Determinants of Corporate Bond Trading: 
A Comprehensive Analysis

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Abstract

This paper studies the determinants of trading volume and liquidity of corporate bonds. Using transactions data from a comprehensive dataset of insurance company trades, our analysis covers more than 17,000 US corporate bonds of 4,151 companies over a five year period. The availability of transactions data allows us to study the effect of a variety of issue- and issuer-specific characteristics on liquidity. We find that the most economically important determinants of bond trading volume are the bond’s issue size and age; trading volume declines substantially as bonds become seasoned and are absorbed into less active portfolios. We also examine the relationship between bond trading volume and activity in the issuer’s stock. Our results show that bonds of companies with publicly traded equity are more likely to trade than those with private equity. Further, public companies with more active stocks have more actively traded bonds. Finally, we show that while the liquidity of high-yield bonds is more affected by credit risk, interest-rate risk is more important in determining the liquidity of investment-grade bonds.

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1. Introduction

This paper presents the most comprehensive study to date of trading activity in the corporate bond market. We analyze the determinants of trading volume for over 17,000 investment-grade and high-yield bonds of public and private firms for a 60-month period from January 1995 to December 1999. Researchers and practitioners have long hypothesized as to how particular firm characteristics, issue characteristics, and market conditions are related to corporate bond liquidity. Using transactions data from a comprehensive dataset of insurance company trades allows us to provide meaningful estimates of the significance and magnitude of these effects.

Corporate bonds are primarily traded in a non-centralized dealer market. Prior to the phase in of trade reporting requirements under the NASD’s TRACE system beginning in July 2002, transactions data has been generally unavailable. The primary exception to this lack of data is that insurance companies are required to provide information on bond trades to the National Association of Insurance Commissioners (NAIC).\(^1\) Insurance companies have been shown to be significant participants in the U.S. corporate bond market.\(^2\) For the time period we examine, the NAIC database includes daily transactions data on more than 18,400 corporate bonds.

Liquidity is defined as the ability to trade quickly at a low cost (O’Hara, 1995, p.216). Previous literature suggests three ways of measuring liquidity: through the bid-ask spread, the price impact of large trades, and trading volume. Prior to the availability of transactions based data, direct examination of any of these three measures was not possible. Studies largely used

\(^1\) Date-stamped information on bond trades is reported to the regulators on a quarterly basis.
\(^2\) Hong and Warga (2000) report that insurance companies account for 25% of the market for non-investment grade debt, while their share of trading in the investment-grade debt market is 40%. Schultz (2001) estimates that life insurance companies by themselves hold about 40% of all corporate bonds.
yield spreads or issue size as proxies for bond liquidity, but no data was available to directly test
the relationship between these proxies and more direct measures of liquidity. Further, yield
spreads reflect compensation for credit risk in addition to liquidity risk.

The NAIC database has enabled researchers to examine the first measure of liquidity
through realized bid-ask spreads, as data on quotes is still not available. Chakravarty and Sarkar
(2003) and Hong and Warga (2000) estimate bid-ask spreads based on price differences between
transactions identified as buys versus sells for the most actively traded bonds in the NAIC
dataset. Calculating price impact as a liquidity measure remains problematic because of
infrequent trading in corporate bonds. Our paper focuses on the third measure of liquidity,
trading volume.

Using trading volume as a proxy for liquidity is supported by two theoretical arguments.
First, the 'inventory paradigm' of Demsetz (1968), Ho and Stoll (1981), and Stoll (1989) suggests
that liquidity depends on the cost of financing dealer inventories. Based on this paradigm,
inventory costs for low-trading bonds are likely to be higher and are passed on to the investor in
the form of higher bid-ask spreads. Low trading volume and high bid-ask spreads both indicate
low liquidity, but realized bid-ask spreads also reflect compensation for risk factors in addition to
liquidity. Moreover, Grossman and Miller (1988) theorize that realized spreads provide
compensation to dealers to cover the execution cost of the trade rather than compensation for
providing liquidity. Second, Kamara (1994) develops a measure of 'immediacy risk' which

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4 Schultz (2001) also provides estimates for a larger sample of bond by inferring prices when bonds do not trade
using a database of monthly bond quotes provided by Lehman Brothers. Details of the various data sources are
provided in Section 3.
5 Our paper is closest in spirit to Alexander, Edwards, and Ferri (2000) who study determinants of trading volume
for 55 high-yield bonds, for which transactions were reported to the NASD under the Fixed Income Pricing System
(FIPS).
incorporates trading volume directly. Immediacy risk is the risk of adverse price moves by the
time the transaction is executed. This risk is directly related to the price volatility of the bond
and the time needed to execute a trade, and is reduced with higher trading volume.

At the same time, there are two critiques of using trading volume as a liquidity proxy. First, some critics argue that the volume of large trades, rather than total volume, is a better
measure of liquidity. However, in the NAIC dataset, we find that large trades, small trades, and
total volume are highly correlated. Second, trading volume does not explicitly incorporate
trading costs, falling short of fully satisfying O'Hara's definition of liquidity. While Chakravarty
and Sarkar (2003) find a significant negative correlation between trading volume and realized
bid-ask spreads, there are important exceptions. Bamber (1986) and Krinsky and Lee (1996)
observe that around earning announcements both volume and bid-ask spreads are high, raising
questions about the use of either as a proxy for liquidity. The theoretical literature argues that
increased trading in this situation is not liquidity driven, but rather 'speculation driven', and
results from investors' differences in interpreting economic news. We expect this 'speculative
component' of trading volume to vary with the risk characteristics (interest-rate risk, volatility,
and credit risk) of corporate bonds.

Our comprehensive trading volume dataset allows us to test a wide range of hypotheses
for the determinants of liquidity. For each month a bond is outstanding, we calculate the par
amount traded (which is frequently zero) standardized by the bond's total amount outstanding.
We estimate logit regressions explaining the trading probability in a particular month as well as
tobit regressions explaining the monthly volume of trade. Our limited dependent variable

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6 Keim and Madhavan (1996) and Madhavan and Cheng (1997) believe that the ability to execute large trades with
little price impact reveals better the depth of the market.
7 The list includes Bachelier (1900), Kyle (1985), Admati and Pfeiderer (1988), Harris and Raviv (1993), Kandel
approach allows us to handle the problem of irregularly spaced data due to the generally infrequent trading of corporate bonds. We estimate the relative sensitivity of monthly trading volume to issue- and issuer-specific characteristics, as well as to changes in financial market conditions.

Our results show that issue size and age are by far the two most important determinants of liquidity. Specifically, a $150 million\(^8\) increase in amount outstanding increases the probability of trade in a given month for investment-grade bonds from 35.7% to 55.5%; for high yield bonds, a $190 million increase raises the probability of trade from 25.4% to 35.9%. At the same time, a one standard deviation increase in bond age reduces the probability by 5.9% for investment grade and 3.6% for high yield bonds.\(^9\) Given the importance of these factors in explaining trading volume, we also document the behavior of trading activity relative to the time since issuance. In the first month following the date of issue, 75% of investment grade bonds in our sample are traded by insurance companies, but by month 12 this falls to 20%. Over years 1 through 10, the percentage of bonds with trades falls slowly from 33% to 17%. A similar pattern is observed for high yield bonds, where the percentage of bond traded falls from 32% to 7% over the first 10 years. This behavior is consistent with the idea that over time, bonds are absorbed into less actively traded portfolio. We also show that, controlling for bond age, trading volume increases monotonically with issue size.

We also examine the relationship between trading volume and activity in the firms\' own equity, as well as general movements in government bond and equity markets. Bonds of firms whose equity is not publicly traded trade significantly less than their public equity counterparts.

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\(^8\) The sample average amount outstanding for investment-grade bonds is $130 million and for high yield bonds is $150 million, with standard deviations of $150 million and $190 million, respectively.

\(^9\) The sample average bond age for investment grade (high yield) bonds is 4.4 (3.5) years, with a standard deviation of 5.5 (4) years.
Further, we find that when the stock is publicly traded, there is a strong correlation between the trading volumes of equity and debt for that firm. Finally, we observe that large return shocks in the overall stock market induce less trading in the bond market, but that changes in long-term Treasury rates generate more trading, particularly for longer-maturity corporate bonds.

The rest of the paper is organized as follows: the next section motivates the variables used to explain corporate bond trading and presents some evidence from previous studies. Section 3 describes our dataset of insurance company trades, as well as additional datasets used in this study, and discusses the bond trading patterns observed in our sample of bonds. Section 4 presents the model and estimation methodology. Section 5 discusses the results and the last section concludes the paper.

2. Potential determinants of corporate bond trading

This section motivates the choice of bond and stock variables used to explain liquidity in US corporate bond markets. We review hypotheses about their expected impact on trading as well as related evidence from previous studies.

- **Issue size.** Following the inventory paradigm argument, we hypothesize that size should have a significant positive impact on bond liquidity, as dealers can more easily manage their inventory of larger issues. While studies using yield spreads to proxy for liquidity find little support for this hypothesis\(^{10}\), Hong and Warga (2000) show that larger issues have significantly tighter bid-ask spreads. For the 55 FIPS-traded bonds, Alexander, Edwards, and Ferri (2000) find that larger issues do have higher trading volume.

\(^{10}\) See e.g. Warga (1992), Crabbe and Turner (1995), and Fridson and Garman (1998).
• **Age of bond.** Alexander, Edwards, and Ferri (2000) and Warga (1992) argue that as a bond becomes more seasoned it becomes less liquid, as inactive portfolios absorb progressively more of the original issue and less is available to trade. Prior evidence shows that yield spreads increase as the bond ages (Sarig and Warga (1989), Warga (1992)), bid-ask spreads increase (Chakravarty and Sarkar (2003), Hong and Warga (2000), Schultz (2001)), and trading volume decreases (Alexander, Edwards, and Ferri (2000)).

• **Interest-rate risk.** As in Alexander, Edwards, and Ferri (2000), we test whether bonds with higher interest-rate risk have a stronger speculative trading component. The theoretical literature (Harris and Raviv (1993), Kandel and Pearson (1995)) suggests that differences in investors' forecasts should lead to more speculative trading in the highest duration issues.

• **Credit risk.** Uncertainty concerning value is likely to be higher for lower credit quality issues. Further, speculation about changes in the bond's credit quality, which are more likely for lower grade bonds, should induce more trading. Hotchkiss and Ronen (2002) show that lower grade bonds are more likely to reflect firm specific information. Alexander, Edwards, and Ferri (2000) document more trading in high-yield bonds with higher credit risk.

• **Price volatility.** Harris and Raviv (1993) theorize that trading volume is positively affected by return shocks, because price volatility reflects differences in investors' opinions. This in turn induces more speculative trading. Consistent with this hypothesis, Alexander, Edwards, and Ferri (2000) find that trading increases with bond return volatility.

• **Publicly vs. privately traded equity.** Only a portion of corporate bonds in our sample have publicly traded equity. While all registered firms are required to disclose material
information to the SEC, the disclosure requirements are much more stringent for firms with publicly held equity. As a result, more information is available on public equity firms, hence reducing the cost of adverse selection for market makers in those bonds and increasing their liquidity. Fenn (2000) finds that private firms pay a yield premium over firms with public equity. We expect more information induced trading for public than for private equity firms. For the 55 FIPS-listed bonds, Alexander, Edwards, and Ferri (2000) find the opposite result.

- **Equity trading volume and return.** Firm-specific news should affect trading in both the equity and debt of a firm. Based on the high-yield bond data from FIPS, Hotchkiss and Ronen (2002) find support for the hypothesis that bond and stock returns react jointly to common factors. In contrast, Kwan (1996) finds that only past stock returns are correlated with current bond yield changes. For bonds of companies with publicly traded equity, we expect stock activity and bond liquidity to be positively related.


- **Changes in long-term interest rates.** The price of fixed-income instruments is directly affected by changes in riskless interest rates. We expect more active trading when interest-rate changes are larger. The interest-rate effect should be stronger for higher-duration bonds as their price is more responsive to interest-rate changes.
• *Embedded options.* Some corporate bonds in our sample have attached call option features, which protect the issuer from adverse movements in interest rates. This implied insurance is expected to reduce the interest-rate effect on bond prices, and hence reduce price induced trading.

• *Industry of the issuer.* Trading activity may be different across industry groups due to differences in industry transparency, regulation, or market outlook.

The data and results sections motivate the specific variables used to proxy for the above issue and issuer characteristics and describe the data sources used to obtain them.

### 3. Data

The dataset for this study is obtained from four databases: the *National Association of Insurance Commissioners* Database (NAIC), the *Fixed Investment Securities Database* (FISD), the *Lehman Database*, and CRSP. The former three databases contain bond related data, while CRSP is used to extract the corresponding equity return and volume data as well as market wide stock and bond index returns.

The NAIC provides all bond trading volume information for this study. At the beginning of 1995, the National Association of Insurance Commissioners began providing, in electronic format, transaction information on bonds traded by insurance companies.\(^{11}\) Insurance companies are required to report all trades on Schedule D filings with the NAIC every quarter. The NAIC database covers trades on 30,000 corporate, municipal, and government bond issues in the period between January 1995 and December 1999. Our analysis concentrates on US corporate bonds,

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\(^{11}\) This data was available before 1995, but not in an electronic format.
which reduces the number of issues covered to about 18,400 for the same period. While the
NAIC database includes only insurance company trades, it is still the most comprehensive source
of information to date on corporate bond trading, and covers a significant portion of the market
for corporate debt.\textsuperscript{12}

The \textit{NAIC database} provides information on the transaction date, the par value traded,
the type of order (buy or sell), and the dealer who executed the trade. The total par value of
corporate bonds traded reported in NAIC amounts to $2,334 trillion ($1,282 trillion buy trades
and $1,052 trillion sell trades) between January 1995 and December 1999; this corresponds to
685,670 transactions (376,717 buy and 308,953 sell trades). We exclude from our sample all
transactions that are not date-stamped and do not specify the trader through which the transaction
is executed.\textsuperscript{13} In addition, all convertible, asset-backed, and letter-of-credit backed bonds are
excluded. After filtering, our sample contains 17,113 US corporate bonds that are either regular
debentures, medium-term notes, or zero coupon bonds.

We aggregate all buy and sell transactions in a given month to calculate the total buy-,
total sell- and combined par value traded for any given issue (we call these variables \textit{Dollar Buy
Volume}, \textit{Dollar Sell Volume}, and \textit{Dollar Volume}\textsuperscript{14} - 'Dollar' is used here to reflect that these par

\textsuperscript{12} Data is available from TRACE beginning July 2002, but only for issue sizes over $1 billion and credit ratings of A
or higher. Though the publicly available information increases over time, trade information for BBB and high yield
bonds is only partially available as of October 2004 and is fully available for all non-144A issues as of January
2006. Thus, at this time, the NAIC dataset provides a more significant time series of trading activity. Goldstein,
Hotchkiss and Sirri (2007) show that trading in the BBB market accounts for approximately one third of all trading
activity in investment grade bonds. Goldstein and Hotchkiss (2007) describe the phase in of publicly available
information under TRACE.

\textsuperscript{13} Transactions that are not associated with any specific dealer are marked as 'various'. Such trades have either been
executed through several dealers, or the insurance company has reported on one date all trades executed in the
preceding quarter. We exclude such transactions, because they may overstate the turnover in the month of reporting.
Unlike the Capital Access data, we do not find a pattern or specific dates on which most of these transactions are
reported in NAIC.

\textsuperscript{14} If a bond is traded by insurance companies in the period of January 1995 to December 1999 and it is still
outstanding in a given month in the sample, it is included in our sample even if it does not trade in that month and
we assign it a trading volume of zero for that month.
value quantities are reported in dollars, not to imply that these are the actual dollar price of the trades). We then standardize the total Dollar Volume by the amount outstanding of the issue at the end of the month. The volume variable, our dependent variable, thus represents the percentage of the amount outstanding traded per month:

$$\text{volume} = \frac{\text{in par value traded}}{\text{amount outstanding}} = \frac{\text{Dollar Volume}}{\text{Amount Outstanding}}$$

(1)

The FISD database provides comprehensive bond-specific data including the amount outstanding history, S&P rating history, industry classification, call features, issue and maturity dates. We use the issue and maturity information to compute the age and remaining time-to-maturity (both in years) of each issue in any month.

The Lehman database is a comprehensive set of bond prices for the past 25 years maintained by Lehman Brothers for the purpose of constructing its widely used benchmark bond indexes. This data is provided through the Fixed Income Research program at the College of Business Administration of the University of Houston (see Warga (1998)). Further details on this database are available in Hong and Warga (2000). We use all bond return data available and match it to the combined dataset obtained from NAIC and FISD. We do not exclude bond issues from the previously combined database if return information is not provided in the Lehman database; rather, we analyze the effect of including this variable in our sample on the resulting marginal effects of the remaining variables.

Finally, the CRSP database is used to extract stock information for bonds of firms with traded equity. For each month and each bond, we match the corresponding monthly stock return and stock volume information. We extract both contemporaneous and lagged stock data, and include up to three lags to control for monthly autocorrelation in both returns and volume. We do
not exclude bonds from our sample if they do not have a traded stock. Instead, we include a
dummy indicating whether the company has traded equity to study its effect on bond trading.

Table 1 summarizes the variables used by database, as well as the number of bond-month
observations extracted from each. The maximum number of bond-month data in our set comes
from matching the NAIC data with the FISD data, resulting in a total of 719,190 bond-month
observations on volume and bond characteristics.\textsuperscript{15} Unfortunately, the Lehman database is not as
comprehensive and only covers the period of January 1995 to May 1998. As a result we obtain
only 235,881 bond-month observations with return data available. Many of the bonds in our
sample do not have publicly traded equity. 1,358 of the 4,151 companies in the sample, or
32.7\%, have public equity included on CRSP, resulting in 166,639 stock-month data points. This
number contrasts sharply with that of Alexander, Edwards, and Ferri (2000) where 50 of the 55
bonds traded on FIPS (91\%) have publicly traded equity.

We further subdivide the sample into investment-grade and high-yield bonds. Table 2
illustrates the frequency distribution of monthly volume observations for both categories of
bonds. 79.4\% of the bond-month observations on trading volume in the investment-grade
subsample and 84.1\% of the observations in the high-yield bond subsample are zero. We expect
high-yield bonds to trade less frequently in our sample, since insurance companies are not as
active in this segment of the market. For bonds with publicly traded equity, the proportions are
smaller - 66.7\% of investment-grade bond-month observations and 79.1\% of high-yield bond-
month observations on volume are zero. In months when a bond trades, the proportion traded
that month is also relatively small - generally less than 5\% of par value outstanding. However,

\textsuperscript{15} This includes observations of zero volume for months where bonds are outstanding based on FISD.
the size of an average individual buy or sell transaction is quite large, $2.88 and $2.81 million in
par value, respectively.\textsuperscript{16}

The last column of Table 2 shows the trading frequency of stock for bond issuers’ whose
stock is publicly traded. These stocks trade substantially more often than the bonds, even
considering the fact that our bond observations include only insurance company trades. There
are only 18 observations (out of a total of 166,639 stock-month observations) in which a stock
did not trade for a particular month. About 75% of stocks trade between 1% and 10% of their
total shares outstanding each month, and more than 95% of the stocks trade from 1% to 50% of
their shares outstanding per month. The table illustrates that equities have a much more regular
trading pattern than bonds, 95% of which trade less than 5% of their amount outstanding each
month.

Table 3 shows that insurance companies are involved in more buying than selling activity
in all years except for 1999 (Total Dollar Buy Volume is larger than Total Dollar Sell Volume).
However, the proportion of sell to buy volume has been rapidly increasing from 63% in 1995 to
185% in 1999. The same pattern is observed based on the number of trades.

Table 3 also shows that total dollar trading volume by insurance companies rapidly
increases from $ 152.3 billion in 1995 to $ 303.1 billion in 1998, but drops to $ 190.57 billion in
1999. Both the total dollar amount of bonds outstanding and the number of bond issues
outstanding traded by insurance companies increase for all years of the sample, however, both
quantities grow relatively little in 1999. Specifically, while total amount outstanding in our
sample grows by 22% to 30% per year between 1995 and 1998, it only grows by 8% in 1999.

\textsuperscript{16} The mean is taken across all actual transactions in the database (not across all bond-observations, some of which
reflect zero trading volume) and hence represents the mean across bonds that actually traded.
Similarly, while the number of corporate issues in our sample grows at 25% in 1996, the growth in 1999 is only 1%. The rapid growth in new issues in the years 1995-1998 is also reflected in the reduction in the average age of our bond sample from 4.28 years to 3.95 years during the period, but the drop in net new issues growth in 1999 reverses this trend to make the average age 4.51 years. The negative correlation between the average age of our bond sample and total trading activity by insurance companies is consistent with our initial hypothesis that bond trading decreases as the bond ages.

We split the sample into investment-grade and high-yield bond-month observations by the bond's S&P rating obtained from FISD (ratings above BBB- are considered investment-grade). Descriptive statistics of the bond and stock variables used in our study are presented in Table 4. Insurance companies trade about twice as much investment-grade bonds as high-yield bonds - on average 1.64% vs. 0.94% of amount outstanding traded per bond per month, respectively. High-yield bonds traded by insurance companies tend to be newer issues (3.51 years old on average) than investment-grade bonds (4.39 years on average). A similar pattern is observed for the time-to-maturity characteristic - insurance companies trade investment-grade bonds with an average time-to-maturity of 9.44 years and high-yield bonds with an average time-to-maturity of 7.19 years. High-yield bonds traded by insurance companies are more than twice as likely to be callable - 23% of investment-grade bond-month observations are of callable bonds vs. 58% of high-yield bonds. As expected, high-yield bonds have higher price volatility - the mean (standard deviation) of the absolute bond returns is 0.87% (1.57%) for investment-grade bonds and 1.11% (3.91%) for high-yield bonds. Also, the equity of high-yield bonds seems to trade more than that of investment-grade bonds. The remaining characteristics do not differ considerably across the two samples.
4. Methodology

Unlike stocks, most corporate bonds trade infrequently and many become part of inactive portfolios as they become more seasoned: 79.4% of bond-month observations of trading volume are zero in our investment-grade sample and 84.1% are zero in the high-yield sample. As a result, our dependent variable, bond trading volume, is severely censored and most observations are clustered at zero.

To account for the distribution of trading volume, we use a limited-dependent-variable approach to consistently estimate the effect of each independent variable on bond trading. Such an approach also deals with the problem of irregularly spaced trades in our sample.

Logit and tobit regression models provide unbiased estimates of the sensitivities to the explanatory variables when the dependent variable has a truncated distribution. The logit model is specifically suited for estimating the probability of trade and is formalized as:

\[
y^*_i = \beta_i \cdot X_i + \epsilon_i \\
y_{it} = \begin{cases} 
1 & \text{if } y^*_i > 0 \\
0 & \text{if } y^*_i \leq 0
\end{cases} \\
\epsilon_i \sim N(0, \sigma^2)
\]

where \( y^*_i \) is a scalar representing the desired trade volume in bond \( i \) in month \( t \), \( y_{it} \) is a scalar corresponding to the probability of trade, \( X_i \) is an \( m \times 1 \) vector of explanatory variables specific to bond \( i \) at time \( t \), \( \beta_i \) is a \( 1 \times m \) vector of sensitivities of the latent variable, \( y^*_i \), to the explanatory variables. Due to the large number of bond-month observations in our sample, it is reasonable to assume normality of the error terms, \( \epsilon_i \), necessary for the MLE estimation of the model.
The regression results reported in the paper are based on logit regressions. We also estimate tobit regressions to study the effect of the explanatory variables on trading volume. The results are similar and are not reported here, but are available upon request. Given the large number of observations, standard errors and p-values might not be a good indication of the economic significance of each explanatory variable. To assess the latter, we estimate the marginal change in expected probability of trade induced by a one-standard-deviation change in each explanatory variable.

5. Results

Due to the different number of observations available in each database (see Table 1), we examine four sets of regressions:

<table>
<thead>
<tr>
<th>Sample</th>
<th>Independent Variables</th>
<th>Database Source</th>
<th>Investment-Grade Bond-Month Observations</th>
<th>High-Yield Bond-Month Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>All bond and stock variables</td>
<td>NAIC, FISD, CRSP, Lehman</td>
<td>67,261</td>
<td>16,633</td>
</tr>
<tr>
<td>2</td>
<td>All bond (except bond return) and all stock variables</td>
<td>NAIC, FISD, CRSP</td>
<td>121,964</td>
<td>43,000</td>
</tr>
<tr>
<td>3</td>
<td>All bond variables</td>
<td>NAIC, FISD, Lehman</td>
<td>186,416</td>
<td>49,465</td>
</tr>
<tr>
<td>4</td>
<td>All bond variables (except bond return)</td>
<td>NAIC, FISD</td>
<td>550,073</td>
<td>169,117</td>
</tr>
</tbody>
</table>

The dependent variable in each is monthly bond volume as defined in equation (1).

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17 We do not include fixed effects per bond; given the large number of observations, including fixed effects significantly reduces the degrees of freedom.
Sample 1 includes the most variables but results in the least observations, since only bonds with information in all databases are included. The first and second regression samples include stock variables, and therefore include only bonds with publicly traded equity. The bond return data from the Lehman database is excluded from sample (2) as this variable restricts considerably the available bond-month observations (the Lehman database has data only up to 1998). The third and fourth regression samples include bonds of both public and private companies; these regressions do not include stock variables but rather a dummy indicating whether the issuing firm has traded equity or not. This allows us to assess whether bonds of companies with publicly traded equity trade more than those with private equity. Regression sample 4 is the most comprehensive and includes all bonds from the NAIC and FISD databases.

For each sample, regressions are run separately for the investment-grade and high-yield bond subsamples. Our goal is to understand whether the explanatory variables affecting trading in high-grade bonds have the same impact on the trading of high-yield bonds, and also control for the fact that the activity of insurance companies in these two segments of the market may be different. Our results, therefore, include eight different regressions:

\[
\text{2 samples} \quad \left( \begin{array}{c} \text{Investment - Grade} \\ \text{High - Yield} \end{array} \right) \times \left( \begin{array}{c} \text{Depending on} \\ \text{variables included} \end{array} \right)
\]

Table 5 summarizes the logit results from all eight regressions. The table also reports the total number of observations and the number of zero (or ‘censored’) observations on trading volume in each sample. The proportion of zero observations allows us to assess the degree of censoring of the dependent variable in each subsample. The last two rows of the table give the likelihood ratio test statistic against the intercept-only model as well as the corresponding p-value. All model specifications are significant at the 99% level.
Table 6 presents the impact of a one-standard-deviation move in each explanatory variable on the probability of trade. The last row presents the 'base-case' expected value of the dependent variable given the mean value of all explanatory variables. The results are summarized as follows:

- **Size of issue (amount outstanding):** As expected, issue size has a significant positive impact on trading volume in all regressions (see Table 5). Furthermore, Table 6 reveals that the marginal impact of a one-standard-deviation move in size is much larger than that of the other variables. For investment-grade bonds of companies with publicly traded equity (regression (1) and (2)), a one-standard-deviation change in issue size increases the expected trading probability from 35.7% to 55.5% in the investment-grade subsample and from 25.4% to 35.9% in the high-yield subsample. In all regression specifications, size has a larger effect for investment-grade bonds than for high-yield bonds. In Table 6, we notice that the impact of issue size is slightly larger among bonds with publicly traded equity.

- **Age of bond (years since issuance):** All bonds trade progressively less as they age. We find that age is very significant in explaining trading in corporate bonds. Table 5 shows that, in all regressions, the age coefficients are highly significant and negative. A one-standard-deviation change in age reduces the expected trading probability by as much as 7.3% (from 31.8% - Table 6, regression (3)) for the sample of investment-grade bonds, while the effect in the high-yield sample of bonds with publicly traded equity is 6.0% (from 18.6% - Table 6, regression (4)). In terms of economic impact, age is the second most significant variable in explaining trading probability after issue size.

Both Tables 5 and 6 suggest that the incremental impact of age on the bond’s trading probability is larger for firms with publicly traded equity. To investigate this further, we
interact the age variable with the traded equity dummy and find that the impact of age is significantly stronger for public company bonds (results available upon request).

- **Absolute value of bond returns:** Large return shocks have a significant negative impact on bond trading. The coefficients are always larger (Table 5) and the economic impact is several times stronger in the investment-grade samples (Table 6). These results are in contrast to the theoretical predictions of Harris and Raviv (1993), who argue that bond return volatility should increase speculative trading and that the effect should be stronger among high-yield bonds. Our results also contrast with Alexander, Edwards, and Ferri (2000) who find that return volatility increases trading in their 55 FIPS-traded high-yield bonds.

To verify the effect of *positive* bond returns on trading, we run additional regressions with 'bond returns' rather than their absolute value, but do not find convincing results that positive news increases trading (results available upon request). For the investment-grade samples, contemporaneous returns decrease trading probability, while the results for the high-yield samples are insignificant. The economic impact of bond returns on trading is very small.

- **Interest-rate shocks (absolute return of 10-year Treasuries):** We interact the absolute treasury return variable with a dummy indicating bonds with more than 6 years to expiration to study whether longer maturity bonds react differently to 10-year treasury returns. Overall, large treasury returns have a negative impact on bond trading (see Table 5). The coefficients are insignificant only in public equity samples (1) and (2), when bond return is included among the regressors.

Table 5, however, shows that the incremental impact on long-duration bonds is
positive and always strongly significant. Since all coefficients on the interacted variable are much larger in absolute value than the coefficients on absolute treasury returns, the net effect of treasury returns on long-maturity bond trading is positive. The economic impact of interest rate shocks on the trading probability of long-term bonds is also large. For example, for the investment-grade public company bonds (Table 6, regression (1)), while a one-standard-deviation interest rate shock decreases the expected trading probability of all bonds by 0.6%, it increases the trading probability of long-duration bonds by an additional 2.9%. Overall, therefore, longer-maturity treasury returns decrease trading in short-maturity bonds, but increase trading in long-maturity bonds.

- **Equity market return shocks (abs(S&P500 return))**: Equity market shocks significantly decrease bond trading. All coefficients in Table 5 are significant and of similar magnitude for both investment-grade and high-yield bonds. A one-standard-deviation shock in equity markets reduces the expected trading probability by 3.1% (from 35.7% in regression (1), Table 6). This finding is consistent with evidence from equity markets by Chordia, Roll, and Subrahmanyam (2000) and Engle and Lange (1997) who find that stock market volatility and equity trading are negatively correlated.

- **Traded equity dummy (1 if the issuer has publicly traded equity reported on CRSP)**: Consistent with our expectations, we find that bonds of companies with publicly traded equity trade more than those with privately held equity. All coefficients in Table 5 are significant for both the investment-grade and high-yield bond samples. The economic impact is small but always positive. Publicly traded firms are between 0.9% and 1.8% more likely to trade than their private equity counterparts (see Table 6). These results
contrast with those of Alexander, Edwards, and Ferri (2000), though their results are based on only 5 out of 55 bonds traded on FIPS which have private equity.

- **Shocks in the firm's own equity:** Movements in the firm's own equity do not seem to have a strong impact on bond trading. For investment-grade bonds, the results show a positive but insignificant impact of stock price movements on bond trading. We hypothesized a stronger impact of stock returns on high-yield grade bond trading as high-yield debt behaves more like the firm's equity and can be viewed as a hybrid security between risk-free debt and equity (see Merton (1974)). However, Table 5 shows that all coefficients in the high-yield samples are insignificant and negative. Moreover, Table 6 shows that the economic impact of movements in the firm's equity on bond trading probability is very small, ranging between –0.1% and 0.3%.

For robustness, we find that the results are similar when the squared stock returns or the actual stock returns are used instead of their absolute value (results available upon request). The results show a significant positive correlation between stock returns and bond trading, but the economic impact is extremely small.

Contemporaneous equity trading volume, however, is significantly positively related to bond trading for all bonds and regressions (Table 5). This result is consistent with findings by Hotchkiss and Ronen (2002) who document that bonds and stocks react simultaneously to firm-specific information. The economic impact of changes in stock trading on the bond’s trading probability ranges from 1.2% to 1.6% (Tables 6). The size of the coefficients and the economic impact is similar for investment-grade and high-yield bonds, despite our expectations that the correlation would be stronger in the high-yield samples.
We include up to three lags of both stock trading volume and returns to control for possible autocorrelation in those variables. In the high-yield samples, we find some negative impact of stock return shocks at the second and third lag, and in one subsample a negative impact of stock trading volume at the first lag. Yet all remaining coefficients of lagged stock trading and returns are insignificant and switch signs, and the economic impact is small.

- **Credit risk (S&P rating):** Table 5 shows that all coefficients in the high-yield bond regressions are significant and negative, indicating that higher credit risk reduces the expected trading probability of high-yield bonds. Trading by insurance companies in the lowest credit rating segment is limited. Strikingly, a one-standard deviation change in credit rating in the high-yield segment decreases the trading probability from 13.8\% to 7.8\% (Table 6, regression (8)). An increase in credit rating also significantly decreases trading in investment-grade bonds of publicly traded firms (Table 5, regression (3)) and the economic impact is a reduction of trading probability of 4.3\% (Table 6). Credit rating becomes insignificant and its impact is very small once we control for bond return shocks (regression (1)). However, when both public and private equity firms are considered, credit rating seems to have a significant positive impact on bond trading in investment-grade bonds (Table 5). Moreover, Table 6 regression (5) shows that trading probability increases from 31.0\% to 32.7\% given a one-standard-deviation increase in credit risk. The evidence suggests that high-yield and investment-grade, as well as bonds of companies with public and private equity, are affected differently by credit risk.

- **Interest-rate risk (time-to-maturity):** When time-to-maturity (TTM) is used to proxy for duration, the impact of interest rate risk on trading in investment grade bonds is
significantly negative in all regressions. Moreover, the economic impact of a one-standard deviation increase in interest-rate risk increases trading probability by 3.1% from 35.7% (Table 6, regression (1)). However, the effect on the high-yield subsample is unclear. Three of the coefficients in Table 5 are insignificant and one is positive.

To further study the duration effect, we interact a 'callable bond' dummy with TTM to control for the fact that callability shortens duration. Tables 5 and 6 show that for callable bonds, longer time-to-maturity increases trading probability in high-yield bonds and decreases trading probability in investment-grade bonds (except for regression (3)). The coefficients are all significant and the economic impact is large, especially when the bond return variable is part of the explanatory variables.

- **Callable bond dummy (1 if the issue is callable):** Embedded call options reduce bond trading in all but two samples of investment-grade bonds when the bond return variable is among the regressors (Table 5, regressions (1) and (5)). For high-yield bonds, the economic impact is quite large. Callability reduces trading probability by as much as 7.6% from 25.4% (Table 6, regression (2)). Call options modify a bond's risk characteristics by reducing its duration, which may be causing the fall in trading volume.

- **Autocorrelation in liquidity (Lagged Bond Volume):** As expected, we find significant positive autocorrelation in trading probability. All coefficients are highly significant in all samples of investment-grade and high-yield bonds (Table 5). Table 6, however, shows that the economic impact of a standard-deviation move in last month's trading does not change much the probability of trade this month (the impact is always less than 1%). The economic impact is small relative to variables like size and age.
Industry of the issuer ('financial', 'industrial', or 'utilities', as categorized by FISD): The industry of the issuer does not have a strong impact on bond trading. High-yield bonds of industrial and financial firms do trade less (Table 5) than bonds of utility firms, but the economic impact of changes in the industry of the issuer on bond trading is generally small (Table 6). Investment-grade bonds of financial and industrial firms, however, trade more, with the exception of sample (7) in Table 5. Our regressions show that after controlling for other issuer- and issue-specific features (the remaining explanatory variables), insurance companies are more likely to pick high-yield bonds from the utility sector, though the overall impact of industry is small.

5.1. Further Results on Issue Size and Age

We observe that the most important determinants of bond trading volume are clearly the bond's issue size and age. Therefore, in this section we provide additional evidence concerning the relationship between these two characteristics and trading activity.\(^\text{18}\)

The results in the previous section are consistent with the idea that as a bond ages, it is more likely to be absorbed into an inactively traded portfolio, leading to a decline in volume over time. Table 7 demonstrates this effect directly, reporting the percentage of bonds that trade as well as the average monthly turnover for bonds that trade, for the first 24 months following issuance (Panel A) and for the first 10 years following issuance (Panel B). The first column of Panel A shows that average turnover of investment-grade bonds that trade drops from 36.54% in the month of issuance to 6.32% in the 24\(^{th}\) month after issuance. Similarly, the second column

\(^\text{18}\) Cai, Helwege and Warga (2007) examine underpricing for newly issued corporate bonds using the NAIC database but do not consider trading activity. Goldstein and Hotchkiss (2007) report trading activity for newly issued bonds using data from TRACE, but consider only the first 90 days of trading.
reveals a drop in turnover in high-yield bonds from 16.31% in the month of issuance to 4.04% in the 24th month after issuance. For investment grade bonds, the percentage of bonds with positive trading volume drops from 75.03% in the month of issuance to 17.91% in the 24th month. For high-yield bonds, the percentage traded falls from 57.87% to 15.92%.

Panel B examines a substantially longer horizon, and shows that both the percentage of bonds trading and the turnover of those that trade continue to fall over the 10 years following issuance. For investment-grade bonds, average turnover of trading bonds falls from 11.06% per month in the year of issuance to 3.27% per month 10 years after issuance. The proportion of bonds traded also drops from 33.19% in the first year to 16.97% in the 10th year since issuance. The magnitude of trading activity is lower in the high-yield sample, but also shows a decline from 31.80% for the first year to 6.85% in the 10th year.

To better illustrate the relation between issue size and trading volume, we divide the sample into groups by bond age. Figure 1 demonstrates the almost perfectly monotonic positive relation between issue size and trading activity for bonds of different age groups. This relation is strong and present in all age subsamples. For bonds with less than one year since issuance, the first plot reveals that the smallest size decile trades more than 20 times less than the largest size decile – the average monthly turnover is 9.51% for the smallest issues and 194.73% for the largest ones. For bonds in their second year since issuance (second plot), insurance companies trade on average 0.73% of the amount outstanding in the smallest issues, while their average monthly turnover is 62.53% in the largest issues (or more than 85 times more). For bonds with 2 to 5 years since issuance (plot 3), the monthly turnover is 124 times larger in the largest issues (at 50.43%) than it is in the smallest issues (at 0.41%). Finally, for bonds with more than 5 years

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19 For each age group, we compute the size deciles and the average monthly bond turnover within each size decile.
since issuance (plot 4), the largest issues trade almost 6 times more than the smallest, with the average monthly turnovers being 35.59% and 6.11% in the two size groups, respectively.

6. Conclusion

This paper provides a direct examination of the determinants of corporate bond trading and liquidity, using a dataset of insurance company trades from January 1995 to December 1999. Our analysis involves more than 17,000 high-yield and investment-grade bonds of 4,151 US private and public companies.

Our analysis shows that about 80% of bonds do not trade in a month, and when they do trade, only about 5% of par value outstanding is traded. The size of an average buy or sell transaction by insurance companies is still, however, about $2.8 million of par value outstanding.

We find that insurance companies are more likely to trade larger and newer investment-grade bonds of public equity firms. Interest-rate shocks increase trading in long-maturity bonds, while shocks in the equity markets reduce corporate bond trading. Moreover, trading activity in stocks and bonds tend to be positively correlated for firms whose equity is publicly traded. It is important to distinguish between high-grade and high-yield bonds, as these two classes of bonds have opposite responses to interest-rate and credit-risk. Trading in high-yield (investment-grade) bonds decreases (increases) as their credit risk increases, while the opposite is true when their duration increases.

The insurance company trading data allows us to quantify relationships between trading and bond characteristics that are representative of corporate bond trading practices. Understanding liquidity in corporate bond markets is important to both asset managers and
policy makers. For passive funds, especially those mimicking indices of illiquid bonds, analysis of liquidity is essential for establishing a balance between tracking accuracy and trading costs.\(^{20}\)

Active portfolio strategies involve substantially more trading and demand liquidity for immediacy in executing informationally motivated trades. Finally, understanding the determinants of liquidity is important in evaluating the efficiency of current trading and reporting systems and in the design new market trading mechanisms.

**References**


\(^{20}\) Sinquefield (1991) shows that passive funds can experience significant performance shortfalls unless they implement indexing techniques, aimed at optimizing tracking error and trading costs.


### Table 1
**Bond and Stock Variables By Database Source**

The first two variables in each database are used for matching purposes. Several bond issues may correspond to the same issuer. The last row presents the number of matched bond-month or stock-month observations extracted from each database. Notation: **NAIC**: National Association of Insurance Commissioners, **FISD**: Fixed Investment Securities Database, **Lehman**: Lehman Database.

<table>
<thead>
<tr>
<th>Database</th>
<th>NAIC</th>
<th>FISD</th>
<th>Lehman</th>
<th>CRSP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
<td>Bond Cusip Month</td>
<td>Bond Cusip Month</td>
<td>Bond Cusip Month</td>
<td>Stock Cusip Month</td>
</tr>
<tr>
<td></td>
<td>Trading volume</td>
<td>Amount outstanding</td>
<td>Bond return</td>
<td>Stock return</td>
</tr>
<tr>
<td></td>
<td>S&amp;P rating</td>
<td>Industry code Callable</td>
<td>S&amp;P500 Return</td>
<td>Stock volume</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>Time to maturity</td>
<td>10yr Gvt Bonds</td>
<td></td>
</tr>
<tr>
<td>Bond-Month Obs.</td>
<td>719,190</td>
<td>719,190</td>
<td>235,881</td>
<td>166,639</td>
</tr>
</tbody>
</table>

### Table 2
**Trading Frequency of Bonds and Stocks in the Sample**

The table presents the frequency distribution of monthly turnover for the complete NAIC/FISD sample and for the CRSP subsample of bonds of companies with publicly traded equity. The percentages in the table represent the number of bond-month (or stock-month) observations in each category as a proportion of the total number of bond-month (or stock-month) observations. Notation: IG = Investment grade, NIG = Non-investment grade.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Total NAIC/FISD Sample</th>
<th>CRSP Subsample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IG</td>
<td>NIG</td>
</tr>
<tr>
<td>Bins</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Trading</td>
<td>79.4%</td>
<td>84.1%</td>
</tr>
<tr>
<td>(0-1)% of Par Value Traded</td>
<td>7.6%</td>
<td>7.0%</td>
</tr>
<tr>
<td>(1-5)% of Par Value Traded</td>
<td>7.4%</td>
<td>5.7%</td>
</tr>
<tr>
<td>(5-10)% of Par Value Traded</td>
<td>2.4%</td>
<td>1.5%</td>
</tr>
<tr>
<td>(10-50)% of Par Value Traded</td>
<td>2.5%</td>
<td>1.4%</td>
</tr>
<tr>
<td>50%+ of Par Value Traded</td>
<td>0.7%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Total Bond-Month Observations</td>
<td>550,073</td>
<td>169,117</td>
</tr>
</tbody>
</table>
Table 3
Trading Activity Across Years in the Sample
The table presents, for each year, the total trading activity in US corporate bonds by insurance companies, the total number of bonds, total amount outstanding, and the average age of the bonds in our sample. The growth in Total Amount Outstanding and Number of Bond Outstanding is calculated as the percentage increase from the previous year from the row above.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Dollar Volume (in $ billions)</td>
<td>152.30</td>
<td>180.72</td>
<td>197.26</td>
<td>303.10</td>
<td>190.57</td>
</tr>
<tr>
<td>Total Dollar Buy Volume (in $ billions) ((a))</td>
<td>93.57</td>
<td>102.40</td>
<td>106.54</td>
<td>162.85</td>
<td>66.90</td>
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<tr>
<td>Total Dollar Sell Volume (in $ billions) ((b))</td>
<td>58.73</td>
<td>78.32</td>
<td>90.71</td>
<td>140.25</td>
<td>123.67</td>
</tr>
<tr>
<td>Proportion of Sell to Buy Volume ((= b/a))</td>
<td>63%</td>
<td>76%</td>
<td>85%</td>
<td>86%</td>
<td>185%</td>
</tr>
<tr>
<td>Total Number of Buy Trades ((c))</td>
<td>31,400</td>
<td>34,707</td>
<td>36,364</td>
<td>55,288</td>
<td>27,369</td>
</tr>
<tr>
<td>Total Number of Sell Trades ((d))</td>
<td>23,191</td>
<td>29,777</td>
<td>31,662</td>
<td>49,116</td>
<td>41,159</td>
</tr>
<tr>
<td>Proportion of Sell to Buy Trades ((= d/c))</td>
<td>74%</td>
<td>86%</td>
<td>87%</td>
<td>89%</td>
<td>150%</td>
</tr>
<tr>
<td>Total Amount Outstanding ($ trillion)</td>
<td>1.07</td>
<td>1.30</td>
<td>1.64</td>
<td>2.13</td>
<td>2.29</td>
</tr>
<tr>
<td>Growth in amount outstanding from previous year</td>
<td>22%</td>
<td>26%</td>
<td>30%</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Total Number of Bonds Outstanding</td>
<td>8,908</td>
<td>11,140</td>
<td>13,210</td>
<td>15,501</td>
<td>15,720</td>
</tr>
<tr>
<td>Growth in number of bonds from previous year</td>
<td>25%</td>
<td>19%</td>
<td>17%</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Average Age of Bonds Outstanding (in years)</td>
<td>4.28</td>
<td>4.05</td>
<td>3.98</td>
<td>3.95</td>
<td>4.51</td>
</tr>
</tbody>
</table>
Table 4
Descriptives Statistics of Variables in the Sample

The table reports descriptive statistics of the investment-grade and high-yield bond samples. All variables are at a monthly frequency and span the period between January 1995 and December 1999. The S&P Rating is represented in points (rating below 10 is considered investment-grade, the lower the rating, the higher the credit quality of the bond). The averages are taken across all bond-month (or stock-month) observations in each subsample.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Investment-Grade Bonds</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>High-Yield Bonds</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bond Volume (% of am. outst.)</td>
<td>550,073</td>
<td>1.64</td>
<td>11.59</td>
<td>-0.84</td>
<td>4600</td>
<td>169,117</td>
<td>0.94</td>
<td>9.84</td>
<td>0.00</td>
</tr>
<tr>
<td>Amount Outstanding ($ billions)</td>
<td>550,073</td>
<td>0.13</td>
<td>0.15</td>
<td>0.00</td>
<td>2.50</td>
<td>169,117</td>
<td>0.15</td>
<td>0.19</td>
<td>0.00</td>
</tr>
<tr>
<td>Abs(Bond Return) (%)</td>
<td>186,416</td>
<td>0.87</td>
<td>1.57</td>
<td>-96.60</td>
<td>54.93</td>
<td>49,465</td>
<td>1.11</td>
<td>3.91</td>
<td>-96.56</td>
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<tr>
<td>Credit Rating (%)</td>
<td>550,073</td>
<td>5.79</td>
<td>2.21</td>
<td>1.00</td>
<td>10.00</td>
<td>169,117</td>
<td>18.57</td>
<td>6.38</td>
<td>11.00</td>
</tr>
<tr>
<td>Age of Bond (years)</td>
<td>550,073</td>
<td>4.39</td>
<td>5.51</td>
<td>0.00</td>
<td>98.33</td>
<td>169,117</td>
<td>3.51</td>
<td>4.02</td>
<td>0.00</td>
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<tr>
<td>Time to Maturity (years)</td>
<td>550,073</td>
<td>9.44</td>
<td>10.25</td>
<td>0.00</td>
<td>100.08</td>
<td>169,117</td>
<td>7.19</td>
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<td>0.00</td>
</tr>
<tr>
<td>Industrial Sector (Dummy)</td>
<td>550,073</td>
<td>0.34</td>
<td>0.47</td>
<td>0.00</td>
<td>1.00</td>
<td>169,117</td>
<td>0.66</td>
<td>0.48</td>
<td>0.00</td>
</tr>
<tr>
<td>Financial Sector (Dummy)</td>
<td>550,073</td>
<td>0.42</td>
<td>0.49</td>
<td>0.00</td>
<td>1.00</td>
<td>169,117</td>
<td>0.19</td>
<td>0.39</td>
<td>0.00</td>
</tr>
<tr>
<td>Callable (Dummy)</td>
<td>550,073</td>
<td>0.23</td>
<td>0.42</td>
<td>0.00</td>
<td>1.00</td>
<td>169,117</td>
<td>0.58</td>
<td>0.49</td>
<td>0.00</td>
</tr>
<tr>
<td>S&amp;P500 Return (%)</td>
<td>550,073</td>
<td>2.00</td>
<td>4.21</td>
<td>-14.58</td>
<td>8.03</td>
<td>169117</td>
<td>2.02</td>
<td>4.21</td>
<td>-14.58</td>
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<td>10yr Treasury Return (%)</td>
<td>550,073</td>
<td>0.53</td>
<td>1.86</td>
<td>-4.40</td>
<td>5.49</td>
<td>169,117</td>
<td>0.58</td>
<td>1.89</td>
<td>-4.40</td>
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<td>Stock Return (%)</td>
<td>122,245</td>
<td>1.57</td>
<td>9.53</td>
<td>-82.93</td>
<td>103.57</td>
<td>43,408</td>
<td>1.37</td>
<td>16.67</td>
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<td>Stock Volume (% of shares outst.)</td>
<td>122,750</td>
<td>7.74</td>
<td>6.68</td>
<td>0.00</td>
<td>313.89</td>
<td>43,889</td>
<td>13.26</td>
<td>17.51</td>
<td>0.00</td>
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<tr>
<td>Traded Equity (Dummy)</td>
<td>550,073</td>
<td>0.22</td>
<td>0.42</td>
<td>0.00</td>
<td>1.00</td>
<td>169,117</td>
<td>0.26</td>
<td>0.44</td>
<td>0.00</td>
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</table>
The dependent variable is $y = 1$ if the bond trades and $y = 0$ otherwise. Notation: IG = Investment grade, NIG = Non-investment grade.

<table>
<thead>
<tr>
<th>Regression</th>
<th>Variables</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amount Outstanding</td>
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<td>0.000</td>
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<td>NIG</td>
<td>IG</td>
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<td>NIG</td>
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</table>

Table 5
Results from Logit Regressions

Observations: 67,261
Censored Observations: 42,683
Likelihood Ratio Test: $2(L_u - L_r) = 6,447$

P-Value of L-Ratio Test: 0.0000
Table 6
Sensitivity of Probability of Trading to Each Dependent Variable
The table reports the impact of a one-standard-deviation change in each explanatory variable on the probability of a bond to trade. The dependent variable: $y = 1$ if the bond trades and $y = 0$ otherwise. Therefore, $E[y] = \text{Prob}(\text{Trade})$. The last row in the table gives the probability of trade given the average value of the explanatory variables, i.e. the "base-case trading probability". Notation: IG = Investment grade, NIG = Non-investment grade.

<table>
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<th>Regression Variables</th>
<th>Regression (1)</th>
<th>Regression (2)</th>
<th>Regression (3)</th>
<th>Regression (4)</th>
<th>Regression (5)</th>
<th>Regression (6)</th>
<th>Regression (7)</th>
<th>Regression (8)</th>
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<td>-0.029</td>
<td>-0.007</td>
<td>-0.041</td>
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<td>-0.015</td>
<td>-0.004</td>
<td>-0.006</td>
<td>-0.004</td>
<td>-0.006</td>
<td>-0.004</td>
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<tr>
<td>AGVT=Abs(10yr Treasury Return)</td>
<td>-0.006</td>
<td>-0.005</td>
<td>-0.012</td>
<td>-0.008</td>
<td>-0.004</td>
<td>-0.015</td>
<td>-0.006</td>
<td>-0.004</td>
</tr>
<tr>
<td>AGVT × Dummy(TTM&gt;6 yrs)</td>
<td>0.029</td>
<td>0.015</td>
<td>0.015</td>
<td>0.016</td>
<td>0.025</td>
<td>0.024</td>
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<tr>
<td>Abs(S&amp;P500 Return)</td>
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<td>-0.023</td>
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<td>-0.025</td>
<td>-0.025</td>
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<td>-0.014</td>
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<td>0.002</td>
<td>-0.000</td>
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<td>0.002</td>
<td>-0.000</td>
<td>-0.001</td>
<td>0.004</td>
<td>0.007</td>
<td>0.002</td>
<td>0.008</td>
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<td>0.002</td>
<td>-0.000</td>
<td>-0.001</td>
<td>0.004</td>
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Table 7
Monthly Turnover After Issuance
The table presents average monthly trading statistics over the months/years following bond issuance. The first two columns report the average monthly turnover per bond across all bond-month observations (in % of amount outstanding). The next two columns present the percentage of bonds-month observations with positive trading volume. The last two columns provide the number of bond-month observations used to compute the cross-sectional means. The sample in Panel A (Panel B) includes bonds with at least 2 (10) years to maturity at issuance.

Panel A: Over 24 months to Maturity At Issuance

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<th>Months after Issuance</th>
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<th>Percentage of Bonds Traded</th>
<th>Number of Bonds</th>
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Panel B: Over 10 Years to Maturity At Issuance

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<td>16.97</td>
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</table>
Figure 1. Average Monthly Turnover by Issue Size Decile. Each plot displays, for a particular bond age group, the average monthly bond turnover for each issue size decile. The issue size deciles are calculated within each bond age group.