average yield on the Merrill Lynch high yield index and the one year Treasury yield.
SHELF	A dummy variable that takes on the value of 1 if the bond is a shelf registered bond according to rule 415, 0 otherwise
	Agency
PRIVATE	A dummy variable that takes on the value of 1 if the bond is a private rule 144a issue, zero otherwise.
SIZE	The log of the issuing company's assets
ROA	The return on assets of the issuing company
RATING	A 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)
RESTRICT	A dummy variable that takes on the value of 1 if the bond contains a company or subsidiary restrictive covenant or a bond protective covenant, zero otherwise
COMPETITIVE	A dummy variable that takes on the value of 1 if the bond issue sale was competitive, 0 otherwise
	Control Variables/ Variables Unique to the Offer Spread Equation
ISSUE AMOUNT	Log of the dollar amount of the bond issue
MATURITY	Log of the number of days a bond is scheduled to mature as of the date of issue
TDR	The total debt ratio of the issuing company
QR	The quick liquidity ratio of the issuing company
FINANCIAL	A dummy variable that takes on the value of 1 if the company issuing the bond was in the Finance industry, 0 otherwise
UTILITY	A dummy variable that takes on the value of 1 if the company issuing the bond was in the Utility industry, 0 otherwise
CALLABLE	A dummy variable that takes on the value of 1 if the bond is callable, zero otherwise
MILLSOC	The inverse mills ratio for ordinary callable bonds
YXX	A dummy variable that takes on the value of 1 for observations of a given year, zero otherwise. XX refers to the year in question, i.e., XX = 96 for the year 1996.

Table 4
Selection Model for Callable and Non-callable Financial Bonds

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

<i>Variable</i>	<i>All</i>	<i>SE</i>	<i>HIGHER</i>	<i>SE</i>	<i>LOWER</i>	<i>SE</i>
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
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
MATURITY	2.155***	0.083	2.101***	0.151	2.141***	0.123
Y95	-1.912***	0.324	-3.016***	0.578	-0.024	0.632
Y96	-1.466***	0.329	-2.350***	0.595	-0.513	0.613
Y97	-1.485***	0.296	-3.494***	0.571	0.259	0.539
Y98	-2.017***	0.240	-1.945***	0.358	-1.924***	0.551
Y99	-1.381***	0.229	-1.510***	0.379	-1.618***	0.613
Y01	0.121	0.371	0.720	0.644	-0.488	0.715
Y02	1.501***	0.505	1.239	1.155	1.305*	0.770
Y03	1.001*	0.534	1.980	1.374	1.079	0.767
Y04	0.320	0.497	0.969	1.245	0.826	0.715
Y05	0.228	0.318	-0.128	0.779	1.035*	0.546
Y06	0.512**	0.251	1.347	0.447	-0.601	0.611
N	3175		1829		1346	
CASE CORRECT NUMBER	2995		1776		1241	
CALLABLE PSEUDO R ²	0.821		0.899		0.792	

* p < 0.10, ** p < 0.05, *** p < 0.01

Table 5
Offer spreads for Callable and Non-callable Financial Bonds

This table reports the variables that determine the offer spread for new issues of financial callable and non-callable bonds. The inverse mills ratio MILLSOC report the difference in the offer spread for ordinary callable bond relative to non-callable bonds. All variables are defined in Table 3. HIGHER and LOWER are higher (AAA to A) and lower grade (A- and lower) bonds respectively, SE refer to the standard errors.

<i>Variable</i>	<i>All</i>	<i>SE</i>	<i>HIGHER</i>	<i>SE</i>	<i>LOWER</i>	<i>SE</i>
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
CALLABLE	0.480***	0.072	0.256***	0.089	0.695***	0.106
MILLSOC	0.071*	0.042	-0.016	0.065	0.067	0.062
Y95	-0.373***	0.076	-0.383***	0.087	-0.487	0.372
Y96	-0.303***	0.074	-0.342***	0.068	-0.609*	0.369
Y97	-0.250***	0.081	-0.235***	0.085	-0.328	0.349
Y98	-0.200***	0.072	-0.026	0.066	-0.506	0.334
Y99	-0.182***	0.069	-0.001	0.076	-0.460	0.341
Y01	-0.195	0.197	0.126	0.241	-0.533	0.454
Y02	-0.058	0.198	-0.021	0.298	-0.533	0.448
Y03	-0.307*	0.171	0.085	0.246	-0.707*	0.430
Y04	-0.223	0.143	0.229	0.202	-0.848**	0.402
Y05	-0.061	0.088	0.026	0.116	-0.514	0.343
Y06	-0.009	0.036	-0.082**	0.040	-0.772**	0.320
N	3,175		1829		1346	
R ²	0.511		0.381		0.465	

* p < 0.10, ** p < 0.05, *** p < 0.01

Table 6**Selection Model for Callable and Non-callable Non-Financial Bonds**

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

<i>Variable</i>	<i>All</i>	<i>SE</i>	<i>HIG</i>	<i>SE</i>	<i>MIG</i>	<i>SE</i>	<i>BIG</i>	<i>SE</i>
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
Y95	-1.183***	0.278	-1.402	1.056	-1.292***	0.481	-0.056	0.724
Y96	-0.804***	0.260	-2.163**	1.087	-1.330***	0.470	0.477	0.628
Y97	-0.796***	0.234	-0.766	0.715	-1.966***	0.499	0.596	0.568
Y98	-0.951***	0.197	-2.590***	0.761	-0.861***	0.333	0.171	0.497
Y99	-0.551**	0.230	-0.604	0.935	-0.608	0.404	0.823	0.552
Y01	1.279***	0.270	2.108***	0.771	-0.168	0.730	0.925	0.740
Y02	1.249***	0.350	2.240**	1.044	0.011	0.852	0.312	0.907
Y03	0.879**	0.392	0.899	1.223	0.213	0.912	-0.107	0.928
Y04	0.480	0.375	-0.073	1.406	0.184	0.812	-0.366	0.853
Y05	0.264	0.258	-1.245	1.103	0.318	0.473	0.847	0.583
Y06	0.664***	0.228	-0.537	0.786	0.763**	0.381	0.741	0.547
N	2601		523		1688		390	
CASE CORRECT NUMBER	2264		497		1615		297	
CALLABLE PSEUDO R ²	0.461		0.869		0.644		0.360	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7
Offer spreads for Callable and Non-callable Non-Financial Bonds

This table reports the variables that determine the offer spread for new issues of non-financial callable and non-callable bonds. The inverse mills ratio MILLSOC report the difference in the offer spread for ordinary callable bond relative to non-callable bonds. All variables are defined in Table 3.

<i>Variable</i>	<i>All</i>	<i>SE</i>	<i>HIG</i>	<i>SE</i>	<i>MIG</i>	<i>SE</i>	<i>BIG</i>	<i>SE</i>
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
CALLABLE	0.103	0.083	-0.024	0.085	0.082	0.092	-0.112	0.223
MILLSOC	-0.210***	0.027	-0.153***	0.019	-0.150***	0.021	0.554**	0.276
Y95	-0.416***	0.156	-0.261*	0.157	-0.207**	0.102	-0.407	1.244
Y96	-0.320**	0.156	-0.347**	0.175	-0.291***	0.100	-0.404	1.159
Y97	-0.368***	0.132	-0.196	0.130	-0.166*	0.097	-0.308	1.029
Y98	-0.179**	0.091	0.164*	0.092	-0.193**	0.083	-0.041	0.617
Y99	0.017	0.112	0.013	0.098	-0.065	0.097	0.196	0.852
Y01	-0.530***	0.159	-0.421**	0.184	-0.482***	0.159	-0.817	0.964
Y02	-0.526**	0.217	-0.481**	0.225	-0.517**	0.227	-0.623	1.287
Y03	-0.573**	0.254	-0.164	0.296	-1.027***	0.250	-0.480	1.278
Y04	-0.357	0.242	-0.043	0.309	-0.965***	0.207	-0.141	1.114
Y05	-0.125	0.153	0.327**	0.160	-0.621***	0.133	1.368**	0.663
Y06	0.009	0.117	0.118	0.117	-0.222	0.136	0.906	0.560
N	2,601		523		1688		390	
R ²	0.502		0.121		0.379		0.177	

* p < 0.10, ** p < 0.05, *** p < 0.01

Table 8
Analysis of Call Spreads

This table regresses the difference in offer spreads between matched pairs of same date and industry (financial or non-financial) new issues of callable bonds with non-callable bonds.

<i>Variable</i>	<i>Coefficient</i>	<i>SE</i>
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 LEVEL	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
Difference in QR	0.002	0.015
Y95	0.572	0.597
Y96	1.586 ^{***}	0.613
Y97	0.873	0.638
Y98	1.202	0.734
Y99	1.039 [*]	0.606
Y01	1.028	1.011
Y02	2.229 ^{**}	1.026
Y03	1.576	1.140
Y04	1.416	1.016
Y05	1.471 ^{**}	0.699
Y06	1.220 ^{**}	0.583
N	270	
R ²	0.294	

* p < 0.10, ** p < 0.05, *** p < 0.01

Figure 1

The proportion of all new issues of US dollar, fixed coupon corporate bonds that are callable and non-callable bonds by year from 1995 to 2007

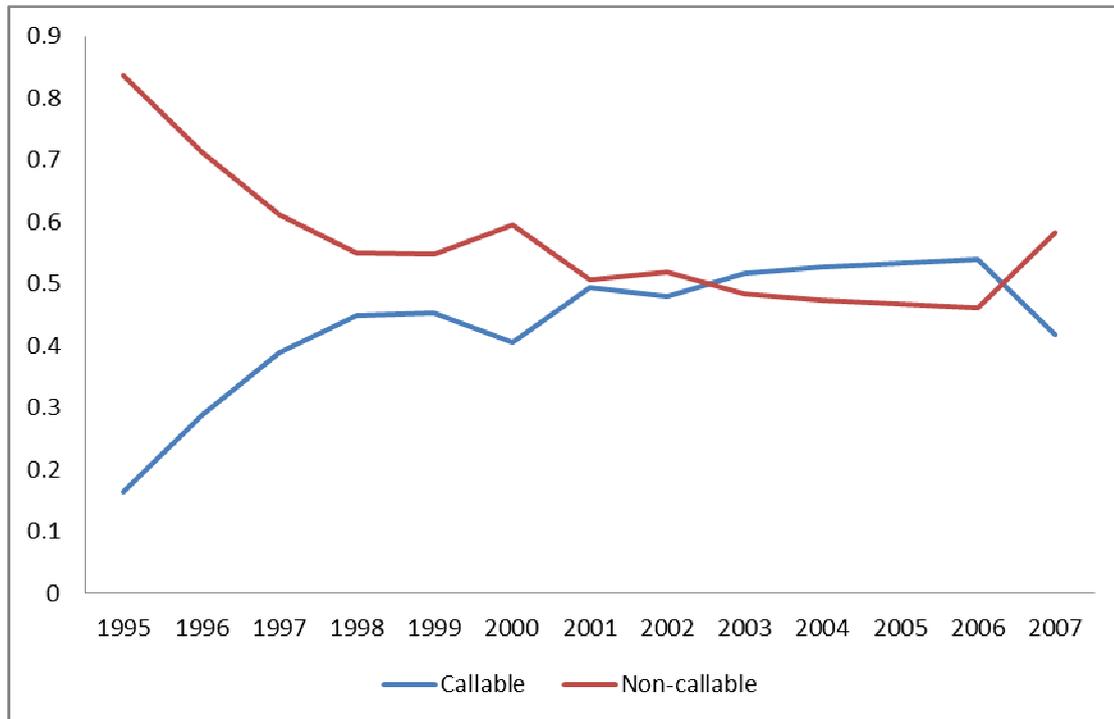


Figure 2

The level and slope of the treasury term structure as depicted by the one year and the difference between the ten year and one year treasury yields as reported by the Federal Reserve Bank of New York, Table H15.

