# Underpricing in the Corporate Bond Market

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This article examines underpricing of initial public offerings (IPOs) and seasoned offerings in the corporate bond market. We investigate whether underpricing represents a solution to an information problem or a liquidity problem. We find that underpricing occurs with both IPOs and seasoned offerings and is highest among riskier, unknown firms. Our evidence suggests that information problems drive underpricing, with support for both the bookbuilding view of underpricing and the asymmetric information theory. We do not find evidence in favor of the Rock model of underpricing or any evidence that illiquidity causes underpricing. (*JEL* G12, G14, G24)

The equity initial public offering (IPO) literature includes numerous theories as to why underpricing occurs, frequently arguing that it alleviates information problems (e.g., Rock (1986) and Benveniste and Spindt (1989)). More recent work has suggested that underpricing is related to the liquidity of the stock. In this article we examine corporate bond offerings to determine which, if any, of these theories explains underpricing on public bonds.

If underpricing arises because of information problems, we expect it to occur among firms with more of these issues, whereas if it is more closely related to liquidity then it ought to vary with the bond's trading activity. If information drives underpricing, then we would like to know what purpose it serves: is it payment for information collected from informed investors; compensation to uninformed investors for the winner's curse; or is it a method of signaling superior quality? We focus much of our attention on bond IPOs (first time offerings in the public bond market), which are more likely to exhibit underpricing than "seasoned" bond offerings (SBOs).

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We examine underpricing with a sample of 2975 corporate bonds issued between 1995 and 1999, including 439 bond IPOs and 2536 SBOs, using price data from transactions reported in the University of Houston-National Association of Insurance Commissioners (UH-NAIC) database. We find significant underpricing on speculative-grade debt IPOs that averages 47 basis points (bp), but no significant underpricing on investment-grade bond IPOs. Underpricing also occurs with speculative-grade SBOs. We find that underpricing is greater for riskier firms, such as private firms for which the debt IPO is the very first public security offering, firms that have not been issuing in the corporate bond market for long, and firms that only recently issued equity in the public markets. We also find that initial returns are related to the bookbuilding process. In contrast, we find no support for the Rock model, nor do we find evidence that underpricing is related to postoffering liquidity.

The remainder of the article is organized as follows. Section 1 reviews existing theory and evidence. Section 2 summarizes our data, the methodology of adjusting returns, and the explanatory variables. The empirical analysis of bond IPOs and post-IPO offerings appears in Section 3. Section 4 concludes the study and summarizes the results.

## 1. Underpricing: Theory and Evidence

While a variety of theories could explain underpricing on equity IPOs, in this article we focus on models of underpricing that seem more relevant to the bond market, such as information and liquidity models that are important even for large issuers. We consider the following information-based models: the Rock (1986) model; the signaling models of Allen and Faulhaber (1989), Grinblatt and Hwang (1989), and Welch (1989); and the bookbuilding models of Benveniste and Spindt (1989), Benveniste, Busaba and Wilhelm (2002) and Sherman and Titman (2002)).[1] We also investigate liquidity-based explanations found in Ellul and Pagano (2006) and Booth and Chua (1996).

Two of the theories focus on differences in information between informed and uninformed investors. Rock (1986) highlights the winner's curse problem that arises when informed investors only request an allocation of fairly valued or undervalued IPOs, leaving the allocation of overpriced, unprofitable IPO investments to uninformed investors. Underpricing solves this problem by increasing the profits of uninformed investors, who would otherwise not participate in the IPO market. Benveniste and Spindt (1989) extend the analysis of Rock's situation to

[1] Stoughton, Wong and Zechner (2001), Welch (1992), and Maksimovic and Pichler (2001) also model underpricing as a solution to an information problem, but in their models firms must decide whether to even exist. These theories are less likely to be relevant for our study, given the size of issuers.

consider how investment banks might extract the information known by informed investors. In their model, as well as the other bookbuilding models, underpricing is compensation for providing information about the value of the firm in the roadshow.

Underpricing could also result if there is asymmetric information between investors and managers (the signaling models). Managers face a lemons problem: because investors cannot tell good firms from bad firms, all firms receive the same valuation. Hence, managers of good firms will want to use IPO underpricing as a mechanism to separate themselves from lesser firms and receive their true, high worth. Several researchers have also looked at alternative, nonsignaling mechanisms for reducing this problem.

Empirical studies of equity IPO underpricing have yet to determine conclusively which factors are most important. However, the evidence contradicts signaling models (e.g., Spiess and Pettway (1997) and Jegadeesh, Weinstein and Welch (1993)), while bookbuilding is viewed more favorably (see Cornelli and Goldreich (2003) and Jenkinson and Jones (2004)). Ritter and Welch (2002) review the literature in detail.

Ellul and Pagano (2006) argue that underpricing is compensation for the risk that the stock will be illiquid after the IPO. Empirically, they find measures of liquidity impact underpricing in the predicted direction. In contrast, Booth and Chua (1996) argue that high underpricing causes the IPO investors to trade more, leading to high post-IPO liquidity. They provide indirect evidence in support of this hypothesis.

Whatever the source of underpricing in the equity IPO market, one would expect that the same factors would be important in the underpricing of corporate bonds. Empirical studies of bond underpricing largely predate these theories. Early studies, such as Ederington (1974), Lindvall (1977), Weinstein (1978), and Sorenson (1982) consider the question of why the yield to maturity (YTM) on a new bond offering is usually higher than the YTM on an existing corporate bond. They investigate when the YTMs converge: if the YTMs converge quickly, then the differentials are ascribed to underpricing, and if not, then new issues are deemed to undergo a seasoning process. In the most recent of the articles, Sorenson (1982), concludes that the seasoning process observed in previous articles is mostly an underpricing phenomenon. Fung and Rudd (1986) argue that once one uses better quality bond price data, both seasoning and underpricing disappear. Wasserfallen and Wydler (1988) find evidence of underpricing in the Swiss bond market.

These older studies do not distinguish between bond IPOs and SBOs. In contrast, Datta, Iskandar-Datta and Patel (1997) and Helwege and Kleiman (1998) focus exclusively on bond IPOs. Datta et al., use transaction data from the NYSE and find initial returns for speculative-grade bonds of 1.86% and *negative* initial returns for investment-grade bond IPOs. Helwege and Kleiman calculate underpricing using trader

quotes, which are more representative of the dealer-dominated corporate bond market. They find significant positive underpricing on speculative-grade bond IPOs that averages 39 bp. A likely explanation for the discrepancy in the results is the infrequent bond trading on the NYSE, and the fact that it is dominated by retail-sized trades of ten bonds or less. However, Datta et al.'s results might differ if the Rock model describes underpricing best, and the NYSE bonds are more affected by informed investor trading. Hale and Santos (2007) investigate the costs of issuing a debt IPO and also find evidence of underpricing.

## 2. Data, Calculation of Underpricing, and Explanatory Variables

### 2.1 Data sources

We analyze US corporate bond offerings listed in the Fixed Investment Securities Database (FISD) from Mergent Inc., between 1995 and 1999. This database maintains issuance information on all fixed income securities that are assigned a CUSIP, or are likely to receive one soon.[2] We exclude all bonds that have unusual features that could affect underpricing: foreign issues, private placements, convertible bonds, pay-in-kind bonds, corporate pass-thru trusts, and financial firms.[3]

We identify bond IPOs by first finding all firms with new debt offerings, but no debt outstanding prior to 1995. These potential bond IPOs are then screened further, by examining data in the Fixed Income Database (FID) (Lehman Brothers data) and Moody's Annual Bond Records, to eliminate firms that have outstanding public straight bonds before 1995, when the FISD starts.[4] Our definition of bond IPOs excludes offerings by firms that issued debt in some other corporate form: for example, NTL Communications Corp.'s offering is not an IPO because the firm was spun off from NTL Inc., which had issued public debt earlier. We check for such relationships in Moody's Industrial manuals and the Directory of Corporate Affiliates. In total, 524 bond offerings meet our criteria for debt IPOs; 4082 offerings are SBOs.

We obtain secondary bond prices from the UH-NAIC database, which includes prices of all purchases and sales of publicly traded corporate bonds made by insurance companies. Insurers are required to report this information to the NAIC annually. The University of Houston supplies these data to academic institutions after matching the transaction records

[2] The latter are principally 144As that often receive a CUSIP within three months of issuance. See Chaplinsky and Ramchand (2000) for a detailed study of Rule 144A securities.

[3] Financial firms are excluded because their offer prices are likely to be affected by regulatory factors.

[4] FISD includes all public bonds that mature in 1990 or later. Thus, a firm that issued a bond prior to 1990 that had already matured would be mistakenly identified as having a bond IPO were it not for the crosscheck in the other databases.

with the FISD. These data are the same as those used by Campbell and Taksler (2003) and Krishnan, Ritchken and Thomson (2005).

A potential concern with the UH-NAIC database is whether insurers are representative participants in the US corporate bond market. Campbell and Taksler (2003) note that insurance companies hold about a third of all corporate bonds, so obviously, they are an important market participant. Hong and Warga (2000) conclude that these firms account for a quarter of transactions in the high-yield market. The insurers' data are far more representative of transactions in the corporate bond market than transactions completed on the NYSE's Automated Bond System (ABS), which is the only other transaction database for the time period we investigate. For example, in 1999, the average daily volume of trades in the UH-NAIC database was over $2 billion, compared to less than $10 million for ABS trading (reported in the Wall Street Journal).

Do insurance companies also participate actively in new bond offerings? We investigate all bond offerings in the FISD to determine the fraction of offerings in which insurance companies participate. Our potential sample includes 4082 SBOs and 524 IPOs. Of these, 3297 SBOs and 507 IPOs have trades in the NAIC database, implying that insurance firms bought 96% of the IPOs and 81% of the SBOs offered.

As in any database, filters need to be applied to check for errors. For example, we find that for some bonds that trade more than once in the same day, the reported accrued interest differs to an extent not due to rounding error. We examine all the accrued interest figures by calculating their values according to the Securities Industry handbook and comparing them to the figures in the database. If the difference between the two numbers is less than 10-days' accrued interest, we assume that the UH-NAIC is accurate and keep the trading record; otherwise it is deleted.[5] This screen results in the deletion of 120 bond trades. For bonds that have several trades occurring on the same day and have different reported accrued interest, if the difference between them is less than 0.01% of par, we consider it a rounding error and keep it; otherwise, we delete all the observations of that bond on that day. With this filter, we delete 50 bond transactions.

### 2.2 Calculation of underpricing (initial returns)

In the equity IPO literature, underpricing is typically calculated as the percentage difference between the offer price and the closing price on the first day of trading. In the corporate bond market, trading occurs less frequently, and none of the available databases include all trades. We calculate initial returns on bonds for which transaction data are available

[5] Bonds sometimes have long or short initial coupon periods that can lead to discrepancies between the "theoretical" accrued interest and reported interest. Since this information is not always available we are forced to assume that the reported accrued interest figure can deviate from the "theoretical" value.

within seven calendar days of the offering date.[6] We require that all bonds in our sample have at least one transaction during this period. This reduces the sample to 439 IPOs, which were completed by 421 firms (some firms issued two bonds simultaneously in their IPOs), and 2536 SBOs by 979 firms. The quality of bond pricing data is not as good as that typically available for equity market studies, so using a number of trades for the same bond improves the precision of the estimates. For issues with more than one trade in a day we use all the information by using a weighted average price. The weights are the fraction of the day's total transactions accounted for by each trade.

Because the market could move sharply during our seven-day window, we use the excess return of the individual bond over the return on a bond index during the same period. We use the Lehman Brothers Corporate Indices as benchmarks.[7] These indices are broken down by maturity (intermediate or long term, depending on whether the bonds mature in less than 10 years or not) and by credit quality (indices are available for each major rating category). Lehman indices use Moody's ratings to classify high-grade bonds, and S&P ratings for junk issues. For consistency, we convert all ratings into their equivalent S&P categories.

To calculate market-adjusted returns, first we calculate raw returns for the individual bonds. Let $n$ be the number of days between reported bond trades. We begin by defining the bond return over $n$ days as follows:

$$BR_{i,n} = (P_{t+n} - P_t)/P_t \tag{1}$$

where $P_t$ is the price reported for the transaction on date $t$ (or the weighted average price if there are multiple trades on that day), and $P_{t+n}$ is the price of the bond at the next transaction $n$ days later, and both prices are expressed as the sum of the flat price and accrued interest. The calculation of the bond return is the same whether it is the initial return associated with the IPO ($P_t$ is the offering price) or a subsequent return.

Once we have an individual bond return, we adjust for changes in the benchmark. Using Equation (1) to define the individual bond return ($BR_{i,n}$), we then find the comparable index based on rating and maturity.

The excess return over the initial return trading period is:

$$MARK_{i,n} = BR_{i,n} - \prod_{j=1}^{n} INDX_{i,t-n+j} \tag{2}$$

[6] We also examine trades (not reported) within 14 days of the issue date and find similar results.

[7] These indices include all publicly traded US corporate debentures and secured notes that meet prescribed maturity, liquidity, and quality guidelines. Securities with calls, puts and sinking fund provisions are included, which is standard for indices. However, the indices exclude private placements, 144A securities, floating rate securities, and Eurobonds. In addition, the speculative grade index excludes pay-in-kind bonds and debt issues from countries designated as emerging markets.

where $BR_{i,n}$ is the raw bond return on bond $i$ over $n$ days that first trades on day $t$ and $\Pi$ $INDX$ over $n$ days is the cumulative index return over the $n$ days also starting on day $t$ for the Lehman Brothers' index with the same rating and similar maturity.

Figure 1 shows the frequency of bond trading on each trading day during the calendar week following the offering. Our sample only includes bonds that trade within seven calendar days of the offer date, which means within five trading days if there is no holiday during that week. The figure, however, shows trades by trading days. On the first trading day after the IPO is completed, 167 of the 439 bonds have trades reported in the database. On the second trading day, 82 of the IPO bonds trade, of which 29 have already traded and 53 are bonds IPOs for which this day is the first day of trading. Thus, half of the bonds trade within two days of the IPO. Panel B shows trades for the SBO sample: the frequency of trading is fairly similar to that observed in the IPO sample.

Figure 1 highlights the fact that corporate bonds trade infrequently—while over 1100 of the bonds trade on the day of the offering, only a few hundred trade on the next day. Nevertheless, trading in the first week after the bond offering is considerably higher than later in the life of the bond. Over the entire sample period, the median number of trades per bond is 22 (note, this figure is low partly because some bonds are issued late in the sample period). Most of the trading occurs in the first year of the bond's life (the median during the first year is 15 trades) and most of this trading is in the week following the offering (median number of trades is 8). In comparison, Alexander, Edwards and Ferris (2000) report that bonds in the FIPS system (the most frequently traded high-yield bonds) have 7.8 trades per day on average and a median of 5.5 trades. They also find that trading is most active early in the life of a bond.

Before considering the topic of underpricing in detail, we investigate trading during the first week after the offering date to determine whether there is a seasoning process. If there is no seasoning in our sample, then virtually any price during the first week of trading would provide the same estimate of underpricing. Table 1 shows returns on each trade after the bond offering—seasoning is absent from the data.

Another possibility is that the cumulative return over the week is zero, as the initial trade's underpricing might be reversed. We also investigate the return over the week for the longest time period possible (e.g., over five days if the bond trades five days after the offering, over one day if it only trades on the first day of the week). Using this approach, we find that initial returns are significantly positive for both IPOs and SBOs. As the results are scarcely affected by the trade used during the first week, we restrict our analysis hereafter to the first recorded trade after the bond offering.

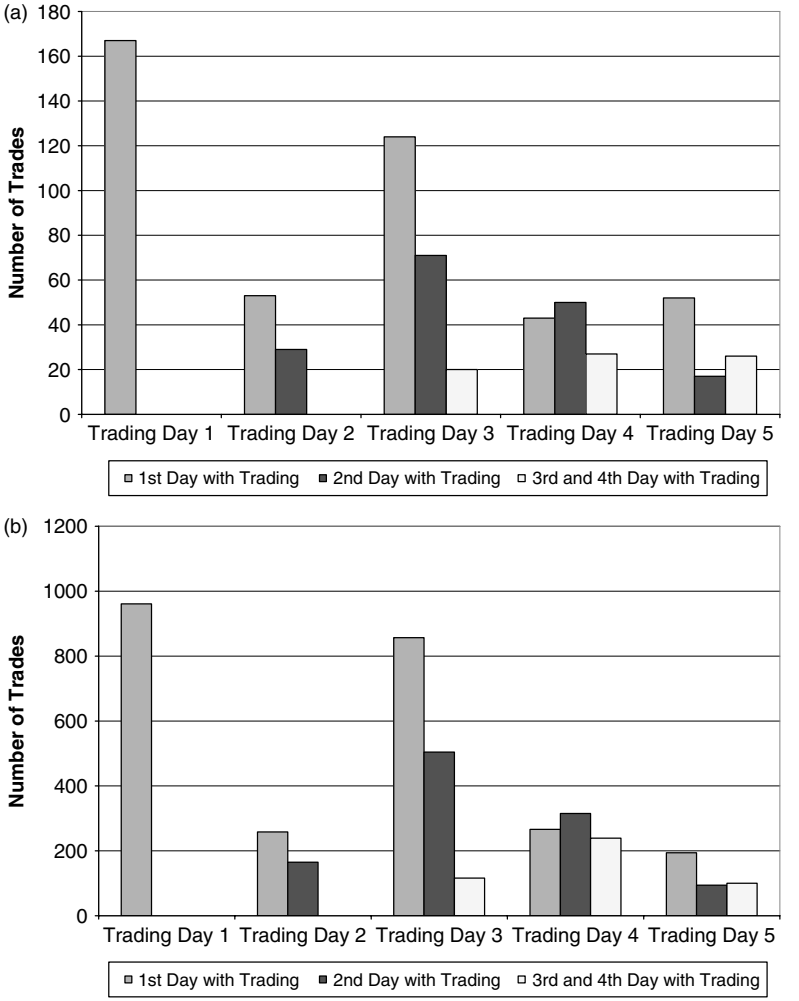


**Figure 1**
(a) Trade frequency for IPO bonds. (b) Trade frequency for new issues offered by seasoned issuers.

## 2.3 Explanatory variables

Here we enumerate the theories we test and the variables we use to test them.

**2.3.1 Information theories.** Bond IPOs by private firms are offerings by private firms that have no public equity outstanding at the time of bond offering. Hence, its bond IPO is the first public security offering ever made by the firm, and would be the first time investors have analyzed the

**Table 1**
**Initial returns**

| | IPO issues | | | SBO issues | | |
|---|---|---|---|---|---|---|
| Order of trade | Number of trades | Mean | *t*-statistic | Number of trades | Mean | *t*-statistic |
| 1st day with trading | 439 | 0.370*** | 8.754 | 2536 | 0.027** | 2.529 |
| 2nd day with trading | 167 | −0.172 | −1.173 | 1078 | −0.011 | −0.785 |
| 3rd day with trading | 59 | 0.049 | 0.362 | 354 | 0.016 | 0.456 |
| 4th day with trading | 14 | 0.217 | 0.931 | 101 | 0.116 | 1.163 |

Bond offerings and bond features are obtained from the Fixed Income Securities Database (FISD) and the bonds must have transaction prices in the UH-NAIC database within one week of the offering date. Initial public offerings (IPOs) are identified from FISD. The IPO issues sample includes 439 bonds issued by 421 firms. The seasoned bond offering (SBO) sample includes 2536 bonds issued by 979 firms. Initial returns of bond IPOs on date $t$ are adjusted for market returns using the date $t$ Lehman Brother's index return, where the index is matched by maturity and rating. $BR_{i,n}$ is the return for bond $i$ over $n$ days for IPO firms and $\prod INDX_{i,n}$ over $n$ days is the cumulative return on the Lehman Brothers index for bonds of the same rating and maturity for the $n$ days that also start on day $t$. The initial (excess) return over $n$ days ($BR_{i,n}$) for firm $i$ for its bond IPO is then:

$$MARK_{i,n} = BR_{i,n} - \prod_{j=1}^{n} INDX_{i,t—n+j}$$

Statistical significance at the 0.001, 0.05, and 0.1 levels are denoted by *** , ** , and * , respectively.

firm's situation. All the information models predict greater underpricing for bond IPOs completed by private firms.

Riskier bonds should have more information problems—if the bond is perfectly safe, there is little value to additional information about the firm. Risk is summarized by bond ratings in the FISD, which reports each bond's ratings (from S & P's, Moody's and Fitch's) within one month of the offering. If a bond has no rating from any rating agency during the first month (there are only four such issues), then we use its rating in the month after the IPO. In the case of multiple ratings, we use S&P's rating when available, Moody's next, and the Fitch rating only when no other ratings are reported.

Smaller firms are also expected to have more information problems: they are less well known, may suffer more competitive pressures and are more likely to default. We match the bond pricing database with Compustat to obtain data on total assets. As bonds are frequently issued by a subsidiary whose CUSIP differs from the parent, this is an imprecise match. Moreover, a sizeable fraction of the issuers are private firms that are less likely to have information recorded in Compustat.

**The winner's curse** The Rock model of underpricing relies on the existence of uninformed and informed investors in the market. While there is no definitive way to identify informed and uninformed investors, a priori, one would expect retail investors to possess less information than institutions. As noted earlier, most of the dollar volume in the corporate bond market is in the dealer market, which is an institutional market, but some bonds

do trade on the NYSE, where individuals are far more likely to trade bonds. Presumably, the firm lists the bonds on the NYSE hoping to attract a wider investor base, but this also makes the bondholders more likely to suffer from the winner's curse problem. If this is an important explanation for underpricing, then we would expect greater underpricing among bonds listed on the NYSE at the time of the offering. We identify these bonds from the NYSE's Fact Book for the relevant year, cross-checked with Edgar when we are unable to determine which of a firm's bonds are listed on the NYSE. Our sample includes 144A bonds which we do not count as NYSE bonds, because 144As must first be offered to qualified institutional buyers (QIBs) before they can trade on the NYSE.

**Bookbuilding** If payment for information to institutional investors in the bookbuilding process is the main explanation for underpricing, then we expect that a firm that just went through the bookbuilding process would require less underpricing, even if capital-raising for this firm requires substantial information gathering. We create two indicator variables: (i) one which takes the value of one for firms that have made an offering in the bond market recently (within the previous two years); and (ii) one which takes the value of one if the firm has completed its equity IPO in the last two years. The literature has detailed the downside of issuing public equity, including negative announcement effects and poor long-term performance, whereas public debt offerings have no such effects.[8] With greater frequency of tapping the bond market, issuers are likely to benefit from the fact that institutional investors have already recently evaluated the firm. This suggests that bookbuilding in the equity markets and bond markets are not perfect substitutes for each other and the two events should be treated separately.

**Asymmetric information** Signaling theory states that the best firms will use underpricing to signal that they are better, while lesser firms will not find it in their interest to do so. A prediction of the model, then, is that bonds with significant underpricing should turn out to be among the better bonds in the sample. Among bonds with significant information problems (i.e., bonds that are not "safe debt" as described by Myers and Majluf (1984)), signaling theory predicts that the bonds with the highest incidence of downgrades will have the least underpricing. We use future downgrades as a measure of asymmetric information in the IPO sample.

Chemmanur and Paeglis (2005) argue that asymmetric information problems can be reduced by alternative mechanisms, such as the reputation

[8] See Masulis (1988) for a review of announcement effects associated with various security offerings and Ritter and Welch (2002) for examples of long-term performance studies.

of the issuer. We use the number of years the firm has been issuing in the bond market as a proxy for reputation, as suggested by Diamond (1989) and Carty (1996). A firm with several decades of issuance history is unlikely to have much more of a reputation than one that had issued for 10 years, so we also include the square of the years to capture the concave relationship.[9]

**2.3.2 Liquidity risk.** As Figure 1 indicates, bonds do not trade frequently after issuance. Most bond offerings are placed with institutions, whose purchases are \$5–10 million each, so a smaller offering (e.g., \$125 million) could only have a dozen or so investors, and the bond would be unlikely to trade often in the secondary market. The UH-NAIC database allows us to examine three measures of liquidity: the size of the bond offering, the frequency with which the bond trades (among insurance companies) and the bid-ask spread. While trading frequency and the bid-ask spread may be theoretically preferable to the size of the bond offering, empirically they are both flawed. For example, the bid-ask spread is only available for a small fraction of the sample (533 offerings). The number of trades is available for all bonds, but some of the bonds are issued early in the sample period and could trade for as many as five years, while others are issued later and only trade for a year or less. We adjust for this by using the number of trades per month, but if trading thins as the bond ages (it usually does), extrapolating out using trading in the first year or so may be biased. Nevertheless, we compare the amount of the bond offering to these other liquidity measures to see if they roughly correspond to the same phenomenon. We find that the three measures are similar: larger offerings have narrower bid-ask spreads, as expected, and larger offerings trade more frequently. The correlation of the offering size with the bid-ask spread is 0.08 ($p$-value of 0.06) while the correlation with the trading frequency is 0.57 ($p$-value of 0.001). Given the paucity of observations for the bid-ask spread, we do not use it in estimations.

## 3. Empirical Investigation

### 3.1 Univariate analysis

We begin our empirical analysis with summary statistics of the sample of 439 debt IPOs and the 2536 SBOs in Table 2. We then present univariate

[9] Diamond (1991) argues that banking relationships help establish a reputation for debt repayment. We investigate the impact of banking relationships by examining firms' bank borrowings just prior to the bond offering. Data on bank debt outstanding, and the availability of lines of credit, are available for most of the firms in Moody's manuals. For those that do not show up in the manuals prior to the offering, we obtain bank debt outstanding and available lines of credit in the companies' electronic filings with the SEC (at www.sec.gov). For a small fraction of firms, bank debt information is simply unavailable. Using this information, we construct an indicator variable that is set to one if the firm had neither outstanding bank loans nor any lines of credit prior to the bond. We do not find that bank borrowings reliably explain underpricing, and therefore do not report the results.

**Table 2**
**Summary statistics**

| | | IPO issues | | SBO issues | |
|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent |
| Panel A: Bond rating | | | | | |
| A or better | | 34 | 7.7 | 1085 | 42.8 |
| BBB | | 62 | 14.1% | 861 | 34.0 |
| BB | | 31 | 7.1 | 226 | 8.9 |
| B | | 263 | 59.9 | 322 | 12.7 |
| CCC or lower | | 31 | 7.1 | 28 | 1.1 |
| Not rated | | 18 | 4.1 | 14 | 0.6 |
| Panel B: Exchange where the firm's equity is listed | | | | | |
| NYSE/AMEX | | 141 | 32.12 | 2038 | 80.36 |
| OTC | | 72 | 16.40 | 242 | 9.54 |
| Private firms | | 226 | 51.48 | 256 | 10.09 |
| Panel C: Whether the bond trades on the NYSE | | | | | |
| Trades on NYSE | | 10 | 2.28 | 92 | 3.63 |
| Does not trade on NYSE | | 429 | 97.72 | 2444 | 96.37 |
| Panel D: Industry | | | | | |
| Agriculture, forestry, fishing, mining, & construction | | 38 | 8.66 | 190 | 7.49 |
| Manufacturing | | 186 | 42.37 | 913 | 36.00 |
| Transportation & public utilities | | 76 | 17.31 | 880 | 34.70 |
| Wholesale & retail trade | | 56 | 12.76 | 256 | 10.09 |
| Services | | 64 | 14.58 | 267 | 10.53 |
| Panel E: Maturity | | | | | |
| Long term | | 330 | 75.17 | 1664 | 65.62 |
| Intermediate | | 109 | 24.83 | 872 | 34.38 |
| Panel F: Offering size and MTN | | | | | |
| Bond offerings over | Non-MTNs | 249 | 56.72 | 1487 | 58.64 |
| $125 million | MTNs | 1 | 0.23 | 75 | 2.96 |
| Bond offerings of | Non-MTNs | 186 | 42.37 | 436 | 17.19 |
| $125 million or less | MTNs | 3 | 0.68 | 538 | 21.21 |

Bond offerings and bond features are obtained from the Fixed Income Securities Database (FISD) and the bonds must have transaction prices in the UH-NAIC database within one week of the offering date. Bond ratings are S&P ratings where available, otherwise we use Moody's or Fitch's ratings. Ratings, maturity, exchange where the firm's equity is listed, and industry are obtained from FISD. Whether the bond trades on the NYSE is determined from the NYSE Fact Book; bonds that trade on the NYSE at the time of the offering are included in this category. Initial public offerings (IPOs) are identified from FISD. The IPO issues sample includes 439 bonds issued by 421 firms. The non-IPO issues sample includes 2536 bonds issued by 979 firms.

statistics and $t$-tests of differences in underpricing in the two samples in Table 3.

Panel A of Table 2 shows the majority of the bond IPO firms are rated speculative-grade, with only 22 percent of the sample bonds at the BBB level or higher. In contrast, about 77% of the SBOs belong to investment-grade firms. Panel B indicates that nearly half of bond IPOs are done by firms that are still private. Again, the SBOs deviate dramatically, as fewer

than 11% are private. Panel C shows that most bonds are not listed on the NYSE around the time of the offering. In Panels D, E and F, we examine the industry distributions, maturities and offering sizes of the debt IPO firms relative to these features of the experienced firms. The two sets are fairly similar with regard to the industries represented (the largest number of debt IPOs occurs in manufacturing (42.4%), with only somewhat less in manufacturing (36%) for the seasoned issuers). Panel D indicates that 75% of the IPO bonds are long-term (maturity greater than 10 years). Panel E indicates that the offering sizes of the two types of firms do not differ markedly. However, the small SBOs are more likely to be medium-term notes (MTNs), reflecting the fact that MTNs are more often issued by investment-grade firms.

Table 3 presents univariate comparisons of initial returns by rating, maturity, private/public status and offering size for the two samples. Note that the distribution of initial returns is quite skewed, regardless of the subsample examined, but this is true of equity IPOs as well (see Table 1, Panels (a) and (b) of Loughran and Ritter (2004)). We include underpricing by maturity category in these tables, although we should keep in mind that maturity is correlated with rating.

For investment-grade bonds, initial returns are not significantly different from zero, regardless of whether the bond is an IPO or a SBO.[10] However, high-yield bond IPOs exhibit an average initial return of 47 bps, with a very high $t$-statistic. The SBO sample also has a significant amount of underpricing among the speculative-grade sample, although the magnitude is smaller than that observed among the debt IPOs.

Panel B in Table 3 indicates that underpricing is sharply higher among private firms' IPOs. A private firm has no public equity outstanding at the time of bond offering, and hence, its bond IPO is the first public security offering ever made by the firm. This result is consistent with the idea that underpricing solves an information problem. The SBOs of private firms, however, do not exhibit greater underpricing than their public firm counterparts, even though underpricing for the public firm SBOs is significantly positive. This may reflect estimation noise in the small sample of private firms' SBOs, given that the point estimate is substantially larger than that for public firms' SBOs.

Bonds that trade on the NYSE do not exhibit significant underpricing, which goes against the Rock model. However, we do not control for other variables here that might be correlated with NYSE's trading status.

We further examine the pricing of bond IPOs by splitting the sample according to maturity and according to the size of the offering. Neither variable strongly affects underpricing, except that MTNs that are SBOs

[10] This finding sharply contrasts with that of Datta, Iskandar-Datta and Patel (1997), who find significant negative initial returns on investment-grade bond IPOs.

**Table 3**
**Initial returns by rating, public/private status, maturity and offering size**

| Panel A: By rating | | Number | Mean | *t*-Statistic | Max | Min | Median | Number of zeros |
|---|---|---|---|---|---|---|---|---|
| SBOs | High yield | 590 | 0.149*** | 4.58 | 4.82 | −6.69 | 0 | 233 |
| | Investment grade | 1946 | −0.01 | −1.08 | 3.63 | −2.80 | 0 | 712 |
| IPOs | High yield | 343 | 0.469*** | 9.14 | 5.04 | −6.35 | 0 | 143 |
| | Investment grade | 96 | 0.019 | 0.40 | 1.57 | −1.28 | 0 | 28 |
| Panel B: By Public/private status | | | | | | | | |
| SBOs | Public | 2280 | 0.022** | 2.07 | 3.97 | −6.69 | 0 | 813 |
| | Private | 256 | 0.071 | 1.52 | 4.82 | −5.96 | 0 | 132 |
| IPOs | Public | 213 | 0.256*** | 5.03 | 5.04 | −2.00 | 0 | 84 |
| | Private | 226 | 0.478*** | 7.24 | 4.49 | −6.35 | 0 | 87 |
| Panel C: By Whether the bond trades on the NYSE | | | | | | | | |
| SBOs | Trades on NYSE | 92 | −0.024 | −0.47 | 1.11 | −1.80 | 0 | 17 |
| | Does not trade on NYSE | 2444 | 0.029*** | 2.65 | 4.82 | −6.69 | 0 | 928 |
| IPOs | Trades on NYSE | 10 | 0.067 | 1.21 | 0.47 | −0.10 | 0 | 7 |
| | Does not trade on NYSE | 429 | 0.377*** | 8.73 | 5.04 | −6.35 | 0 | 164 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Panel D: By maturity | | | | | | | | | |
| SBOs | Intermediate | | 872 | 0.009 | 0.60 | 4.82 | −5.96 | 0 | 386 |
| | Long term | | 1664 | 0.036*** | 2.59 | 3.97 | −6.69 | 0 | 559 |
| IPOs | Intermediate | | 109 | 0.462*** | 5.26 | 5.04 | −1.02 | 0.005 | 39 |
| | Long term | | 330 | 0.340*** | 7.06 | 4.49 | −6.35 | 0 | 132 |
| Panel E: By offering amount and MTN | | | | | | | | | |
| SBOs | Bond offerings over | Non-MTNs | 1487 | 0.042*** | 3.01 | 3.97 | −3.47 | 0 | 407 |
| | $125 million | MTNs | 75 | −0.065 | −0.92 | 3.92 | −1.66 | 0 | 38 |
| | $125 million or less | Non-MTNs | 436 | 0.078*** | 2.61 | 4.82 | −6.69 | 0 | 182 |
| | | MTNs | 538 | −0.044*** | −2.61 | 2.03 | −5.96 | 0 | 318 |
| IPOs | Bond offerings over | Non-MTNs | 249 | 0.433*** | 7.55 | 5.04 | −1.02 | 0.002 | 75 |
| | $125 million | MTNs | 1 | 0.000 | n.a. | 0.00 | 0.00 | 0 | 1 |
| | $125 million or less | Non-MTNs | 186 | 0.286*** | 4.54 | 2.98 | −6.35 | 0 | 93 |
| | | MTNs | 3 | 0.492 | 1.00 | 1.48 | 0.00 | 0 | 2 |

Bond offerings and bond features are obtained from the Fixed Income Securities Database (FISD) and the bonds must have transaction prices in the UH-NAIC database within one week of the offering date. Bond ratings are S&P ratings where available, otherwise we use Moody's or Fitch's ratings. Ratings, maturity, exchange where the firm's equity is listed, and industry are obtained from FISD. Initial public offerings (IPOs) are identified from FISD. The remaining offerings are seasoned bond offerings (SBOs). The analysis is based on market-adjusted returns as described in Table 2. "Investment-Grade" bonds have ratings of BBB or higher while "high-yield" bonds have ratings of BB or lower. "Private" means the bond issuer does not have public equity outstanding at the time of bond offering while "public" firms do. Intermediate bonds have a maturity of 10 years or less, while long-term bonds have a maturity of more than 10 years. "MTNs" are medium term notes.

have sharply less, even negative, underpricing. MTNs are quite small and, therefore, might be expected to have less liquidity [see Crabbe and Turner (1995)]. This result supports Booth and Chua's (1996) view that greater underpricing leads to greater liquidity, but MTNs also tend to be issued by very safe firms, so the univariate results may be more closely related to rating.

While the underpricing of high-yield bonds identified in Table 3 is significantly positive, a potential concern is whether the magnitude of this underpricing is large enough to offer a trading opportunity for insurance companies. In particular, a concern is that our estimates merely reflect bid-ask spreads. We address this issue in two ways: first, we compare our results to estimates of the bid-ask spread in the dealer market; and second, we consider the sensitivity of our estimates to the buy/sell transactions, including redoing Table 3 using only sell transactions.

How do bid-ask spreads compare to the size of our underpricing estimates? Hong and Warga (2000) report bid-ask spreads of 19 cents or approximately 19 bp. As we find significant underpricing mainly among speculative-grade bonds, this measure of the bid-ask spread seems more appropriate than a measure that applies to the whole market (they find an average bid-ask spread of 8 bp for investment-grade bonds, so the market average is well under 19 bp). Our estimate of initial returns on speculative-grade bonds is substantially larger than the bid-ask spread.

Further, we consider the impact of buys and sells on our estimates. When selling occurs, it tends to be the case that all the trades on that day are sells (about 70% of the sells occur on days when all the transactions are sells). Selling is not significantly related to the sign of the initial return on the IPO. Further, to check robustness of the estimates, we restrict our analysis to sell transactions when we calculate initial returns. In doing so, we find sharply higher returns, especially within the speculative-grade bond sector, although the samples are considerably smaller. For example, using the 174 sell observations on debt IPOs, the average return is 75 bp compared to 37 bp reported in Table 1. Likewise, restricting the sample to sell transactions of high-yield SBOs (196 observations), we find underpricing on bonds that is more than double the amount reported in Table 3 (37 bp vs 15 bp). However, we note that the sell transactions indicate that underpricing is actually significantly negative (about −15 bp) for investment-grade bonds. Given the small sample of sell transactions, we continue the remainder of our analysis with both buy and sell transactions.

A further robustness check on the extent of underpricing on debt IPOs is to compare initial returns on IPO bonds with those on similar SBO bonds. To do so, we create a match for each IPO, where the matching bond has the same rating class (investment-grade or speculative-grade) and the same public/private status. We then require that the offering size of the matching bond be between 90 and 110% of the IPO's offering size.

If more than one such match exists, we choose the one closest in offer size to the IPO. We are able to find matches using this method for 352 IPO bonds.[11]

The initial returns for our matching bonds are reported in Table 4. Both the IPO bond and the matched bond have the same status in panels A and B, but in the remaining panels we do not match by the variables of interest. Thus, for example, the match will contribute data to the mean of the matched category regardless of whether it has the same maturity as the IPO.

Our matching exercise highlights two results: First, high-yield IPOs exhibit significant underpricing, even compared to similar firms' SBOs. In fact, by most measures, underpricing among debt IPOs is two to three times larger than that of comparable firms. The most extreme difference occurs for private firms. Second, many of the matched firms with speculative-grade ratings also exhibit significant underpricing.

### 3.2 Multivariate analysis

Our univariate analysis provides substantial evidence that underpricing is related to information problems and less so to post-offering liquidity, but the effects of each may not be clear in univariate analysis. Next, we examine underpricing in multivariate regressions: Table 5 presents results for all the bond offerings, while Table 6 presents results for the IPO sample by itself. The significance levels in these tables are computed using White's (1980) correction for heteroskedasticity. We include the maturity of the bond offering as a control variable. Maturity is measured as an indicator variable that is set to one if the bond has a maturity over 10 years and zero otherwise.

From Model (1) in Table 5, we can see that the overall excess returns for IPO bonds are significantly higher than those of SBOs and that underpricing is especially high for private firms' IPOs (as captured by the interaction of the private firm indicator and the IPO indicator). Maturity is not significant. To the extent that the size of the bond offering is a good measure of aftermarket liquidity, the fact that it is positively and significantly related to underpricing is counter to the prediction of Ellul and Pagano (2006).

One possible explanation for the positive, significant sign on the amount of the bond offering is that the variable is not actually a proxy for liquidity, but is correlated with information problems. In particular, if bond offering size is highly correlated with firm size, then larger offerings might have greater underpricing if large firms are more difficult to understand.

[11] Using a less restrictive offering amount rule does not increase the number of matching bonds available. This largely reflects the smaller number of private, high-yield firms available to serve as matches in the non-IPO sample.

**Table 4**
**Initial returns for IPOs and a matched sample of SBO firms**

| | | IPOs | | Matched SBOs | | Difference |
|---|---|---|---|---|---|---|
| | Number | Mean | *t*-statistic | Mean | *t*-statistic | *t*-statistic |
| Panel A: By rating | | | | | | |
| High yield | 257 | 0.468*** | 7.379 | 0.178*** | 3.406 | 3.528 |
| Investment grade | 95 | 0.017 | 0.366 | 0.005 | 0.082 | 0.174 |
| | 352 | 0.346*** | 7.043 | 0.131*** | 3.183 | 3.353 |
| Panel B: By public/private status | | | | | | |
| Public | 213 | 0.256*** | 5.032 | 0.126** | 2.270 | 1.733 |
| Private | 139 | 0.484*** | 5.039 | 0.139** | 2.288 | 3.029 |
| | 352 | 0.346*** | 7.043 | 0.131*** | 3.183 | 3.353 |
| Panel C: By whether the bond trades on the NYSE | | | | | | |
| Trades on NYSE | 10 | 0.067 | 1.212 | 0.054 | 0.361 | 0.081 |
| Does not trade on NYSE | 342 | 0.354*** | 7.016 | 0.133*** | 3.161 | 3.357 |
| | 352 | 0.346*** | 7.043 | 0.131*** | 3.183 | 3.353 |
| Panel D: By maturity | | | | | | |
| Intermediate | 88 | 0.410*** | 4.079 | 0.040 | 0.355 | 2.441 |
| Long term | 264 | 0.325*** | 5.762 | 0.161*** | 4.049 | 2.366 |
| | 352 | 0.346*** | 7.043 | 0.131*** | 3.183 | 3.353 |
| Panel E: By offering amount | | | | | | |
| Greater than $125 million | 210 | 0.423*** | 6.541 | 0.148*** | 2.957 | 3.370 |
| $125 million or less | 142 | 0.233*** | 3.111 | 0.107 | 1.509 | 1.223 |
| | 352 | 0.346*** | 7.043 | 0.131*** | 3.183 | 3.353 |

The variables in this table are identical to those in Table 3. IPOs are compared to a group of SBO bonds that are matched on the basis of rating (investment-grade or high-yield), public/private status, and offering size. We create a match for each IPO in the sample, where the matching bond has the same rating class (investment-grade or speculative-grade) and the same public/private status. Once we find a set of matches that meet these two criteria, we require that the offering size of the matching bond be between 90 and 110% of the IPO's offering size. If more than one such match exists, we choose the one closest in offer size to the IPO.

However, in results not reported, we find total assets of the firm has a negative coefficient (albeit not always significant) in the underpricing regression, which would occur if smaller firms have more information problems.[12] It is also possible that bond offering size is important because of MTNs, which are issued by safer firms. To check on this, we rerun the regression in model (2) without the MTNs. The offering size variable loses its significance in model (2), suggesting it is more related to information problems than liquidity.

[12] We ignore assets in subsequent analysis because it reduces the sample size sharply.

**Table 5**
**Multivariate analysis of initial returns**

| Variables | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Constant | −0.273*** | −0.186 | 0.005 | −0.045 | −0.023 | −0.278** |
| | **−2.61** | **−0.80** | **0.26** | **−0.46** | **−0.23** | **−2.49** |
| IPO | 0.228*** | 0.225*** | 0.236*** | 0.117* | 0.043 | |
| | **5.13** | **4.76** | **5.50** | **1.79** | **0.55** | |
| Maturity | 0.001 | −0.006 | 0.010 | 0.002 | 0.002 | −0.006 |
| | **0.06** | **−0.23** | **0.44** | **0.11** | **0.09** | **−0.27** |
| Private firm | 0.046 | 0.086* | 0.053 | −0.006 | −0.012 | −0.007 |
| | **1.14** | **1.84** | **1.35** | **−0.11** | **−0.24** | **−0.17** |
| Private firm* IPO | 0.179** | 0.133 | 0.171** | 0.268** | 0.355*** | 0.144 |
| | **2.28** | **1.57** | **2.47** | **2.28** | **2.76** | **0.83** |
| Offering size | 0.058*** | 0.043 | | 0.026 | 0.023 | 0.052** |
| | **2.79** | **1.00** | | **1.57** | **1.35** | **2.57** |
| Frequency of post-offering bond trading | | | 0.004* | | | |
| | | | **1.65** | | | |
| Bond trades on the NYSE | | | | −0.069 | −0.071 | −0.033 |
| | | | | **−1.32** | **−1.34** | **−0.42** |
| Length of time in the bond market | | | | −0.465* | −0.474* | 0.028 |
| | | | | **−1.78** | **−1.82** | **0.09** |
| Time in the bond market squared | | | | 1.049* | 1.066* | 0.295 |
| | | | | **1.72** | **1.75** | **0.37** |
| Issued a bond in the last 2 years | | | | −0.058** | −0.056* | −0.041* |
| | | | | **−2.07** | **−1.94** | **−1.75** |
| Completed an equity IPO in the last 2 years | | | | 0.008 | 0.000 | 0.044** |
| | | | | **0.37** | **0.00** | **1.98** |
| Completed equity IPO* Bond IPO | | | | | 0.216* | |
| | | | | | **1.78** | |

(continued overleaf)

**Table 5**
**(Continued)**

| Variables | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| BB | | | | | | 0.031 |
| | | | | | | **0.81** |
| B1 | | | | | | 0.324*** |
| | | | | | | **5.47** |
| B2 | | | | | | 0.183*** |
| | | | | | | **3.60** |
| B3 | | | | | | 0.316*** |
| | | | | | | **5.80** |
| CCC and below | | | | | | 0.117 |
| | | | | | | **1.39** |
| IPO* IG | | | | | | −0.028 |
| | | | | | | **−0.40** |
| IPO* BB | | | | | | 0.372*** |
| | | | | | | **2.66** |
| IPO* B1 | | | | | | −0.033 |
| | | | | | | **−0.26** |
| IPO* B2 | | | | | | 0.335*** |
| | | | | | | **3.86** |
| IPO* B3 | | | | | | 0.113 |
| | | | | | | **1.12** |
| IPO* CCC and below | | | | | | 0.224* |
| | | | | | | **1.74** |
| Number of observations | 2975 | 2358 | 2975 | 2975 | 2975 | 2975 |
| Adjusted $R^2$ | 0.033 | 0.043 | 0.045 | 0.049 | 0.53 | 0.055 |

Bond and IPO data are obtained from FISD. Their transaction prices must appear in the UH-NAIC database within one week of the offering date. Bond ratings are mainly from S&P. "Offering size" is the dollar amount of the bond offering. "Issued a bond in the last two years" and "Completed an equity IPO in the last two years" are indicator variables for bonds belonging to firms that have issued bonds or completed equity IPOs in the last two years, respectively. "Private" bond issuers do not have public equity outstanding at the time of the offering. "Length of time in the bond market" is years since the first offering by the firm. "Bonds traded on the NYSE" are identified from the NYSE Fact Book. "Frequency of post-offering bond trading" is the number of trades in the UH-NAIC database divided by the number of months the bond is in the database. Model (2) excludes MTNs. White heteroskedasticity corrected $t$-statistics are in bold. ***, **, and * denotes significance at the 0.001, 0.05, and 0.1 levels, respectively.

**Table 6**
**Multivariate analysis of initial returns of debt IPOs**

| Variables | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Constant | −0.667 | −1.911*** | 0.391*** | −0.102 | 0.899** |
| | **−1.10** | **−2.59** | **3.98** | **−0.17** | **2.02** |
| Maturity | −0.188* | −0.210** | −0.158 | −0.145* | −0.014 |
| | **−1.85** | **−2.04** | **−1.53** | **−1.73** | **−0.19** |
| Private firm | 0.277*** | 0.232*** | 0.226*** | 0.335*** | 0.291*** |
| | **3.25** | **2.73** | **2.64** | **4.02** | **3.88** |
| Offering size | 0.200* | 0.445*** | | 0.070 | −0.179** |
| | **1.73** | **3.13** | | **0.62** | **−2.12** |
| Frequency of post-offering trades | | | −0.009 | | |
| | | | **−1.31** | | |
| Completed an equity IPO in the last two years | | | | 0.179* | 0.133* |
| | | | | **1.89** | **1.80** |
| Bond was downgraded in year after IPO | | | | −0.113 | −0.138* |
| | | | | **−1.44** | **−1.91** |
| BB | | | | | 0.306*** |
| | | | | | **2.84** |
| B1 | | | | | 0.296* |
| | | | | | **1.95** |
| B2 | | | | | 0.394*** |
| | | | | | **3.63** |
| B3 | | | | | 0.234** |
| | | | | | **2.39** |
| CCC and below | | | | | 0.120 |
| | | | | | **1.23** |
| Number of observations | 439 | 435 | 439 | 439 | 439 |
| Adjusted $R^2$ | 0.031 | 0.042 | 0.017 | 0.041 | 0.101 |

Bond offerings and bond features are obtained from the FISD. Their transaction prices must appear in the UH-NAIC database within one week of the offering date. Where available, bond ratings are from S&P (otherwise, Moody's or Fitch's). IPOs are identified from FISD. "Offering size" is the dollar amount of the bond offering. "Frequency of post-offering trades" is the number of trades in the UH-NAIC database divided by the number of months the bond could trade in the database. "Completed an equity IPO in the last two years" is an indicator variable for bonds belonging to firms that have completed equity IPOs in the last two years. "Private" means the bond issuer does not have public equity outstanding at the time of bond offering. "Bond was downgraded in the year after IPO" is an indicator variable for firms that were downgraded within 12 months of the IPO. Model (2) excludes medium term notes. White heteroskedasticity corrected $t$-statistics are reported below coefficients, which are marked by ***, **, and * for significance at the 0.001, 0.05, and 0.1 levels, respectively.

We also investigate liquidity with the average number of times the bond trades in the UH-NAIC database (per month), shown in model (3). As before, the results suggest greater underpricing when the bond is more liquid, although the variable is only significant at the 10% level. Moreover, as trades per month average 2.11, the impact evaluated at the mean is fairly small. Given that the offering size is more significant in model (1), we revert to using offering size in the rest of the models.

Our results so far are more supportive of information-related factors than liquidity factors, but we would like to know which specific information problem is solved by underpricing. In the last three columns of Table 5 we analyze the question further with our proxies for manager/bondholder asymmetric information, bookbuilding and the winner's curse.[13] Admittedly, these proxies are imperfect and they may all be correlated with bond ratings. Thus, model (4) omits bond rating information while model (6) includes dummy variables for the various rating categories and their interactions with the IPO indicator variable. Model (4) shows no role for the winner's curse. Bonds that trade among the retail investors of the NYSE are no more likely to exhibit underpricing than other bonds. We find more support for the asymmetric information and bookbuilding theories, as both the amount of time the firm has been issuing in the bond market and the recent bond issuance variable are significant with the expected signs. The equity issuance variable has the wrong sign for the bookbuilding theory, although it is not significant in model (4). This regression implies that, for firms that recently underwent a bookbuilding process for an equity offering, the information collected in the equity-raising process was not sufficient to warrant a reduction in the information collection process for the subsequent bond offering. This result is at odds with the bookbuilding view of underpricing, as there is no need to pay a substantial amount for information during the bond bookbuilding process if the information was just recently collected in an equity underwriting process. After all, both the equity and bond offerings involve collection of information about the same firm. Moreover, valuing equity requires more detailed information about the firm's asset value distribution than debt does (see Myers and Majluf (1984) and Boot and Thakor (1993)). And it is especially difficult to reconcile the positive significant coefficients in model (6) with bookbuilding theory, as it suggests that firms that recently did an equity offering have *more* underpricing on their subsequent bond offerings.

However, a positive coefficient on the equity offering indicator may mean something else. Given that these firms were private only a short while before their bond offerings, they may be better described as a

[13] We also included a proxy for asymmetric information related to bank loans, but found that it was not statistically significant.

group with more severe asymmetric information problems: they have only marginally more information available about them than do private firms. Thus, these firms and the private firms may share the feature that managers know much more about their firms than do investors. In model (5) we show that the equity issuance coefficient is strongest for debt IPOs, which makes more sense if the equity indicator is viewed as a measure of asymmetric information between investors and firms rather than as a proxy for information gathered in the bookbuilding process.

Finally, we note that the introduction of ratings in model (6) reduces the significance of the length of time as a bond issuer, but has no impact on the recent bond issuance indicator. The ratings and their interaction with the IPO indicator are not always significant, but for the most part suggest that riskier firms and riskier IPOs have more underpricing. Once again, we have evidence that underpricing is about information, not about trading conditions. It is difficult to say which information problem is most important, although if we rely on the NYSE indicator results, it is not the problem addressed by the Rock model. If we can ascribe the results on equity IPO bookbuilding to imperfect measurement of asymmetric information problems, then both bookbuilding and asymmetric information problems find support as reasons for underpricing.

We can further consider the issue of bondholder/manager asymmetric information by analyzing the IPOs alone. In this subsample, we expect asymmetric information problems to be solved with underpricing (reputations are not available to these issuers). If asymmetric information theory is correct, then the ones signaling with underpricing should have more positive futures. We test this by analyzing the subsequent downgrading activity of the IPO issuers. If good firms signal, then the most underpricing should occur among the firms that are not downgraded after the offering. In Table 6, we consider this specification of the underpricing regression, as well as the relevant specifications in Table 5.[14]

Among the IPO subsample, we see a more robust relationship between underpricing and private firm status, as well as between underpricing and whether the firm recently completed an equity IPO. In contrast, the offering size variable flips sign (and significantly so) in the last model. As before, the frequency of bond trading goes against the prediction of the Ellul and Pagano model. However, now it is not significant, so we cannot claim support for Booth and Chua's view either. In models (4) and (5), we include an indicator for whether the bond was subsequently downgraded by the rating agencies. The coefficients are negative in both models, but only significantly so once ratings are controlled for. Still, this provides some evidence in favor of signaling as an explanation for underpricing.

[14] The number of upgrades is too small to use an indicator variable for subsequent upgrades.

## 4. Conclusion

We examine underpricing on corporate bonds and find it averages 47 bp for speculative-grade IPOs, substantially more than the bid-ask spread. And, while much smaller, speculative-grade SBOs also exhibit underpricing on average. Our evidence suggests that underpricing is not related to subsequent trading or other measures of market liquidity. Given that trading in the corporate bond market is infrequent, perhaps it is not surprising that investors who rarely trade do not require a premium for liquidity risk. Underpricing appears to be related to information problems. It is especially high among private firms' bond IPOs, which are the first public security offerings ever by the firm. Firms that only recently changed from private to public equity status have unusually high underpricing. Our two proxies for asymmetric information, how long the firm has been issuing in the market and whether it is subsequently downgraded, largely support this view. However, the variables are not always statistically significant. We also find that underpricing is lower if the firm recently completed a bond offering, suggesting that underpricing is related to the bookbuilding process. In contrast, we do not find any evidence favoring the Rock model, as the small subset of bonds that involve large retail investor participation do not exhibit higher underpricing.

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