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Corporate Bond Trading Costs: A Peek Behind the Curtain

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ABSTRACT

In this paper, I use institutional corporate bond trade data to estimate transactions costs in the over-the-counter bond market. I find average round-trip trading costs to be about \$0.27 per \$100 of par value. Trading costs are lower for larger trades. Small institutions pay more to trade than large institutions, all else being equal. Small bond dealers charge more than large ones. I find no evidence that trading costs more for lower-rated bonds.

TRANSACTIONS COSTS IN EQUITY MARKETS have been studied extensively by financial economists in recent years. In contrast, almost nothing is known about the costs of trading bonds. In this paper, I use a large dataset of institutional corporate bond trades from 1995 to 1997 to estimate trading costs for investment-grade bonds in the over-the-counter market. I find that round-trip trading costs average about \$0.27 per \$100 of par value. Costs are smaller for large trades. All else being equal, active institutions pay less to trade than inactive ones, and large dealers charge less than small ones. Bond ratings seem to have little effect on trading costs.

Two recent working papers also examine institutional bond trading costs. Hong and Warga (1998) employ a sample of 1,973 buy and sell trade prices for the same bond on the same day and estimate an effective spread of \$0.13 per \$100 of par value for investment-grade bonds and \$0.19 per \$100 of par value for non-investment-grade bonds. Chakravarty and Sarkar (1999) also estimate trading costs by comparing buy and sell prices for the same bond on the same day. They find that trading costs are highest for municipal bonds. Corporate bonds are the next most expensive and treasury bonds are the cheapest to trade. Chakravarty and Sarkar (1999) report that trading costs have declined from 1995 to 1997, at least for municipal bonds. However, they are unable to find evidence of differences in trading costs across institutions, perhaps because of their small sample size.

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The methodology employed here differs from the methodology used in Hong and Warga (1998) or Chakravarty and Sarkar (1999). Rather than using matched buy and sell trades in the same bond on the same day, I estimate the bid quote at the time of the trade and regress the difference between the trade price and the estimated bid price on a dummy variable that takes a value of one for buys and zero for sells. The coefficient on this dummy variable is an estimate of the difference between the buy and sell prices, or, equivalently, an estimate of the round-trip trading costs. One advantage of using this technique is that it provides a much larger set of observations and thus permits an examination of the factors that determine trading costs. A second advantage is that it allows us to examine a more representative cross section of bonds. If attention is restricted to bonds with both buy and sell orders on the same day, transactions cost estimates reflect only the most active bonds.

The remainder of the paper is organized as follows: In the first section, I provide a description of how the corporate bond market works. In Section II, I provide information on the data used here. Section III reports estimates of trading costs for corporate bonds. In Section IV, I examine determinants of trading costs in the bond market. Section V offers a summary and conclusions.

I. How the Corporate Bond Market Works

The corporate bond market is primarily an institutional market. Almost all trading takes place over the counter, where the potential bond trader cannot observe all quotes in a central location or on a computer screen. Instead, the institution must call several dealers for quotes or broadcast a list of bonds to sell (or buy) to various dealers through Bloomberg, a vendor of quotes and financial information that is popular with institutions. Alternatively, dealers may broadcast quotes on lists of bonds in their inventory to potential institutional customers. When dealers broadcast quotes, they typically provide bid or ask quotes but not both. Quotes are indicative, not firm.

If an institution wants to buy or sell a bond that is not quoted, they can contact dealers to provide quotes. Most of the variation in the prices of investment-grade bonds comes from fluctuations in interest rates, so bid and ask quotes for investment-grade bonds are given in terms of additional basis points of yield over a treasury security of similar maturity. Thus dealers can usually provide a quote by comparing the bond with other bonds with similar maturities, coupon rates, bond ratings, and call provisions and then estimating the yield spread between the bond and the treasury security. High-yield bonds are quoted in dollars rather than in terms of a premium from treasury yields because they, like equities, are affected primarily by firm-specific factors. As a result, dealers cannot easily determine an appropriate quote by comparing the bond to others of similar rating, coupon, and maturity.

Most bonds trade infrequently. Alexander, Edwards, and Ferri (1998) cite anecdotal evidence that bonds initially trade often but that trading declines as the bonds fall into the hands of institutions who hold them to maturity.

Also contributing to the lack of volume is the fact that institutions buy bonds in sufficiently large quantities that even the largest issues can be held entirely by 200 or fewer institutions.

II. Data

Data on corporate bond trades from January 1995 through April 1997 are obtained from Capital Access International. These data are also employed by Chakravarty and Sarkar (1999) and Hong and Warga (1998). The record for each trade consists of the trade date, the identity of the institution, the identity of the dealer, the bond's CUSIP number, the firm issuing the bonds, a description of the bonds, the coupon rate, the maturity date, whether the trade is a buy or sell, the par value of the traded bonds, and the actual dollar value of the trade. Capital Access also provides an indicator variable that says whether each trade date is the actual trade date or whether the date is an estimate provided by Capital Access. Trades with estimated dates are not included in transaction cost estimates.

Capital Access obtains their data from several sources. Insurance companies are required to file a Schedule D with the National Association of Insurance Commissioners every quarter. This schedule includes the trade date, amount bought or sold, the identity of the buyer and seller, and the par value of the bonds traded for all bond market transactions. The president, secretary, and controller of the insurance company must sign and attest to the validity of the information in the statement. Inaccurate or fraudulent statements leave the signers open to statutory fines and possible criminal penalties. Capital Access obtains Schedule D information from A. M. Best & Co. and provides further cleaning and checking of these data. Information on insurance company trades appears complete, which is important because life insurance companies by themselves hold almost 40 percent of corporate bonds. Mutual fund managers are required to file information on bond holdings semiannually and some file quarterly. Capital Access collects mutual fund information directly and also receives information from Morningstar. Public pension funds are not required to file holdings but Capital Access obtains information on their trades through voluntary disclosure and through the filing of Freedom of Information Act forms.

Several features of these data make them well suited for estimating institutional bond-trading costs. First, prices of actual trades are provided and the trades are designated as buys or sells. Also, the institution and counterparty are identified for each trade. Finally, although not all trades of all institutions are included in the dataset, there are between 3,400 and 9,549 corporate bond trades each month during the sample period.

These data also have several limitations. First, although information is complete for institutions included in the database, not all institutions are included. Second, the dollar value of trades is rounded up to the nearest $1,000. I expect the rounding to have little effect on my transactions cost estimates as the median sample trade size is $1,513,000. Also, to estimate trading costs, I regress the difference between trade prices and their contemporaneous bid prices on a dummy variable that takes a value of one for buy orders. Trade prices are rounded up to the nearest $1,000 for both buys and sells, and thus any bias from this should end up in the intercept term. The slope coefficient, which estimates round-trip trading costs, should be unaffected.

In total, the Capital Access dataset contains 192,867 corporate bond trades from January 1995 through April 1997. I match these data with information from the beginning of the month (or month end if it is not available) from the Fixed Income Database compiled at the University of Houston. This source provides the issue date, maturity date, coupon yield, duration, convexity, and Moody's and S&P ratings for each bond contained in the Lehman Brothers' bond index. This dataset has been used by Hong and Warga (1998) and Blume, Lim, and MacKinlay (1998) among others. Of the total of 192,867 trades in the Capital Access data, 117,015 (about 61 percent) could be matched with information in the Fixed Income Database.

For those matched bonds, the median time to maturity is 8.71 years at the time of a trade. Most trades took place soon after the bonds' issuance. The median percentage of the bond's life remaining at the time of a trade is 85 percent. Trades are large, with the median trade containing 0.98 percent of the total number of outstanding bonds in the issue. Most of the bonds are investment-grade bonds. Specifically, 2.2 percent of the bonds are Aaa rated, 10.2 percent are Aa rated, 42.8 percent are rated A, and 25.7 percent are rated Baa.

It is often reported that the over-the-counter bond market is dominated by a small number of dealers. In total, 601 dealers appear in the sample, but the top 12 dealers traded 72 percent of the total. Although trading volume seems to be dominated by a relatively small number of dealers, trading in specific bonds seems to be spread across multiple dealers.

III. Estimates of Transaction Costs

A. How I Estimate Trading Costs

Round-trip transactions costs are estimated by regressing the difference between the trade price and the estimated contemporaneous bid quote on a dummy variable that takes a value of one for buys and zero for sells. That is,

$$\Delta_i = \alpha_0 + \alpha_1 D_i^{Buy} + \epsilon_i, \tag{1}$$

where Δ_i is the price of trade i minus the estimated bid price and D_i^{Buy} equals one if trade i is a buy and zero otherwise. The variable of interest is α_1, an estimate of the difference in prices for buy and sell orders. Or, in other words, α_1 is an estimate of the average round-trip trading costs.[1]

[1] This is similar to the technique used in Warga (1991) to estimate NYSE bond trading costs by comparing NYSE trade prices with Lehman Brothers' quotes.

Bid quotes are obtained from the University of Houston's Fixed Income Database.[2] This dataset contains all bonds included in the Lehman Brothers' bond index. Over the sample period, this index contains between 9,485 and 13,582 bonds, but quotes are not available for the least active and recently issued bonds. A more important limitation of the data is that quotes are provided at month end only. This means that quotes within the month have to be estimated. Most of the day-to-day changes in investment-grade corporate bond prices are explained by changes in the level of default-free interest rates, or, equivalently, by changes in the prices of treasury bonds. Hence, I use the change since the end of the previous month in the price of a treasury bond with a similar duration to estimate bid quotes within a month.

I obtain closing bid prices each day of the sample period for bonds (or notes) with 1, 2, 3, 5, 7, 10, and 20 years to maturity from *The Wall Street Journal*. At the beginning of each calendar month a treasury bond (or note) is selected that is closest to each maturity. If two or more bonds have the same maturity, I choose the bond with the price that is closest to par on the last day of the preceding month.

Using these daily treasury bond prices, I estimate within-month quotes for the corporate bonds using a three-step procedure. First, for each trade, I take the bond's previous end-of-month quote and multiply by the percentage change in price of treasury bonds over the month to predict the month-end quote. The percentage change in treasury bond prices is calculated as the weighted average of the percentage price change of bonds with durations that bracket the bond's duration, with the weights chosen so that the weighted average of the treasury bonds' durations equals the duration of the corporate bond.[3] The change in the 20-year maturity bond price is used to predict the change in prices of corporate bonds with longer durations, and the 1-year treasury bond price change is used to predict price changes for bonds with shorter durations. The second step is to subtract the predicted quote from the actual end-of-month quote and divide by the number of days in the month. This gives an average daily error from predicting that the percentage change in the corporate bond price is the same as the percentage change in treasury bond prices. These errors are used to make a rough adjustment for the changes in the yield spread between corporate and treasury bonds and for the idiosyncratic changes in the bond's price over the month. The third step is to take the previous end-of-month price, multiply by the percentage change in treasury bonds up to the trade date and add on the average daily error times the number of days from the previous month end to the trade date. This

[2] Hong and Warga (1998) find that the dealer bid quotes from Lehman Brothers that are used in this dataset are similar to transaction prices from the NYSE's Automated Bond System (ABS) but appear to be more accurate quotes.

[3] Durations are obtained from the Fixed Income Database and make no adjustment for the bonds' call provisions. The result of using this simple duration measure rather than one that adjusts for calls will be that bid estimates will be noisier. The estimate of the expected transaction cost will be unaffected as long as the noise introduced by this simple measure is uncorrelated with whether trades are buys or sells.

provides the estimated bid quote for that trade date. Note that this methodology uses the actual end-of-month quote as the estimate for that date and that the total impact of estimation errors is negligible near the beginning and end of the month.

As an example of this three-step technique, suppose that I want to estimate the bid quote for a bond on February 10, 1996. At the end of the January, 1996, the bid price of the bond was priced at \$1,000. Suppose that during February, 1996, treasury bonds with the same duration increased in price by 1 percent. In the first step I predict a value of $\$1{,}000 \times 1.01$ or \$1,010 for the value of the corporate bond at the end of February. If the actual price of the corporate bond is \$1,012 at the end of February and there are 20 trading days in February, in the second step, I divide the error of \$2 by 20 to get an average daily error of \$0.10. If the treasury bonds with the same duration increased by 0.25 percent from the end of January to February 10 and that date was the seventh trading day of the month, in the third step, I obtain an estimated bid price of $\$1{,}000 \times 1.0025 + 7 \times \$0.10 = \$1{,}003.20$, or, expressed as per \$100 of par value, \$100.32.[4]

B. Are My Estimates of Bid Quotes Accurate?

As a check on my methodology, I examine how well treasury bond price changes predict changes in monthly corporate bond quotes in the Fixed Income Database. For each bond with quotes in consecutive months, I predict that the price change is the same as the change in a treasury bond with the same duration. To approximate that, I take a weighted average of the changes in the treasury bonds with durations that straddle the bond in question. The weights are chosen so that the weighted average of the durations equals the duration of the corporate bond. The prediction error is the difference between the actual change in the quote and the change predicted by assuming that the percentage change in the bond price is the same as the percentage change in the treasury bonds.

Results are described in Table I. The table breaks down price changes and prediction errors by bond rating. The first column of that table gives the bond rating and the second gives the number of monthly quote changes available for bonds with that rating. The next two columns report the mean absolute price change and the mean absolute prediction error. A comparison of these two columns provides a clear indication that treasury bond price changes are useful for predicting changes in the corporate bond prices. For investment-grade bonds, mean absolute price changes range from \$0.76 to \$1.27 per \$100 par value. Typically, the mean absolute prediction error is one-third to one-half of the mean absolute price change. Thus, most of the price change

[4] Note that I use Treasury bond price changes to directly calculate the corporate bond price changes. Dealers quote corporate bonds in terms of an additional yield over Treasuries. An alternative methodology would be to calculate changes in Treasury bond yield and use this to estimate changes in the corporate bond yields and use corporate bond yield changes to calculate bond price changes.

Table I

Month-to-Month Price Changes in Corporate Bonds and the Ability of Treasury Bond Price Changes to Explain Them

For every bond in the Fixed Income Database with bid quotes in two consecutive month ends between January 1995 and March 1997, I calculate the absolute value of the bond's price change over the month. I also calculate a prediction of the price change that equals the previous month-end price multiplied by the price change of Treasury bonds with the same duration over the month. The prediction error is the difference between the actual quote and the predicted quote. Errors and price changes are expressed in dollars per $100 of par value. The percentage of bond predictions improved is the percentage of all monthly quotes that are closer to their predicted values than the previous month's quote. The average percentage change explained by treasury bond changes is calculated by subtracting the mean absolute prediction error from the mean absolute price change and dividing by the mean absolute price change for each quote and then averaging across all quotes.

Rating	Number of Bond Months	Mean Absolute Price Change	Mean Absolute Prediction Error	% of Bond Predictions Improved	Avg. % Change Explained by T-bond Changes
Aaa	133,981	$0.7527	$0.3369	70.19%	55.24%
Aa	23,030	$1.1739	$0.3837	78.65%	67.32%
A	69,231	$1.1865	$0.3640	80.00%	69.32%
Baa	36,350	$1.2696	$0.4665	77.94%	63.26%
Ba	10,316	$1.3045	$1.0775	56.30%	17.40%
B	14,058	$1.5912	$1.8009	39.22%	−13.18%
<B	10,843	$1.2501	$1.0848	55.78%	13.22%

for investment-grade bonds is captured by changes in treasury bond prices. In contrast, very little of the month-to-month price changes of high-yield bonds are captured by treasury bond prices.

The last two columns show the percentage of bond price changes that are predicted more successfully with the change in treasury bonds than by the naive prediction that bond prices will not change at all. For bonds rated Baa and above, predictions based on treasury bond changes beat the naive prediction about 75 percent of the time. On average, treasury bond price changes explain 50 to 65 percent of the price changes for investment-grade bonds. This is calculated by subtracting the mean absolute prediction error from the mean absolute price change and then dividing by the mean absolute price change. For B-rated bonds, the naive prediction that the bond price will be the same at the end of the month as at the beginning is usually more accurate than prediction obtained from treasury bond price changes. Hence, by this measure, the percentage of the high-yield bond price changes explained by treasury bond changes is negative.

It is not surprising that changes in high-yield bond prices are not well explained by changes in treasury bond prices. Practitioners claim that price changes in investment-grade bonds are usually caused by changes in interest rates whereas changes in high-yield bond prices are more often due to changes in firm-specific factors. Therefore, I do not attempt to estimate trading costs for high-yield bonds with this methodology.

The results in Table I suggest that using treasury bond price changes to estimate quotes a month away works well. On average, 61 percent of the month-to-month changes in investment grade bond quotes can be explained by changes in treasury bond prices. Mean absolute values of the differences between actual and predicted quotes range for \$0.3369 per \$100 par value for Aaa bonds to \$0.4665 per \$100 par value for Baa bonds. I expect my estimates of within-month quotes to be much more accurate for two reasons. First, I am predicting corporate bond quotes that will occur closer in time to the previous quote than at the end of the month. Absolute price changes from the previous quote should be much smaller. Second, in the three-step procedure I use to estimate trading costs, I adjust prices within the month for shifts in the yield spread and idiosyncratic changes in individual bond prices by assuming that the month-long difference between the bid change and predicted bid change occurs in equal daily increments.

C. Estimates of Trading Costs Based on Trade Prices and Estimated Bid Quotes

In total, 117,015 trades in the Capital Access database are matched with quotes from the Fixed Income Database. Of these, 21,837 are discarded because they do not have quotes both at the beginning and end of the month. An additional 11,122 trades with a trade date of June 30, 1995, or June 30, 1996, are discarded because a large number of these trades appear to have taken place on a different date. A further 6,290 trades were discarded because their trade date was uncertain. I only estimate trading costs for investment-grade bonds, so an additional 12,659 trades of bonds rated below Baa are omitted. I also discard 2,172 trades that take place at prices that differ by more than 5 percent from the beginning and end-of-month quote and are thus likely to be data errors. Note that the requirement that the bond is included in the Fixed Income Database at the end of the previous month eliminates almost all primary trades. I also throw out the 1,607 remaining trades that are flagged as primary trades by Capital Access so that transactions cost estimates are for secondary market trading only. A total of 61,328 clean secondary market trades in investment-grade bonds remain.

Table II describes the distribution of Δ_i, the difference between the price of trade i and the estimated bid quote, for buy and sell trades. The mean Δ, expressed in terms of dollars per \$100 of par value, is 0.3368 for buys and 0.0646 for sells. These results are not surprising. If institutions pay more to buy bonds than they receive when they sell them, the mean Δ should be larger for buys than sells. The median Δ is \$0.248 for buy orders and \$0.064 for sell orders. The interquartile range is from $-\$0.108$ to \$0.749 for buy orders and from $-\$0.295$ to \$0.449 for sell orders. It is worth observing that 31.3 percent of buys occur at prices below the estimated bid whereas 44.4 percent of sells occur at prices below the estimated bid price. This suggests that in practice, Δ, the difference between the trade price and the bid price, is measured with error.

Table II

The Distributions for Buy and Sell Trades of Δ, the Difference Between the Trade Price and Estimated Bid

The difference is expressed in dollars per $100 of par value. The sample includes all investment-grade corporate bond trades from Capital Access International from January 1995 through March 1997 that (1) could be matched with quotes from the Fixed Income Database at both the beginning and end of the month, (2) had a trade price that did not differ from the beginning and end of the month quote by more than $5 per $100 par value, (3) was a secondary market trade, and (4) did not occur on June 30, 1995 or June 30, 1996. Trades for these dates are not included because many of them appear to have occurred on different dates. Estimated bids are calculated through a three-step procedure. First, for each trade, I take the bond's previous end-of-month quote and multiply by the percentage change in price of Treasury bonds with similar duration over the month to predict the month-end quote. Second, I subtract the forecasted quote from the actual end-of-month quote and divide by the number of days in the month. This gives an average daily error from predicting that the percentage change in the corporate bond price is the same as the percentage change in Treasury bond prices. Third, I take the previous end-of-month price, multiply by the percentage change in Treasury bonds up to the trade date and add on the average daily error times the number of days from the previous month end to the trade date.

Percentiles	Buy Order Δs	Sell Order Δs
10th	−0.655	−0.915
25th	−0.108	−0.295
Median	0.248	0.064
75th	0.749	0.449
90th	1.470	1.045
Mean	0.3368	0.0646
Number of trades	36,060	25,268
Number of Δs < 0	11,274	11,223
Number of Δs = 0	40	19
Number of Δs > 0	24,746	14,026

Δ could be measured with error if either the estimated bid price or trade price is inaccurate. Bid prices may be imprecise either because Lehman Brothers' bids may not reflect the actual bids available in the market or because the estimates of within-month quotes that I employ are imprecise. Trade prices may be inaccurate as a result of Capital Access' practice of rounding the dollar amount of a trade up to the next $1,000.

The effects of these errors can be seen by observing that I am actually estimating

$$\tilde{\Delta}_i = P_i - B_i + \eta_i - v_i = \alpha_0 + \alpha_1 D_i^{Buy} + \epsilon_i, \tag{1a}$$

where P_i is the price of trade i, B_i is the bid price at the time of trade i, η_i is the error from misestimation of P_i, and v_i is the error from misestimation of B_i. The expectation of the ordinary least squares estimate of α_1, the round-trip costs of trading, is

$$E(\alpha_1) = E\left(\frac{\operatorname{Cov}(P_i - B_i + \eta_i - v_i, D_i^{Buy})}{\operatorname{Var}(D_i^{Buy})}\right)$$
$$= \alpha_1 + E\left(\frac{\operatorname{Cov}(\eta_i, D_i^{Buy})}{\operatorname{Var}(D_i^{Buy})}\right) - E\left(\frac{\operatorname{Cov}(v_i, D_i^{Buy})}{\operatorname{Var}(D_i^{Buy})}\right). \quad (2)$$

The estimate of the trading costs is unbiased as long as the covariance between the trade type and the error in measuring the bid price or the error in measuring the trade price is zero. Although I am unable to provide direct evidence on these covariances, it is reasonable to expect both to be close to zero. Consider first the covariance between errors in my estimates of the bid and the trade type. Errors in bid price estimates could arise from adjusting bid prices for interest rate changes with treasury bonds with the wrong durations or because the month-end bid prices from the Fixed Income Database are wrong. But are institutions more likely to buy (or sell) when my estimates of the bid price are too high? There is no reason to expect that. Now consider the covariance between errors in the trade price and trade type. Trade price estimates are biased upwards by Capital Access' practice of rounding up the dollar value of trade to the next $1,000. This will affect the estimate of the intercept term α_0. However, it will only affect the estimate of trading costs if the error is correlated with the trade type. For a trade of $500,000, the maximum error from rounding is $0.02 per $100 of par value. For a trade of $2,000,000, the maximum error is $0.005. So, if buy and sell order are different sizes, estimate of α_1 can be biased. Order sizes are similar though. The median size of all buy trades used in the transaction cost estimates is $1.11 million and the median size of sell orders is $1.87 million. Inclusion of the trade size in the regression should minimize any remaining bias.

Regression estimates of trading costs are reported in Table III. The first row of the table reports estimates based on all 61,328 trades of investment-grade bonds. The mean difference between the sale price and the estimated quote (the regression intercept) is $0.0646. One explanation for the positive intercept is that on average, the prices dealers pay for bonds exceed the Lehman Brothers' bid quotes by 6.464 per $100 of par value. This is quite possible, as there are a number of dealers and some may be willing to pay more for a bond than the Lehman Brothers' bid quote. An alternative explanation for the positive intercept coefficient is that there is a bias in the methodology. This could arise, for example, if actual bid prices usually exceeded my estimates. However, as long as the bias is the same for both buys and sells, the estimate of the slope coefficient on the dummy variable for buy orders provides an unbiased estimate of the round-trip trading costs.

The estimate for round-trip trading costs that is obtained from the regression is $0.2721 per $100 par value. Trading costs are estimated with a surprising degree of accuracy. The 95 percent confidence interval for the dummy variable for buy orders is from $0.2559 to $0.2883 and the t statistic on the

Table III

Regression Estimates of Round-trip Trading Costs

Differences between the prices of institutional bond trades and the estimated contemporaneous bid price, Δ_i, for each trade i are regressed on an intercept and a dummy variable that takes a value of one for buys and zero for sells. The coefficient on the dummy variable provides an estimate of round-trip trading costs. Month-end quotes are obtained from the Fixed Income Database. Within-month quotes are estimated in three steps. First, the bid quote from the previous month end is multiplied by the percentage change in the price of Treasury bonds of similar duration to obtain an estimate of the end of month price for the corporate bond and the estimated price is compared with the actual end-of-month quote. Second, the difference between estimated end-of-month bid quote and the actual end-of-month bid quote is divided by the number of days in the month to obtain an estimate of the average daily change in the yield curve. Finally, within-month quotes are estimated by multiplying the previous month-end quote by the change in treasury bonds of similar duration between the quote date and the Trade date and then adding on the average daily change in the yield curve multiplied by the number of days from the previous month end to the trade date. The sample includes all investment-grade corporate bond trades from Capital Access International from January 1995 through March 1997 that (1) could be matched with quotes from the Fixed Income Database at both the beginning and end of the month, (2) had a trade price that did not differ from the beginning and end of the month quote by more than $5 per $100 par value, (3) was a secondary market trade, and (4) did not occur on June 30, 1995 or June 30, 1996. Trades for these dates are not included because many of them appear to have occurred on different dates.

Panel A: Estimates of Round-trip Trading Costs in Dollars per $100 Par Value

Bond Rating	Mean Sale Price − Lehman Quote (dollars)	t stat.	Mean Buy Price − Mean Sale Price (dollars)	t stat.	N	Adj. R^2
All Baa–Aaa	$0.0646	10.19	$0.2721	32.92	61,328	0.0174
Aaa	$0.1287	3.44	$0.3444	6.83	1,875	0.0238
Aa	$0.0522	3.03	$0.2395	10.74	8,127	0.0139
A	$0.0334	4.01	$0.2925	27.31	33,677	0.0216
Baa	$0.1150	9.38	$0.2525	15.28	17,649	0.0130

Panel B: Estimates of Round-trip Trading Costs as a Percentage of the Bond Price

Bond Rating	Mean Sale Price − Lehman Quote (Percent)	t stat.	Mean Buy Price − Mean Sale Price (Percent)	t stat.	N	Adj. R^2
All Baa–Aaa	0.0606	9.60	0.2701	32.84	61,328	0.0173
Aaa	0.1307	2.97	0.3218	5.42	1,875	0.0149
Aa	0.0473	2.78	0.2416	10.97	8,127	0.0145
A	0.0297	3.58	0.2927	27.47	33,677	0.0219
Baa	0.1100	9.16	0.2461	15.22	17,649	0.0129

buy-order dummy is 32.92. The large sample that is made possible with the regression methodology permits precise estimates of round-trip trading costs.[5]

[5] The trading cost estimate of $0.2721 per $100 par value that could be obtained more simply by taking the difference between the mean Δ for buys and the mean Δ for sells as given in Table II. However, regressions will be needed as continuous variables like trade size are added.

The regression is re-estimated separately for bonds with different ratings. For every rating class, the point estimate of round-trip trading costs is between \$0.2395 and \$0.3444 per \$100 par value. It could be expected that transaction costs would be higher for lower-rated bonds, but the transaction cost estimates do not change in a systematic way across ratings classes. It appears that any differences in trading costs are small.

Panel B of Table III repeats the analysis of Panel A, but now percentage differences between trade and estimated bid prices are regressed on a dummy for buy orders. Trading costs are estimated to be 0.270 percent for investment-grade bonds, which is almost identical to the \$0.272 per \$100 of market value estimated using differences between trade and bid prices in dollars. Results are also similar to Panel A when different ratings classes are examined separately. It appears that sample bond prices are sufficiently close to par value that nearly identical estimates of trading costs are obtained by calculating percentage or dollar costs.

D. How Do These Cost Estimates Compare with Others?

Chakravarty and Sarkar (1999) and Hong and Warga (1998) estimate trading costs by comparing buy and sell prices for the same bond on the same day. To evaluate my methodology, I construct a subsample of the trades included in the regressions consisting of buy and sell trades of the same bond on the same day. This leaves 4,387 trades. If there is more than one buy (sell) trade during a day, I take the simple average of them to estimate a buy (sell) price for the bond on that day. Thus the 4,387 trades become 1,646 matched pairs of buy and sell prices for the same bond on the same day. I use this subsample to estimate trading costs in two ways. First, I use a regression with estimated bid prices as in equation (1). Second, I use the mean difference between buy and sell prices for the same bond on the same day as in Chakravarty and Sarkar (1999) and Hong and Warga (1998).

The regression methodology yields an estimate of \$0.1781 per \$100 par value. The coefficient has a t statistic of 4.61. When I calculate trading costs by averaging differences between buy and sell prices for the same bond on the same day, my estimate is \$0.2001 per \$100 par value.[6] The t statistic is 13.23. This suggests three conclusions. First, the trading cost estimates obtained from my methodology are 2.2¢ lower—a difference that may not be economically significant. Second, t statistics indicate that calculating a simple difference between buy and sell trade prices provides more accurate estimates of trading costs than the regressions when the same observations are used for both techniques. This is not surprising, as the bid prices estimates I use are noisy. Finally, we see that when we restrict our sample to

[6] If the bond price did not change during the day, we would expect each individual matched pair to provide a positive spread estimate. Instead, of the 1,646 matched pairs, 856 have positive estimated bid-ask spreads, 556 have zero estimated spreads, and 234 have negative estimated spreads. Although this dictates the need for a large sample size, an unbiased average spread estimate can still be obtained if prices are equally likely to rise or fall after each trade.

bonds with both buy and sell trades on the same date we lose about 93 percent of our observations. Thus, as a result of the much larger sample sizes, the regression methodology can produce more precise estimates of trading costs than matching buy and sell trades even though the matching technique works better when the same sample is used. Even more important is that only transactions in the most actively traded bonds are used when buy and sell trades are matched. Extrapolating transactions cost estimates from these bonds to the general population is problematic.

As a whole, my estimates are comparable to estimates in other studies. We would expect trading costs to be lower for treasuries than for corporates given their lower risk and greater liquidity. Elton and Green (1998) provide information on bid-ask spreads for treasury securities from GovPX from June 11, 1996, through June 13, 1996. They report a median quoted spread of \$0.0625 and a mean quoted spread of \$0.0529 per \$100 of par value. Chakravarty and Sarkar (1999) estimate mean round-trip trading costs of \$0.2150 per \$100 par value for corporate bonds from 1995 through 1997. Their estimate is somewhat lower than mine, but they estimate trading costs by comparing buy and sell prices for the same bond on the same day. Thus, their sample is tilted toward the bonds that trade most frequently. Hong and Warga (1998) also estimate trading costs for investment-grade bonds over the same time by computing differences between buy and sell prices for the same bond on the same day. Their estimate of the mean spread for investment-grade bonds is \$0.1328. This is lower than my regression estimate and also lower than the \$0.2001 that I obtain using Hong and Warga's technique of matching buy and sell trades. This is not surprising. They discard trades of less than \$500,000 whereas I retain them for the sample of paired buys and sells. As the next section will show, smaller trades are more expensive. In addition, restricting estimates to bonds with buys and sells on the same day means cost estimates reflect only the most active bonds, and thus estimates obtained in this way should be lower than the estimates I obtain through the regressions.

IV. The Determinants of Trading Costs

Thus far I have estimated the average costs of trading corporate bonds across a wide variety of trades. However, we would expect characteristics of the bonds and the trade itself to affect transactions costs. In this section I examine the effects of three factors on trading costs. The first factor is trade size. Some models of market making imply that large trades should cost more. In Easley and O'Hara (1987), informed traders prefer to trade larger amounts at any given price. In a resulting separating equilibrium, investors are charged more for large trades because they are more likely to be motivated by information. Grossman and Miller (1988) demonstrate that trading costs are likely to be higher for large trades of volatile assets if market makers are risk averse. On the other hand, trading costs could decrease with trade size if the fixed costs of executing a trade are significant.

A second factor that could affect trading costs is whether or not the institution involved trades actively. Institutions who trade frequently call dealers for quotes often and have a better sense of what is being bid or offered than less active institutions. Similarly, dealers are more likely to take the time to fax offers to buy or sell to institutions that they feel are inclined to trade. Without a convenient central source for quotes and trade reporting, inactive institutions are at an informational disadvantage compared to more active traders. Thus inactive institutions may pay more to trade as a result of the lack of transparency in the over-the-counter market. For the tests to follow, I categorize the 20 sample institutions with the largest dollar volume during the period as active institutions.

A third factor that may affect trading costs is whether the dealer is a large dealer. Small dealers usually obtain bonds from another dealer through an interdealer broker. In this case, the price that the institution pays (receives) would reflect the markups of both dealers and the interdealer broker. It is also possible that the larger and more active dealers may enjoy economies of scale that allow them to charge less for trading. I define large dealers as the 12 dealers with the largest dollar volume of trades during the sample period.

To examine the effects of trade size and the dealer and institutional size on bond trading costs I run the following regression:

$$\Delta_i = \alpha_0 + \alpha_1 D_i^{Buy} + \alpha_2 S_i + \alpha_3 D_i^{Inst} + \alpha_4 D_i^{Deal} + \alpha_5 D_i^{Inst} D_i^{Deal} + \alpha_6 D_i^{Inst} S_i + \alpha_7 D_i^{Deal} S_i + \epsilon_i \tag{3}$$

where Δ_i is the difference between the price of trade i and the estimated bid price, D_i^{Buy} is one if trade i is a buy and zero if it is a sell, S_i is the natural logarithm of the size (in thousands of dollars) of trade i multiplied by one for buy orders and negative one for sell orders, D_i^{Inst} is one if trade i is a buy and negative one if it is a sell for the 20 active institutions and it is zero if the institution is not active, and D_i^{Deal} is one if trade i is a buy and negative one if it is a sell if the dealer is one of the 12 active dealers and zero otherwise. For the interaction term for active dealers and institutions, the product of the dummies is positive for buy orders and negative for sell orders when both the dealer and institution are active, and zero otherwise.

Table IV reports the estimate of equation (3) and of regressions that include a subset of the variables in equation (3). In each case, the regression is run for all investment-grade bonds together, but results are similar when trading costs are estimated separately for bonds with different ratings (not shown). The first column of Table IV shows the coefficient estimates of a regression of the difference between the trade price and estimated bid price on an intercept and a dummy variable that takes a value of one for buy orders. This is the same regression estimated in Table III and is reported for comparison with the other regressions in the table. The number in parentheses under the coefficient estimate is the t statistic. So, for example, the coefficient of 0.2721 on the buy order dummy in the first regression means

Table IV

Trading Cost Determinants

The dependent variable is the difference between the trade price and the bid quote for the bond. Independent variables include a dummy variable that takes a value of one for buy orders and negative one for sell orders; the natural logarithm of the trade size (in thousands of dollars) multiplied by one for buy orders and negative one for sell orders; a dummy variable that takes a value of one if the trade is a buy by a large institution, negative one if the trade is a sell by a large institution, and zero otherwise; a variable that takes a value of one if the trade is a buy from an active dealer, negative one if the trade is a sell to an active dealer, and zero otherwise; an interaction term between the active dealer and active institution variables; and interaction terms between the trade size variables and the active dealer and active institution variables. Active institutions are defined as the 20 institutions with the largest dollar volume of trades in the sample and active dealers are the 12 dealers with the largest dollar volume of trades. Month-end quotes are obtained from the Fixed Income Database. An estimate of within-month quotes is obtained in three steps. First, the bid quote from the previous month end is multiplied by the percentage change in the price of Treasury bonds of similar duration to obtain an estimate of the end-of-month price for the corporate bond. Second, the estimated price is compared with the actual end-of-month quote. The difference between estimated end-of-month bid quote and the actual end-of-month bid quote is divided by the number of days in the month to obtain an estimate of the average daily bond-specific price change. Finally, within-month quotes are estimated by multiplying the previous month-end quote by the change in Treasury bonds of similar duration between quote date and the trade date and then adding on the average daily bond-specific price change multiplied by the number of days from the previous month end to the trade date. t statistics are shown in parentheses. The sample includes all investment-grade corporate bond trades from Capital Access International from January 1995 through March 1997 that (1) could be matched with quotes from the Fixed Income Database at both the beginning and end of the month, (2) had a trade price that did not differ from the beginning- and end-of-the-month quote by more than $5 per $100 par value, (3) was a secondary market trade, and (4) did not occur on June 30, 1995 or June 30, 1996. Trades for these dates are not included because many of them appear to have occurred on different dates.

Variable	Regression				
Intercept	0.0646	−0.5226	−0.5140	−0.5240	−0.7427
	(10.19)	(−25.09)	(−23.59)	(−24.27)	(−23.40)
Buy order dummy	0.2721	1.4233	1.4022	1.4210	1.8591
	(32.92)	(35.78)	(33.50)	(34.33)	(29.82)
Log of order size		−0.0806	−0.0715	−0.7208	−0.1056
		(−29.58)	(−4.91)	(−24.30)	(−22.75)
Active institution dummy			−0.0473	−0.1230	−0.4397
			(−4.91)	(−7.88)	(−8.15)
Active dealer dummy			−0.0508	−0.0819	−0.3581
			(−6.04)	(−8.45)	(−8.69)
Dealer–institution interaction				0.1173	0.0465
				(6.20)	(2.29)
Institution–trade size interaction					0.0464
					(6.63)
Dealer–trade size interaction					0.0417
					(7.02)
Adjusted R^2	0.0173	0.0312	0.0322	0.0328	0.0343

that the average round-trip cost of trading is \$0.2721 per \$100 par value. The t statistic of 32.92 means that this coefficient estimate is significantly different from zero at any conventional confidence level.

The second column of the table provides regression results when the natural logarithm of the order size times one for buy orders and negative one for sell orders is included. The variable is negative and highly significant, indicating that trade prices are lower (higher) for large buy (sell) orders then they are for small buy (sell) orders. The regression's R^2 increases from 0.0173 to 0.0312 when the trade size variable is added.

The next two columns of the table provide estimates of regressions when both the active institution and the active dealer dummy variables are included with and without an interaction term. Dummy variables for active dealers and institutions take values of one for buys, negative one for sells, and zero if the trade is not conducted by an active institution (dealer). Both variables are negative and highly significant, indicating that active institutions face lower trading costs and active dealers charge less even after adjusting for trade size. A positive coefficient on the interaction term indicates that it is inactive institutions that realize the largest savings from trading with active dealers.

The last column of Table IV reports estimates of the regression when variables for interactions between the institution and trade size and the dealer and trade size are included. Of particular interest is that the coefficients on the active institution and active dealer variables remain negative and significant and that the interaction between the active dealer and active institution dummies although positive, is of much smaller magnitude than these variables. This indicates that active institutions pay less to trade bonds after adjustment for their propensity to trade with large dealers. The coefficient on the log of order size is negative. Trading costs decline with trade size. The coefficients on the interactions between trade size and dummy variables for active institutions and large dealers are positive but the sum is smaller than the coefficient on trade size. This means that trading costs also decrease with size for active institutions and trades with large dealers but the decline is not as steep as it is for inactive institutions or trades with small dealers.

Figure 1 plots the round-trip trading cost estimates from the last regression in Table IV for trade sizes ranging from \$100,000 to \$5,000,000. Two cases are shown: active institutions trading with large dealers and inactive institutions trading with small dealers. Trading costs for the inactive institutions trading with small dealers are larger over the entire range of trade sizes. The cost difference narrows to almost nothing for trade sizes around \$5,000,000, but there are few trades of this size between inactive institutions and small dealers. For both groups, trading costs decrease with trade size, but the effect is especially pronounced for the inactive institutions.

The evidence so far suggests that inactive institutions pay more to trade than their more active counterparts. It is possible, though, that the difference in costs can be attributed to differences in the types of bonds that active

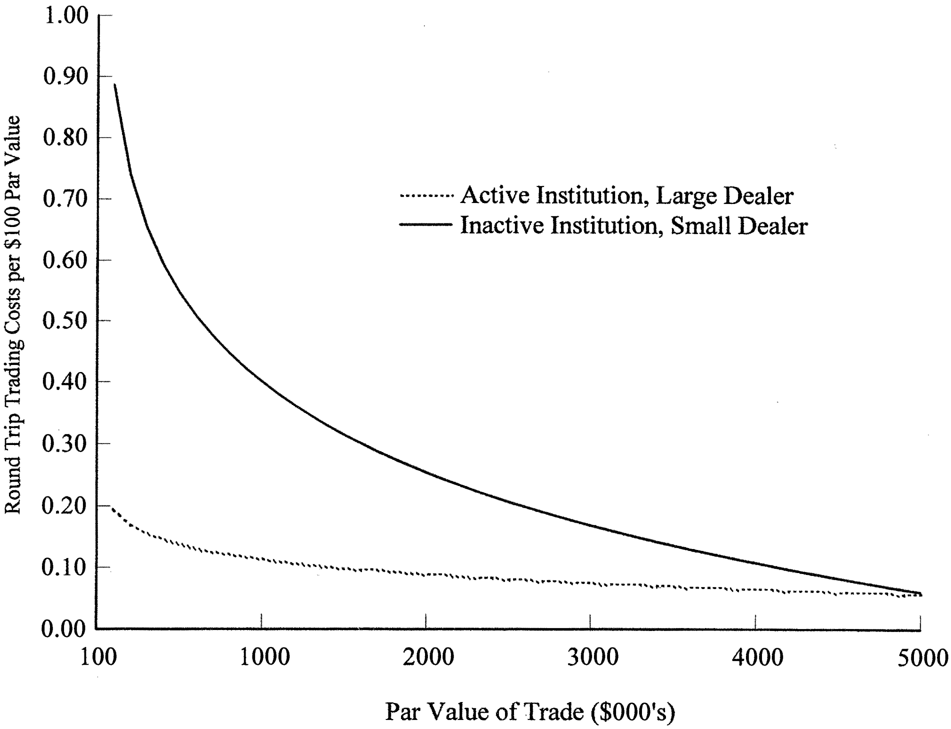

Figure 1. Estimates of round-trip trading costs for different size trades for active institutions trading with large dealers and inactive institutions trading with small dealers.

and inactive institutions trade, or to a misspecification of the regression used to estimate trading costs. Thus, as an alternative, I create a matched sample. A secondary trade by one of the 20 active institutions is matched with a secondary trade by an inactive institution that (1) occurred in the same month, (2) differed in dollar value by no more than 10 percent, (3) involved bonds that differed in duration by no more than 10 percent, and (4) involved bonds with the same Moody's letter rating. Each trade is matched with only one other trade. A total of 11,321 pairs or 22,642 trades remain in the matched sample.

Table V reports the characteristics of the matched sample. The average dollar amount of the active institutions' trades is $3,607,000, whereas the average trade size for the other institutions is $3,592,000. Thus, trade sizes of both are more than twice as large as the mean trade size in the sample as a whole. The matching process eliminates most of the smaller trades. The mean duration of the bonds traded by the active institutions is 6.817 years whereas the average duration for the bonds traded by the inactive institutions is 6.805 years. Neither the dollar value of the trades or the durations of the bonds traded are significantly different across institutions. In con-

Table V

Characteristics of the Matched Sample of Trades of Active Institutions and Other Institutions

The sample includes all investment-grade corporate bond trades from Capital Access International from January 1995 through March 1997 that (1) could be matched with quotes from the Fixed Income Database at both the beginning and end of the month, (2) had a trade price that did not differ from the beginning- and end-of-the-month quote by more than $5 per $100 par value, (3) was a secondary market trade, and (4) did not occur on June 30, 1995 or June 30, 1996. Trades for these dates are not included because many of them appear to have occurred on different dates. A trade by one of the 20 most active institutions is matched with a trade from another institution if (1) both trades occurred in the same month, (2) the dollar value of the bonds traded did not differ by more than 10%, (3) the duration of the of the two bonds differed by no more than 10%, and (4) the bonds had the same letter rating from Moody's. No trade is matched more than once. A total of 11,321 pairs of trades were found for the period January 1995 through February 1997.

Panel A: Means of Variables

	Mean	Standard Deviation	Minimum	Maximum
		Value of trades ($000s)		
Active institutions	3,607	3,271	10	30,602
Other institutions	3,592	3,251	10	28,350
t statistic for difference	(0.35)			
		Duration of bonds (years)		
Active institutions	6.817	2.681	1.433	17.523
Other institutions	6.805	2.665	1.406	17.523
t statistic for difference	(0.34)			
		Total value of outstanding bonds ($000s)		
Active institutions	258,292	185,709	NA	1,500,000
Other institutions	266,693	195,155	NA	1,500,000
t statistic for difference	(−2.41)			

Panel B: Differences in Trade Categories

	Active Institutions	Inactive Institutions	*t* Statistic for Difference
Percent buys	54.39	57.97	(−0.88)
Percent large dealers	68.68	56.66	(18.84)
Percent rated Aaa	0.78	0.78	(0.00)
Percent rated Aa	7.98	7.98	(0.00)
Percent rated A	56.24	56.24	(0.00)
Percent rated Baa	35.01	35.01	(0.00)

trast, the mean dollar value of outstanding bonds in issues traded by the inactive institutions is $266,693,000 whereas the mean dollar value of the outstanding bonds in issues traded by the active institutions is $258,292,000. This difference is statistically significant but economically trivial.

Panel B of Table V reports differences in trade categories across the active and inactive institution's trades. Of the active institutions' trades, 54.39 percent are buys compared to 57.97 percent of the other institutions' trades. This difference is not significant. On the other hand, 68.68 percent of the active institutions' trades are with active dealers, compared to only 56.66 percent of the other institutions' trades. This difference is highly significant. Finally, by design, there is no difference in the ratings of the bonds traded by the active and inactive institutions in the matched sample.

To test whether there are differences in trading costs for active and inactive institutions in the matched sample, the following regression is run:

$$\Delta_i = \alpha_0 + \alpha_1 D_i^{Buy} + \alpha_3 D_i^{Inactive} + \epsilon_i, \tag{4}$$

where Δ_i = the difference between the price of trade i and the estimated bid price, D_i^{Buy} = one for buy orders and zero for sell orders, $D_i^{Inactive}$ = one if the institution is not one of the 20 most active and the trade is a buy, negative one if the institution is not one of the 20 most active and the trade is a sell, and zero if the institution is an active one.

Results are reported in Table VI. In Panel A, estimates of equation (4) are reported for all investment-grade bonds, and for Aaa, Aa, A, and Baa rated bonds. In the regression that includes all investment-grade bonds, the coefficient on the variable for inactive institutions is positive and highly significant. Less active institutions pay much more to trade than the most active ones. When all investment-grade bonds are considered, the active institutions pay round-trip costs of \$0.0853 per \$100 of par value. The dummy variable for inactive institutions in the regression takes a value of one for buys, negative one for sells, and zero for active institutions. Thus an inactive institution pays \$0.0819 more to buy than an active one and receives \$0.0819 less on a sale. In total the inactive institutions pay round-trip trading costs of \$0.0853 + 2 × \$0.0819 or \$0.2491 per \$100 of par value—almost three times as much as the active institutions. When the matched sample is broken down by the bond's rating, the regressions imply that less active institutions pay more to trade bonds in every rating class. The difference is significant for Aa, A, and Baa rated bonds. The matched sample of Aaa bond trades has only 176 trades.

In Panel B of Table VI, the regression is rerun but now includes the natural logarithm of the trade size, duration, the natural logarithm of the value of the outstanding bond's value, and a dummy variable for a large dealer. All of these variables are multiplied by one for buy orders and negative one for sell orders. This regression is run to insure that small differences in the matched variables or differences in the propensity to use active dealers or in the amount of the bond issued do not explain the differences in trading costs paid by active and inactive institutions. As shown in Table VI, inactive institutions still pay significantly more to trade, and they pay significantly more regardless of the bond rating.

Table VI

Regression Estimates of the Effect of Institutional Trading Activity on Trading Costs

The sample includes all investment-grade corporate bond trades from Capital Access International from January 1995 through March 1997 that (1) could be matched with quotes from the Fixed Income Database at both the beginning and end of the month, (2) had a trade price that did not differ from the beginning- and end-of-the-month quote by more than \$5 per \$100 par value, (3) was a secondary market trade, and (4) did not occur on June 30, 1995 or June 30, 1996. Trades for these dates are not included because many of them appear to have occurred on different dates. A trade by one of the 20 active institutions is matched with a trade from another institutions if (1) both trades occurred in the same month, (2) the dollar value of the bonds traded did not differ by more than 10%, (3) the duration of the of the two bonds differed by no more than 10%, and (4) the bonds had the same letter rating from Moody's. A total of 11,321 pairs of trades were found for the period January 1995 through February 1997. The sign of the trade is one for buys and negative one for sells. The active dealer dummy takes a value of one if the dealers was one of the 12 with the largest in-sample dollar volume of trades and zero otherwise.

	Investment-grade	Aaa Bonds	Aa Bonds	A Bonds	Baa Bonds
Panel A: The Effect of Institutional Trading Activity on Trading Costs					
Intercept	0.1694	0.1931	0.2154	0.1498	0.1891
	(14.82)	(1.42)	(6.00)	(10.46)	(8.83)
Buy order dummy	0.0853	0.1134	−0.0181	0.0542	0.1593
	(4.71)	(0.54)	(−0.31)	(2.40)	(4.69)
Inactive institution × sign of trade	0.0819	0.0962	0.0882	0.0973	0.0586
	(6.40)	(0.66)	(2.15)	(6.10)	(2.44)
Adjusted R^2	0.0091	0.0027	0.0030	0.0096	0.0107
Observations	22,642	176	1,806	12,734	7,926
Panel B: The Effect of Institutional Trading Activity on Trading Costs after Adjustment for Bond Characteristics					
Buy order dummy	1.2304	2.5736	−1.9227	1.7321	1.1503
	(4.78)	(0.99)	(−3.55)	(5.26)	(2.23)
Inactive institution × sign of trade	0.0776	0.0965	0.0789	0.0945	0.0548
	(6.04)	(0.66)	(1.92)	(5.87)	(2.28)
Log trade size	−0.0571	−0.0675	−0.0637	−0.0601	−0.0551
	(−9.32)	(−0.96)	(−3.16)	(−7.99)	(−4.67)
Duration	0.0160	0.0314	0.0248	0.0151	0.0166
	(6.62)	(1.34)	(3.16)	(5.18)	(3.45)
Log outstanding bonds value	−0.0171	−0.0793	0.1090	−0.0368	−0.0118
	(−1.70)	(−0.80)	(4.24)	(−2.88)	(−0.58)
Active dealer dummy	−0.0423	0.0902	−0.1177	−0.0315	−0.0550
	(−3.11)	(0.54)	(−2.73)	(−1.85)	(−2.14)
Adjusted R^2	0.0153	−0.0040	0.0215	0.0172	0.0153
Observations	22,642	176	1,806	12,734	7,926

The results of Table VI indicate that even when trade size, duration, and bond rating are similar, institutions that trade less frequently pay much more per trade than active institutions. One explanation for this is the lack of transparency in the bond market. In a market with little transparency, information about quotes and trades may be expensive and time consuming to acquire. Active institutions like Prudential Capital Management, Metropolitan Life Insurance, and TIAA-CREF acquire information as a consequence of their frequent trading. Monitoring of the market by these institutions can pay off in better prices on many trades. Other institutions in the sample, such as the Vermont National Bank, The Polish Women's Alliance, and the Slavonic Benevolent Order trade infrequently. The benefits of acquiring information about quotes and trade prices are likely to be smaller because they trade less often and thus these institutions probably spend less time and effort on finding information about current market conditions.[7]

Some evidence on the importance of having information about dealer quotes is provided by Saunders, Srinivasan, and Walter (1998). They study the bids (and offers) received by one anonymous asset manager who solicited offers to buy or sell from bond dealers on behalf of institutional clients from January to November 1997. Typically, these quotes are received within two minutes of a request for a price. About 70 percent of the time, more than one bid (or offer) was received. On average, for investment-grade bonds, the winning bid price was 12.0 basis points better than the second best price and 20.5 basis points better than the average price.

Lack of transparency is not the only possible explanation for the differences in trading costs paid by active and inactive institutions. Active institutions may provide liquidity to dealers on many of their trades whereas inactive ones consume liquidity. Frequent traders may also pursue different investment strategies than less active traders. Note though that the differences in trading frequency are generally attributable to differences in the institution's size. Further examination of why inactive institutions pay more to trade bonds is needed.

V. Summary and Conclusions

In this paper, I examine corporate bond trades by insurance companies, mutual funds, and pension funds from January 1995 through March 1997. In total, my sample includes over $600 billion in trades. I estimate round-trip transactions costs for secondary trades of investment-grade bonds by regressing the difference between the trade price and the estimated bid price

[7] The lower trading costs paid by institutions do not appear to be a result of relationships that develop between institutions and dealers. I am unable to find any difference between the costs that active institutions pay when they trade with dealers with whom they frequently trade and the costs they pay when they trade with dealers they seldom use. These results are available from the author on request.

on a dummy variable that takes a value of one for buy orders and zero for sell orders. The average round-trip transactions costs across all trades is \$0.2721 per \$100 of par value.

I find that trading costs decline with trade size, are lower when a large bond dealer is used, and are lower for active institutions than inactive ones. When trades are matched on the bond's duration, the dollar value of the trade, the bond rating, and the month in which the trade took place, inactive institutions pay more than twice as much to trade. One explanation for this is that obtaining information on quotes and trades in the bond market is time consuming and expensive as a result of the lack of transparency in the bond market. Only larger institutions that can amortize these costs over many trades find it worthwhile to bear them.

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