The Choice Among Non-Callable and Callable Bonds

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Abstract

This paper examines the choice and the pricing of callable and non-callable bonds. The popularity of callable and non-callable bonds is significantly related to the economic environment. Callable bonds are also more likely to be issued via a shelf prospectus and are more likely to be issued by banks than non-callable bonds. Evidently, firms that prefer to issue callable bonds seek to take advantage of their ability to process economic information but must pay a premium relative to straight bonds for the call feature. Firms that issue callable bonds do not consistently display the characteristics associated with severe agency problems.

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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 have been declining over the last 20 years and its 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 a 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, authors such as 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 factors that can explain the shifting popularity of callable bonds relative to non-callable bonds? If so, do firms that issue callable bonds process economic information to take advantage of these factors and does this influence the preferred practise for issuing callable bonds? Do issuers pay a premium for the call feature? Finally, do firms that issue callable bonds display any characteristics associated with agency problems?

This paper is related to a series of papers that examines the motivation and pricing of different types of callable bonds. Daniels, Ejara and Vijayakumar (2009) examine the motivation and pricing of bond claw backs, while Nayar and Stock (2008) do the same for 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.

Our main contribution is to investigate why the popularity of ordinary callable bonds is time varying. We discover that the popularity of callable bonds relative to non-callable bonds is related to the economic environment. Specifically, the likelihood of new issues of callable bonds decreases in the level and slope of the term structure, in interest rate volatility and in the credit spread. Since we do find evidence that the demand for callable bonds is not random, it follows that there can be firms that can process information more effectively than others. Our second contribution is to find that banks, being just the sort of firm likely to develop superior ability to process interest rate information, are more likely than non-banks to issue callable bonds using institutional arrangements that allows them to quickly issue callable bonds in response to newly developed information. However, after correcting for self-selection bias, we find that issuers of callable bonds pay around 24 basis points relative to non-callable bonds for the option to call a bond prior to maturity. Clearly, our results support Kraus (1973) in that issuers of callable bonds do not save on interest costs by issuing callable bonds.

Consistent with the literature, we find mixed evidence that firms use callable bonds to deal with agency problems. On the one hand, lower rated and less profitable firms, just the type of firm 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 larger firms via competitive bids, the sort of firms not normally thought of as subject to severe agency problems. Moreover, callable bonds are less likely to contain restrictive covenants that can further alleviate agency concerns.

In the next section we develop our hypothesis concerning the motivation for issuing callable bonds. Section 3 discusses the data and the sample selection while section 4 develops a model that examines the choice and the offer spread of callable bonds relative to non-

callable bonds. We then present our empirical findings in section 5, robustness investigations in section 6 and our conclusions in section 7.

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 three sets of hypotheses, the economic environment, asymmetric information 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. If interest rates mean revert, then a rise in interest rates suggest that callable bonds will become more popular because as interest rates later fall the bond can be called to benefit the firm's shareholders. Of course, as Kraus (1973) would argue, bond investors can anticipate mean reversion too and so can require a higher call premium in response to an increase in interest rates. This can discourage new issues of callable bonds so we cannot *a priori* sign the relation between the level of interest rates and the popularity of callable bond issues.

Fama (1984), Hardouvelis (1988) and Mishkin (1988) all find that increases in the forward rate 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.

A rise in interest rate volatility, increase 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. Finally, 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 coincident with the economic cycle. 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. Martel (2008) on a study exploring domestic and international bond spreads indicate that domestic spreads are related to the lagged component of sovereign spreads.

B. Asymmetric Information

Shelf registered bonds are bonds that can be issued quickly in response to market events as most of the detailed information requirements are already filed with regulatory authorities. If firms have some special ability to process interest rate information, then their ability to take advantage of newly developed information will be enhanced by employing shelf registered bonds. Therefore, if issuers do have some special ability to process interest rate information, they are likely to issue callable bonds via shelf registration.

Financial firms that perform the banking function, that is borrowing money at low rates of interest, usually at short terms, and then lending this money at higher, often at fixed interest rates, for longer terms, are vitally concerned with changes in the interest rate and credit environment. It is possible that callable bonds can help manage the spread between lending and borrowing rates. If banks develop expertise in forecasting interest rates and credit conditions, then they can derive hedging strategies from issuing callable bonds. Therefore, we expect that banks are more likely to issue callable bonds than firms in other industries.

C. 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 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

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 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, industry sub sector 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

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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.

rate a large number of bonds in all industry categories.[2] We only keep 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 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

[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.

[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.

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 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 2 about here>>

Table 2 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. 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.

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 H6. 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. 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.

[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.

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 3, firms will self-select callable bonds according to the economic environment, asymmetric information 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 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:

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

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 and MATURITY, are designed to test our hypotheses discussed in Section 1 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 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.

$$(Y_i - Y_m) = \text{CONSTANT} + \beta\text{SECURITY}_t + \beta\text{RESTRICT}_t + \beta\text{RATING}_t + \beta\text{SHELF}_t + \beta PRIVATE_t + \beta\text{COMPETITIVE}_t + \beta\text{FINANCIAL}_i + \beta\text{UTILITY}_i + \beta\text{COMPANY SIZE}_i + \beta TDR_t + \beta\text{QR}_t + \beta\text{ROA}_t + \beta\text{LEVEL}_i + \beta\text{SLOE}_i + \beta\text{VOLATILITY} + \beta CREDIT\,SPREAD_t + \beta CALLABLE_t + \beta\text{MILLSOC}_t + \varepsilon_i \quad (2)$$

The dependent variable $(Y_i\text{-}Y_m)_i$ 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). All other variables are as previously defined except that we include two industry dummy variables, FINANCIAL and UTILITY because the systematic risk of the financial, utility and industrial company sectors can be different and so influence the offer spread. Also, 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. Empirical Results

Table 4 reports the result of the selection equation (1) and is meant to shed light on what determines the characteristics and the type of a bond a firm will issue. The regression

seems to explain the data reasonably well with a pseudo R-square of 64.7%. Moreover, eleven of thirteen coefficients representing hypotheses summarized in Table 1 are significant. The control variables ISSUE AMOUNT and MATURITY show that relative to straight bonds, callable bond issues are smaller and of a longer scheduled maturity.

<< Please insert Table 4 about here>>

A. Economic Environment and Asymmetric Information

The first four variables, from LEVEL to CREDIT SPREAD, examine the influence of the economic environment on bond issue choice. Clearly, the higher the current (LEVEL) and anticipated (SLOPE) interest rate, the more unlikely callable bonds are issued. This suggests that bond investors anticipate mean reversion so that higher rates of current and future interest rates imply that, eventually, the bonds will be called to the financial advantage of the firm. Evidently, firms are discouraged from issuing callable bonds as call premiums rise in anticipation of future lower rates and so issue non-callable bonds instead. Similarly, as volatility rises, the call option embedded in callable bonds becomes more expensive making non-callable bonds the more attractive funding option. Finally, as the credit spread widens, firms are less likely to issue callable bonds. This is consistent with Van Horne (2001) who suggests that there is a credit cycle that is coincident with the economic cycle. Therefore as credit spreads widen, calling the bond is unlikely as credit conditions weaken and so callable bonds are less popular as issuers are unlikely to benefit.

The next two variables, SHELF and BANK, examine the influence of asymmetric information on the likelihood of issuing callable instead of non-callable bonds. We find that issuers of callable bonds are likely to employ shelf registration. Evidently, firms that issue callable bonds act as though they have some ability to process interest rate information,

waiting for the “right” economic environment to quickly issue callable bonds via shelf registration.

In section 1 we suggest that banks can develop an informational advantage in processing interest rate information and so would favour issuing callable bonds to manage interest rate and credit risk. Clearly, Table 4 provides strong support as the BANK coefficient is positive and highly significant for callable bonds.

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. Table 4 shows that low rated (RATING) and modestly profitable (ROA) firms do tend to issue callable bonds. However, all other characteristics of callable bonds do not support, and in some cases refute, the hypothesis that callable bonds are used to respond to agency problems. There is no significant relation between callable bonds and the likelihood that the bonds would be issued privately. Callable bonds are more likely to be issued by relatively large rather than small firms (COMPANY SIZE) who are thought to be less prone to agency problems. To protect themselves from agency problems, one would expect bondholders to insist on restrictive covenants (RESTRICT) and high security (SECURITY) yet callable bonds are less likely than non-callable bonds to include restrictive covenants and there is no significant relation to the security level. Finally, 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, 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.

C. Offer Spreads

Table 5 reports the result of the offer spread equation (2) and is meant to shed light on what determines the offer spread for callable bonds. 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 24.5 basis points on average relative to all other issues.

<< Please insert Table 5 about here>>

A special feature of (2) is the inverse mill's ratio coefficient which adjusting for self-selection bias. While the inverse mills ratio for callable bonds is modest in size, 8.7 basis points, it is highly significant. Once the impact of self-select is accounted for, the CALLABLE coefficient means that issuers of callable bonds must pay a premium of 24.3 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.

Eleven of the remaining sixteen slope coefficients are statistically significant. Specifically, 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.[6] Employing a competitive bid (COMPETITIVE) reduces the offer spread but offering the bond as a PRIVATE issue requires a higher offer spread. Meanwhile, firms with higher debt burdens (TDR) pay a higher offer spread whereas firms with higher liquidity (QR) pay a lower offer spread. As

[6] Only Daniels et al. (2009) consider the influence of restrictive bond covenants on bond type selection. We agree with their results that callable bonds are unlikely to include restrictive covenants but unfortunately they do not examine the influence of restrictive covenants on the offer spread.

the LEVEL, SLOPE and VOLATILITY of the term structure rises, indicating higher current and possibly foreshadowing higher rates of interest, the offer spreads on corporate bonds decrease. This result is consistent with Duffee (1998) and Papageorgiou and Skinner (2006) who find an inverse relation between the level and the slope of the Treasury term structure and the offer spread on corporate bonds. Meanwhile the offer spread increases in the CREDIT SPREAD.

6. Robustness Tests

We check the robustness of our results by time period, by broad credit rating categories and by financial verses non-financial industry status as we wish to ensure that the relation among economic variables and the choice between callable and non-callable bonds really do vary consistently with aspects of the term structure and the credit spread. For the time period check, we run our selection model on thirteen annual sub periods to find that only rarely are the coefficients of a different sign and statistically significant from those reported in Table 4. An exception occurs in 2004 where the level, slope and volatility coefficients are perversely positive. We note that in 2004, the one year rate of interest rose and the slope decreased, reversing the trend of the prior 2 or 3 years. Perhaps issuers of callable bonds were surprised by this reversal so that as these trends continued into 2005, the usual inverse relation between the popularity of callable bonds and increases in the level and slope of the term structure, interest rate volatility and the credit spread, reasserted itself.[7]

We also check the relation between the choice of callable versus non-callable bonds by broad rating classes because some authors such as Banko and Zhou (2010) suggest that the motivation for issuing callable bonds can vary by very broad rating classes. To accomplish

[7] These results are available from the corresponding author upon request.

this task we eliminate the single independent variable RATING from (1) and (2) and instead run these models three times, once each for bonds rated high investment grade AAA/AA-, medium investment grade A+/BBB- and below investment grade BB+ and lower The result of this exercise is reported in Tables 6 and 7 for the selection and offer spread equations respectively.

<< Please insert Tables 6 and 7 about here>>

First, looking are the proxies for the economic environment hypothesis in Table 6, from LEVEL to CREDIT SPREAD, we find that when a coefficient is significant, it agrees with the results reported earlier in Table 4. For the asymmetric information hypothesis we do find one exception. Callable bonds are unlikely to be issued via shelf registration if they are rated below investment grade.

Consistent with Banko and Zhou (2010), one proxy for the Agency Costs hypotheses, COMPANY SIZE does deviate by credit quality. Specifically for very high credit quality and for very low credit quality bonds, smaller companies rather than larger companies are more likely to issue callable bonds. This result adds weight to the argument that callable bonds can be used to deal with agency costs, particularly for low rated, smaller companies where agency costs tend to be most severe. Table 7 reports that the credit rating stratified offer spread model (2) is the same as the main estimates with exceptions concentrated in the high investment grade category. For highest credit quality bonds only, offer spreads decrease in the TDR and increase in COMPANY SIZE and LEVEL and SLOPE of the yield curve.

Next, we examine the relation between the choice of callable versus non-callable bonds by finance industry and non-finance industry as Table 2 shows that callable bonds are very popular in the finance industry. To accomplish this task, we eliminate the industry based dummy variables and instead run (2) and (3) twice, once each for bonds issued by

financial and then non-financial firms. Tables 7 and 8 report the results of this exercise for the selection and offer spread equations respectively.

<<Tables 7 and 8 about here>>

Table 7 reports that the results for the economic environment and asymmetric information hypothesis are the same as our main results reported in Table 4 with the minor exception that for non-financial bonds, it is marginally more likely that callable bonds will be issued as the credit spread rises. This result supports Choi, Jameson and Jung (2013) who suggest that information asymmetry can lead the market to overestimate the issuer's default probability, thereby leading the market to undervalue the call premium and encourage the firm to issue a callable bond. When examining the agency problem hypothesis we find several differences in the issue behaviour but still the overall conclusion remains the same, neither financial nor non-financial callable bonds consistently display the characteristics associated with severe agency problems.

Finally, Table 9 report results that are almost entirely consistent with our main results reported in Table 5. The sole exception is that offer spreads increase in liquidity (QR) for financial firms. This 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. More interestingly, we find that after adjusting for self-selection bias, financial firms pay a higher call premium than non-financial firms, 48.8 basis points as compared to 13.4 basis points. Presumably, financial firms can have asymmetric information concerning when it would be best for them to issue callable bonds. Savvy investors recognize this information asymmetry and charge a correspondingly higher call premium.

7. Conclusions

In response to the questions raised in the introduction, the findings of this paper imply that: (1) the popularity of callable bonds is influenced by changes in the term structure and the credit spread; (2) callable bonds are more likely to be issued via a shelf prospectus; (3) callable bonds are more likely to be issued by banks rather than by other types of firms; (4) callable bonds are issued via competitive bids by larger firms, the sort of firms not normally thought of as subject to severe agency problems and (5) firms that choose to issue callable bonds must pay a premium relative to straight bonds for the call feature. Overall, this paper contributes to our understanding of the selection of the call feature and on the determinate of offer spreads of callable and non-callable corporate bonds–an important corporate finance issue.

In more detail, the findings of this study imply that factors related to the economic environment and asymmetric information can consistently explain the shifting popularity of callable bonds relative to non-callable bonds. As the current and anticipated rates of interest, interest rate volatility and the credit spread on corporate bonds rises, callable bonds are less likely to be issued. Issuers of callable bonds are likely to be institutions that can develop special expertise in processing economic information (BANKS) using procedures that enable them to take advantage of newly developed information (SHELF). However, firms that issue callable bond must pay a premium for the privilege to call the bond and financial firms that can have some special expertise in choosing when to issue a callable bond pay more for the call feature than non-financial firms just as financial theory would suggest.

However, we find mixed support for agency problems explanation for issuing 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. Some of the

characteristics of firms issuing callable bonds, such as lower ROA and ratings are consistent but another important characteristic, firm size, is not always consistent with agency theory. Moreover, all of the secondary characteristics of callable bonds, such as higher security, the presence of restrictive covenants and issuing callable bonds via negotiation rather than competitive bids prove to be just the opposite as expected by agency theory.

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Table 1.
The hypothesized relations between bond issue characteristics and issues of ordinary callable

Factors/Variables	*Callable Bonds*
Economic Environment	
LEVEL	Positive/Negative
SLOPE	Negative
VOLATILITY	Negative
CREDIT SPREAD	Negative
Asymmetric Information	
SHELF	Positive
BANK	Positive
Agency	
PRIVATE	Positive
COMPANY SIZE	Negative
ROA	Negative
RATING	Negative
SECURITY	Positive
RESTRICT	Positive
COMPETITIVE	Negative

Table 2. 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

	Industrial			*Financial*			*Utility*			*All*
Grade	Ordinary Call	Non-Callable	Sub Total	Ordinary Call	Non-Callable	Sub Total	Ordinary Call	Non-Callable	Sub Total	Grand Total
AAA	167	81	248	104	79	183	12	23	35	466
AA+	0	14	14	24	40	64				78
AA	5	70	75	265	16	281	0	2	2	358
AA-	18	101	119	119	27	146	3	27	30	295
A+	5	128	133	32	281	313	6	33	39	485
A	247	160	407	763	79	842	5	78	83	1332
A-	3	237	240	180	259	439	0	77	77	756
BBB+	3	226	229	127	60	187	2	74	76	492
BBB	5	211	216	235	208	443	4	50	54	713
BBB-	3	103	106	171	19	190	2	26	28	324
BB+	9	67	76	28	7	35	0	5	5	116
BB	12	45	57	21	2	23	0	3	3	83
BB-	22	31	53	2	4	6	0	4	4	63
B+	34	28	62	6	6	12	1	6	7	81
B	45	15	60	6	1	7	1	2	3	70

B-	33	8	41	3	0	3	0	2	2	46
CCC+	10	2	12	1	0	1	0	1	1	14
CCC	2	0	2							2
CCC-	1	0	1							1
CC	1	0	1							1
Total	625	1527	2152	2087	1088	3175	36	413	449	5776
Rating	A-	A-	A-	A	A	A	A+	A-	A-	A-
Maturity	15.55	9.31	11.12	14.00	4.58	10.7 7	24.77	11.60	12.65	11.05

Table 3
Variables and Definitions

Variable	*Definition*
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.
	Asymmetric Information
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
BANK	A dummy variable that takes on the value of 1 if the company issuing the bond was a bank, a finance company or a savings and loan company, 0 otherwise
	Agency
PRIVATE	A dummy variable that takes on the value of 1 is the bond is a private rule 144a issue, zero otherwise.
COMPANY 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 Pricing Equation
ISSUE AMOUNT	Log of the dollar amount of the bond issue
MATUTITY	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

Table 4
Selection Model for Callable and Non-callable Bonds

This table reports the results of a probit regression of callable verses non-callable bonds on variables that determine the popularity of ordinary callable and non-callable bonds. All variables are defined in Table 3.

	Ordinary Callable/Non-callable	
Variable	Coefficient	Standard Error
CONSTANT	3.264***	0.548
LEVEL	-0.734***	0.039
SLOPE	-0.487***	0.048
VOLATILITY	-0.037***	0.007
CREDIT SPREAD	-0.046***	0.015
SHELF	0.456***	0.094
BANK	1.135***	0.062
PRIVATE	-0.180	0.116
COMPANY SIZE	0.083***	0.013
ROA	-0.016***	0.006
RATING	-0.085***	0.009
SECURITY	0.056	0.063
RESTRICT	-0.210***	0.080
COMPETITIVE	0.725***	0.237
ISSUE AMOUNT	-0.197***	0.015

MATURITY	1.260***	0.036
N	5,776	
CASE CORRECT	5,025	
NUMBER CALLABLE	2,748	
PSEUDO R^2	0.647	

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

Table 5
Offer spreads for Callable and Non-callable Bonds

This table reports the variables that determine the offer spread for new issues of 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.

Variable	*Coefficient*	*Standard Error*
CONSTANT	3.531***	0.305
SECURITY	0.049	0.044
RESTRICT	0.171***	0.037
RATING	-0.183***	0.005
SHELF	-0.245***	0.058
PRIVATE	0.647***	0.079
COMPETITIVE	-0.477***	0.167
FINANCE	0.046	0.039
UTILITY	-0.026	0.045
COMPANY SIZE	0.002	0.008
TDR	0.002***	0.000
QR	-0.004*	0.002
ROA	-0.002	0.005

LEVEL	-0.087***	0.017
SLOPE	-0.127***	0.024
VOLATILITY	-0.008**	0.003
CREDIT SPREAD	0.189***	0.007
CALLABLE	0.243***	0.042
MILLSOC	-0.087***	0.020
N	5776	
R^2	0.485	

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

Table 6
Selection Model for Callable and Non-callable bonds Stratified by Rating

This table reports the results of a probit regression of callable verses non-callable bonds on variables that determine the popularity of ordinary callable and non-callable bonds. All variables are defined in Table 3.

	AAA to AA-		*A+ to BBB-*		*BB+ and lower*	
Variable	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
CONSTANT	5.970***	2.185	-6.492***	0.992	3.834***	1.399
LEVEL	-1.252***	0.122	-0.462***	0.061	-0.346***	0.110
SLOPE	-0.990***	0.135	-0.248***	0.081	-0.314**	0.133
VOLATILITY	-0.044**	0.021	-0.004	0.010	-0.005	0.024
CREDIT SPREAD	-0.041	0.044	-0.064**	0.026	-0.007	0.049
SHELF	3.225***	0.362	0.957***	0.186	-0.469**	0.211
BANK	0.488**	0.196	1.364***	0.097	0.990***	0.270
PRIVATE	N/A	N/A	-1.588***	0.272	-0.453**	0.223
COMPANY SIZE	-0.225***	0.036	0.466***	0.024	-0.223***	0.045
ROA	-0.063***	0.019	-0.055***	0.013	-0.006	0.008
SECURITY	0.038	0.284	-0.034	0.122	0.214*	0.119
RESTRICT	-1.403***	0.227	-0.922***	0.151	0.280	0.196
COMPETITIVE	1.215	0.995	1.559***	0.417	0.904*	0.465
ISSUE AMOUNT	-0.054*	0.032	-0.095***	0.032	-0.213***	0.052
MATURITY	0.874***	0.102	1.800***	0.065	0.648***	0.136
N	1,197		4,102		477	

CASE CORRECT	1,119	3,657	364
NUMBER CALLABLE	717	1,793	238
PSEUDO R^2	0.774	0.632	0.304

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

Table 7
Offer spreads for Callable and Non-callable Bonds Stratified by Rating

This table reports the variables that determine the offer spread for new issues of 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.

	AAA to AA-		*A+ to BBB-*		*BB+ and lower*	
Variable	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*
CONSTANT	0.480*	0.285	1.595***	0.349	0.915	1.528
SECURITY	-0.088***	0.034	-0.088*	0.051	0.449***	0.141
RESTRICT	0.406***	0.088	0.297***	0.032	-0.111	0.188
SHELF	-0.540***	0.104	-0.056	0.078	-0.433*	0.259
PRIVATE	1.171***	0.227	0.688***	0.100	0.449	0.291
COMPETITIVE	-0.530***	0.074	-0.305***	0.117	-1.014**	0.475
FINANCE	-0.009	0.062	0.032	0.039	0.437	0.294
UTILITY	0.223***	0.079	0.040	0.040	-0.121	0.363
COMPANY SIZE	0.040***	0.009	-0.026**	0.010	-0.076	0.070
TDR	-0.002**	0.001	0.003***	0.001	0.004*	0.002
QR	0.005	0.016	-0.010***	0.002	-0.071**	0.031
ROA	-0.003	0.006	-0.012***	0.004	-0.017	0.012
LEVEL	0.121***	0.033	-0.122***	0.014	-0.221	0.151
SLOPE	0.109***	0.029	-0.136***	0.024	-0.309	0.200
VOLATILITY	0.001	0.005	-0.005	0.003	0.037	0.037
CREDIT SPREAD	0.056***	0.010	0.224***	0.007	0.100	0.071

CALLABLE	0.093	0.062	0.188***	0.037	-0.133	0.194
MILLSOC	-0.183***	0.035	-0.060***	0.016	0.239	0.300
N	1,197		4,102		477	
R^2	0.099		0.366		0.153	

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

Table 8
Selection Model for Callable and Non-callable bonds Stratified by Financial and Non-financial

This table reports the results of a probit regression of callable verses non-callable bonds on variables that determine the popularity of ordinary callable and non-callable bonds. All variables are defined in Table 3.

	Financial		*Non-financial*	
Variable	Coefficient	Standard Error	Coefficient	Standard Error
CONSTANT	-4.069***	1.232	5.164***	0.723
LEVEL	-0.840***	0.069	-0.568***	0.053
SLOPE	-0.708***	0.083	-0.219***	0.071
VOLATILITY	-0.041***	0.011	-0.028***	0.009
CREDIT SPREAD	-0.180***	0.025	0.044*	0.024
SHELF	1.465***	0.237	0.198*	0.114
PRIVATE ISSUE	-0.067	0.325	0.029	0.130
COMPANY SIZE	0.075***	0.025	0.047**	0.022
ROA	-0.187***	0.017	0.031***	0.006
RATING	-0.005***	0.016	-0.133***	0.013
SECURITY	0.718***	0.181	0.041	0.074
RESTRICT	-1.203***	0.181	0.387***	0.095
COMPETITIVE	N/A	N/A	0.471*	0.255
ISSUE SIZE	0.081***	0.027	-0.347***	0.022
MATURITY	1.875***	0.068	0.760***	0.057
N	3,175		2,601	
CASE CORRECT	2,921		2,212	
NUMBER CALLABLE	2,087		661	
PSEUDO R^2	0.765		0.411	

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

Table 9
Offer spreads for Callable and Non-callable Bonds Stratified by Rating

This table reports the variables that determine the offer spread for new issues of 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.

	Financial		*Non-financial*	
Variable	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*
CONSTANT	3.050***	0.655	4.619***	0.421
SECURITY	0.041	0.107	0.048	0.045
RESTRICT	0.400***	0.103	0.072*	0.038
RATING	-0.174***	0.006	-0.191***	0.009
SHELF	-0.370**	0.145	-0.160**	0.064
PRIVATE	0.164	0.217	0.681***	0.082
COMPETITIVE	-1.600***	0.155	-0.409**	0.178
COMPANY SIZE	0.023**	0.009	0.001	0.013
TDR	0.002***	0.001	0.000	0.001
QR	0.019***	0.005	-0.013***	0.003
ROA	-0.003	0.014	-0.005	0.005
LEVEL	-0.117***	0.023	-0.151***	0.030
SLOPE	-0.210***	0.031	-0.110**	0.043
VOLATILITY	-0.001	0.003	-0.020***	0.005
CREDIT SPREAD	0.191***	0.008	0.144***	0.015
CALLABLE	0.488***	0.072	0.134*	0.081
MILLSOC	0.081*	0.048	-0.168***	0.027
N	3,175		2,601	
R^2	0.508		0.495	

* 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