

# **Transparency and the Corporate Bond Market**

**Hendrik Bessembinder and William Maxwell**

**forthcoming, Journal of Economic Perspectives, Spring 2008**

Hendrik Bessembinder is A. Blaine Huntsman Chaired Presidential Professor, David Eccles School of Business, University of Utah, Salt Lake City, Utah. William Maxwell is Associate Professor of Finance, Eller College of Management, University of Arizona, Tucson, Arizona. Their e-mail addresses are <finhb@business.utah.edu> and <maxwell@eller.arizona.edu>, respectively.

This feature explores the operation of individual markets. Patterns of behavior in markets for specific goods and services offer lessons about the determinants and effects of supply and demand, market structure, strategic behavior, and government regulation. Suggestions for future columns and comments on past ones should be sent to James R. Hines Jr., *c/o Journal of Economic Perspectives*, Department of Economics, University of Michigan, 611 Tappan Street, Ann Arbor, MI 48109-1220.

### **The U.S. Corporate Bond Market**

The U.S. corporate bond market is enormous. Outstanding principal in corporate bonds at the end of 2006 was \$5.37 trillion, which as Table 1 shows was larger than either U.S. Treasury obligations or municipal bond obligations, though not quite as large as mortgage-related bonds. Corporate bonds are a principal source of external financing for U.S. firms; new corporate bond issues during 2006 amounted to \$470 billion, up from \$222 billion a decade earlier, as shown in Table 2. Table 2 reports issuances of “High Yield” bonds, which are those with relatively poor credit ratings, and on “Investment Grade” bonds, which are those with stronger credit ratings – a distinction discussed further below. During the decade 1997 to 2006, U.S. corporations issued a total of \$4.6 trillion in corporate bonds, compared to \$1.5 trillion in equity raised through public common stock offerings. Table 2 reports public common stock offerings in two categories: “Initial Public Offerings” of common stock involve the sale of equity shares by companies without existing publicly-traded shares, while “seasoned” offerings are new share sales by companies that previously issued shares to public.

For decades, corporate bonds primarily traded in an opaque environment. Quotations, which indicate prices at which dealers are willing to transact, were available only to market professionals, most often by telephone. Prices at which bond transactions were completed were not made public. In contrast, of course, most stock exchanges continuously disseminate quotations and also report transactions prices and quantities to the investing public within seconds of each trade.

However, the U.S. corporate bond market underwent a fundamental change with the introduction of the Transaction Reporting and Compliance Engine (TRACE) in July 2002. Beginning that date, bond dealers were required to report all trades in publicly-issued corporate bonds to the National Association of Security Dealers, which in turn made transaction data available to the public. While the introduction of transaction reporting through TRACE did not render the corporate bond markets as transparent as the stock markets, it nevertheless had far-reaching effects.

The term “transparency” as applied to security markets refers to the amount and timeliness of the information provided to the investing public regarding market conditions. “Pre-trade transparency” refers to the dissemination of quotations or other indications of trading interest, while “post-trade transparency” refers to dissemination of information such as price and volume for completed trades. The pre-TRACE empirical evidence on the impact of transparency on quality of financial markets is sparse and inconclusive.<sup>1</sup> Such studies are difficult to conduct, both because changes in a market’s transparency are more often incremental than abrupt, and

---

<sup>1</sup> Gemmill (1996) examines the London Stock Exchange after two changes in required post-trade transparency for large trades and does not detect any change in liquidity. Madhavan, Porter, and Weaver (2005) examine the liquidity of the Toronto Stock Exchange when during 1990 it began to disseminate its limit order book publicly, and they document increased execution costs and greater price volatility after the increase in pre-trade transparency. Boehmer, Saar, and Yu (2005) examine the effect when the New York Stock Exchange began to disseminate limit order book information in January 2002. In contrast to the findings of Madhavan, Porter, and Weaver, they report improved liquidity as measured by transaction costs and the informational efficiency of prices.

because it is difficult to obtain data in opaque markets. The introduction of TRACE to the bond market provides a rare opportunity to assess the effects of a substantial increase in transparency.

In this paper, we describe trading protocols in the corporate bond market and assess the impact of the increase in transparency on the market. We summarize the results of three published statistical analyses of how TRACE affected the costs that corporate bond investors paid to bond dealers for their transactions. In addition, we canvassed opinions from a variety of finance professionals and examined a large number of articles carried in the trade press to obtain a broader view of the impact of transparency on the corporate bond market.<sup>2</sup>

## **A Primer on Corporate Bonds**

Corporate bonds, which are contractual promises by the issuing company to make a series of “coupon” interest payments and a payment of the bond’s “face value” (usually \$1,000) at a specified maturity date, are sold to investors to raise capital for issuers. Annual interest payments are a stated percentage (the “coupon interest rate”) of the bond’s face value, typically paid in two installments per year. Subsequent to their initial issue, bonds trade among investors and dealers in secondary markets at prices that depend on economy-wide interest rates, as well as on market perceptions regarding the likelihood that issuing firms will make the promised payments.<sup>3</sup> Unlike common equity shares, which are fully fungible, bonds issued by a given

---

<sup>2</sup> We surveyed professionals representing small, medium and large investment management firms, as well as medium and large corporate bond dealers. We thank Mary Kuan of the Securities Industry and Financial Markets Association for arranging some of the interviews.

<sup>3</sup> A bond’s “yield to maturity” is the interest rate that, when used in standard present value formulae, equates the bond’s promised payments to its market price. Market participants sometimes refer to the yield to maturity simply as the “bond yield.” Closely related, but distinct, is the bond’s “current yield,” which is the ratio of the annual coupon interest payment to the market price. Some corporate bonds, typically noninvestment grade, are issued with embedded call options, which allow the issuer to repurchase the bond at a specified premium over face value during a specified window of time.

corporation at different points in time are distinct contracts that differ in terms of promised payments and legal priority in case of default, and are traded separately.

Bonds that are sold to the U.S. investing public must be registered with the Securities and Exchange Commission. Alternately, bonds may be “privately placed,” which requires that they be sold only to “accredited investors,” who are defined the Securities and Exchange Commission to include certain institutions (for example, pension funds and insurance companies) and wealthy individuals.

Bond issuers hire credit rating agencies to evaluate their creditworthiness. Rating firms--including A.M. Best, Fitch Ratings, Standard & Poors, and Moody’s--assign ordinal ratings to bond issues, with the implication that higher-rated issues are less likely to default on promised payments. Particularly important is the designation of bonds and other debt obligations as “investment grade” (rated BBB or better by Standard & Poors or Baa or better by Moody’s respectively), or “noninvestment grade.” Bonds not rated as investment grade are also referred to as “high yield,” “speculative grade,” or “junk” bonds. For regulated financial service firms, such as banks and life insurance companies, required reserves are greater for noninvestment grade bonds. Further, many financial institutions, including pension and mutual funds, face restrictions on amount of noninvestment grade debt they can hold.<sup>4</sup> Such restrictions contributed to widely-publicized problems in credit markets during 2007. As mortgage-based debt obligations were downgraded to noninvestment grade, a number of firms were required to liquidate positions simultaneously, leading to further price declines.

## **Trading in Corporate Bonds**

---

<sup>4</sup> Further, many institutions face restrictions as to the proportion of their portfolio that can be held in instruments trading at prices less than face values.

Securities markets can rely on dealers, limit orders, or a combination of the two. Dealer markets are organized around one or more designated market makers, who continuously stand ready to buy or sell. Dealers typically issue bid quotations that indicate the price at which they are willing to buy, and ask (or “offer”) quotations that indicate the price at which they are willing to sell. Limit order markets rely on submissions by investors of price-contingent orders—that is, orders to buy (or sell) at any price at or below (or above) a specified “limit” price.<sup>5</sup> In markets without dealers, the highest limit price on an unexecuted buy order and the lowest limit price on an unexecuted sell order comprise the market quotations.

During the early decades of the twentieth century, corporate bonds were predominantly traded on the New York Stock Exchange’s transparent limit order market. However, as Green and Biais (2007) document, corporate bond trading largely migrated away from the New York Stock Exchange to a dealer-oriented “over-the-counter” market during the 1940s. (The label “over-the-counter” or “OTC” market is generic for markets that are not legally organized as “Exchanges” as defined by the Securities and Exchange Commission.) Green and Biais note that this migration was coincident with the growth in bond trading on the part of institutional investors (like pension funds, mutual funds, and endowments), who they assert fare better than individuals in the over-the-counter market. Some corporate bonds are traded on the NYSE to this day. However, as of 2002, only about 5 percent of all bonds are NYSE-listed (Edwards, Harris, and Piwowar, 2006). Further, the average trade size on the NYSE is only about 20 bonds, or approximately \$20,000 (Hong and Warga, 2000).

---

<sup>5</sup> For example, the Nasdaq stock market was traditionally a dealer market. Since regulatory reforms were implemented in 1997, Nasdaq has also allowed public investors to compete with dealers by submitting limit orders. The New York Stock Exchange has long relied heavily on limit order submissions to provide market liquidity, supplemented at times by the buying and selling interest of a designated dealer known as the “specialist.”

The dealer market for corporate bonds, in contrast, is dominated by large institutional investors. Bessembinder, Maxwell and Venkataraman (2006) document an average trade size of \$2.7 million for institutional trades in the over-the-counter dealer market. While a “round lot” for stock trading is 100 shares, or about \$3,000 to \$5,000 for typical stocks, a “round lot” in bond markets involves a trade of \$1 million. Bessembinder, Kahle, Maxwell and Xu (2007) report that during 2006, round lot transactions accounted for at least 85.6 percent of corporate bond dollar trading volume, while at least 96.7 percent of dollar volume occurred in trades of \$100,000 or more. These percentages are somewhat understated, as the TRACE dataset studied by the authors caps reported trade sizes at \$5 million.

While over-the-counter corporate bond trades tend to be large, they also tend to be infrequent. Edwards, Harris, and Piwowar (2007) report that individual bond issues did not trade on 48 percent of days in their 2003 sample, and that the average number of daily trades in an issue, conditional on trading, is just 2.4. Corporate bonds trade infrequently even compared to other bonds. Although Table 1 shows that they comprise about 20 percent of outstanding U.S. bonds, corporate bonds account for only about 2.5 to 3.0 percent of trading activity in U.S. bonds in recent years, as shown in Table 3. By comparison, U.S. Treasury securities comprise 16 percent of U.S. bonds outstanding, but account for 59 percent of total bond trading volume in 2006 (Tables 1 and 3). While the U.S. Treasury market is also an “over-the-counter” dealer market, it is more similar to stock markets in terms of transparency, as quotations are disseminated continuously and trade prices are reported to the market. Fleming (2003) provides a complete discussion of U.S. Treasury bond trading.

The lower trading frequency of corporate bonds may reflect their relatively large trading costs, which in turn could be attributable to greater information asymmetries regarding

underlying value for corporate bonds compared to government bonds. Alternatively, higher trading costs for corporate bond could reflect rents extracted by dealers in the opaque environment. Further, corporate bonds are a favored investment for insurance companies and pension funds, whose long-horizon obligations can be matched reasonably well to the relatively predictable, long-term stream of coupon interest payments from bonds. Correspondingly, most or all of a bond issue is often absorbed into stable “buy-and-hold” portfolios soon after issue.

Dealer quotations in corporate bonds are not disseminated broadly or continuously. Quotations are generally available only to institutional traders, mainly in response to phone requests. Prior to the introduction of TRACE, transaction prices were not reported except to the parties involved in a trade. In contrast, most stock markets disseminate best quotations and information about unexecuted limit orders to the investing public on a continuous basis, and report publicly prices and quantities for completed trades within seconds of the transaction.<sup>6</sup>

Except for the largest and most actively traded bonds, only a few dealers (including the investment bank or syndicate who originally underwrote the bond issue) typically “make a market” – that is, actively buy and sell a particular bond issue. Traditionally, dealers have maintained an inventory of bonds for which they make a market. Telephone quotations indicate a firm price, but are only good “as long as the breath is warm,” which limits the ability to obtain multiple quotations before committing to trade.

In addition to telephone quotations, some institutional investors have access to “indicative” quotations through electronic messaging systems provided by vendors such as Bloomberg. However, these price quotations mainly serve as an indication of the desire to trade, not a firm obligation on price and quantity. Prior to the implementation of TRACE, prices for

---

<sup>6</sup> Opacity is not an inherent feature of dealer-oriented markets. For example, the Nasdaq stock market has long been quite transparent. However, the dealer-oriented segments of the foreign exchange and energy markets have traditionally also been quite opaque.

completed corporate bond trades were not reported to parties uninvolved in the transaction. Institutional investors typically relied on third-party pricing services to provide end-of-day information to estimate the value of their bond portfolios. The largest third-party pricing services are Interactive Data Corporation and Mark-it Partners, which provide current prices for bonds as well as other debt instruments discussed later in this paper, including credit default swaps and syndicated bank loans.

Individual investors generally had access to even less market information than institutions prior to the advent of TRACE. While the New York Stock Exchange's Automated Bond System reports transaction prices, relatively few bond issues are listed there (Edwards, Harris and Piwovar, 2006). Individual investors wishing to trade bonds not listed on the Automated Bond System could obtain quotations from retail brokerage firms, who often add or subtract their own profit margin to quotations they received from dealers.

The main source of data regarding corporate bond trades pre-TRACE is the National Association of Insurance Commissioners, who required insurance companies to report prices and volumes for their bond trades. Using this data, Bessembinder, Maxwell, and Venkataraman, (2006) estimate round-trip (purchase and sale) trading costs during the first half of 2002 (prior to the introduction of TRACE) to be approximately 0.25 percent, or \$6750 on an average-sized transaction. Similarly, Schultz (2001) estimates trading costs of about 0.25 percent using the National Association of Insurance Commissioners data during the period January 1995 to April 1997. Chakravarty and Sarkar (2003), studying the same data source, report that insurance companies pay average trading costs for municipal bonds of 0.23 percent, compared to 0.21 percent for corporate bonds and only 0.08 percent for Treasury bonds.

No systematic evidence apparently exists regarding corporate bond trading costs paid by retail customers prior to the advent of TRACE. However, Edwards, Harris and Piwowar (2007) document in 2003 data that small corporate bond trades pay the largest percentage execution costs. They report average execution costs of 0.92 percent for trades of \$50,000, 0.18 percent for trades of \$1 million, and only 0.08 percent for trades of \$10 million. Finding smaller costs for large trades may seem anomalous. Easley and O'Hara (1987) predict that traders who possess non-public information regarding fundamental values will tend to use large orders. To recoup possible losses to better-informed traders, dealers or limit order traders are therefore expected to widen bid-ask spreads for larger orders. That execution costs for bonds decline with trade size may reflect in part that asymmetric information regarding issuing firm fundamentals is relatively unimportant for bond valuation. It could also reflect the absence of an inexpensive centralized system for processing small bond transactions. Or the higher execution costs for small bond trades could reflect the extraction of rents by better-informed bond dealers from relatively uninformed retail bond traders.

## **The Introduction of TRACE**

On January 31, 2001, the Securities and Exchange Commission initiated post-trade transparency in the corporate bond market when it approved rules requiring the National Association of Security Dealers to compile data on all over-the-counter transactions in publicly-issued corporate bonds. For each trade, the dealer is required to identify the bond, and to report the date and time of execution, trade size, trade price, yield, and whether the dealer bought or sold in the transaction. Not all of the reported information is disseminated to the public:

investors receive bond identification, the date and time of execution, and the price and yield for bonds specified as TRACE-eligible. Trade size is provided for investment-grade bonds if the face value transacted is \$5 million or less, and for non-investment grade bonds if the face value transacted is \$1 million or less – otherwise, an indicator variable denotes a trade exceeding the maximum reported size. Investors can access this information on the Financial Industry Regulatory Authority (FINRA) website or by subscription through third-party vendors, including Bloomberg, MarketAxess, Reuters, and Moneyline Telerate.

While the National Association of Securities Dealers compiled data on all trades in publicly-issued corporate bonds beginning July 1, 2002, reporting of transactions to the public was phased in over time based on the size and credit rating of the bonds. On July 1, 2002, trades in investment-grade corporate bonds with issuance size of \$1 billion or greater, as well as 50 representative non-investment grade bonds, began to be disseminated to the public. During 2003, trades in 120 selected BBB-rated bonds and higher rated bonds with initial issue sizes over \$100 million began to be disseminated. In 2005, data began to be disseminated for all but “newly issued” and “lightly traded” bonds. By January 9, 2006, trades in all publicly-issued bonds were disseminated to the public.<sup>7</sup> In addition, the timeliness with which dealers were required to report trades was tightened in stages. On the introduction of TRACE, dealers had 75 minutes to report trades. This was reduced on October 1, 2003, to a reporting time of 45 minutes, and on October 1, 2004, to 30 minutes. Since July 1, 2005, dealers have been required to report trades within 15 minutes.

## **The Effect of TRACE on Customer Trading Costs**

---

<sup>7</sup> Goldstein and Hotchkiss (2007) provide details regarding the few bonds exempt from reporting.

Well-functioning security markets provide investors with liquidity. However, the term “liquidity” is a broad and somewhat elusive concept, used to describe multiple properties of trading in security markets. For example, Kyle (1985) notes that liquidity can include “tightness,” which is the cost of completing a buy and sell transaction in a short period of time, “depth,” which is the size of the buy or sell order required to move market prices by a given amount, and “resiliency,” which is the speed with which prices recover from a random shock in buy or sell orders. Alternately, practitioners sometimes use the word liquidity to describe the ease of transacting.

The systematic studies of TRACE’s effects on the corporate bond market have focused on customers’ trading costs, most closely analogous to Kyle’s (1985) concept of “tightness.” In theoretical models, costs of trading seem likely to decline in a more transparent market for three reasons. First, in an opaque market, well-informed dealers may be able to extract rents from less well-informed customers (Pagano and Roell, 1996), and in fact dealers may well prefer not to disclose trades that occur, because they profit from the associated reduction in price competition (Madhavan, 1995). Second, increased transparency can facilitate enforcement of rules against excessive “mark-ups” (additions or subtractions in retail price relative to open market) in securities trading. It is a violation of National Association of Securities Dealers Rule 2440 for a member to buy or sell securities “at any price not reasonably related to the current market price of the security.” TRACE helps to establish the current market price for bonds. Third, greater transparency can improve dealers’ ability to share risks, thereby decreasing dealers’ inventory carrying costs, which could also reduce customers’ cost of trading, as in the model of Naik, Neuberger, and Viswanathan (1999).

Empirical evidence on the introduction of transaction reporting in corporate bonds has been the subject of countless articles in the trade press and at least three articles published in refereed academic journals: Bessembinder, Maxwell and Venkataraman (2006), Edwards, Harris, and Piwowar (2007), and Goldstein, Hotchkiss, and Sirri (2007). Although the three studies use notably different samples and research designs, all three conclude that the increased transparency associated with TRACE transaction reporting is associated with a substantial decline in investors' trading costs.

Bessembinder, Maxwell and Venkataraman (2006) rely on the National Association of Insurance Commissioners database of insurance company bond trades—which is apparently the only publicly-available database containing information on corporate bond transactions prior to the implementation of TRACE—to estimate trade execution costs during periods six months before and six months after TRACE's introduction on July 1, 2002. They report average one-way trading costs for those bonds whose trades were made public during the second half of 2002 in the amount of 0.05 to 0.08 percent, which is approximately half of their estimates of pre-TRACE trading costs. Further, they document a smaller reduction in trading costs for bonds whose trade prices were not yet reported to the public. They attribute this reduction to a “liquidity externality” by which investors were able to use price data for reported bonds to estimate values better for non-reported bonds.

Edwards, Harris, and Piwowar (2007) and Goldstein, Hotchkiss, and Sirri (2007) study data comprised of all corporate bond transactions reported by dealers to the National Association of Securities Dealers, including transactions never disseminated to the public. Since reporting to the National Association of Securities Dealers commenced July 1, 2002, these authors cannot compare to the pre-TRACE environment. However, they study the 2003 expansion in the set of

bonds for which trades were reported to the public, and they conduct cross-sectional studies of trading costs for samples that include bonds with and without public transaction reporting. Further, because their dataset includes all trades, they can compare costs for institutional vs. retail-size transactions.

Both studies report reductions in one-way transaction costs of between 0.01 and 0.04 percent when additional bonds became eligible for public trade reporting. Each study further finds that the post-TRACE cost reduction is greatest for smaller trade sizes. Bessembinder, Maxwell and Venkataraman (2006) did not find this result, but their sample contained only institutional trades. In their cross-sectional analysis of data drawn from 2003, Edwards, Harris, and Piwowar (2007) report that one-way trading costs are lower by 0.03 to 0.06 percent for those bonds whose trades are disseminated to the public, after controlling for other factors affecting costs.

Bessembinder, Maxwell and Venkataraman (2006) also examine how transparency affects the competitive environment of the dealer market. They hypothesize that in an opaque market the largest dealers enjoy an informational advantage, but that this informational advantage is mitigated in a transparent market. Consistent with this reasoning, they report that in their sample the concentration ratio of trades completed by the largest 12 dealers falls from 56 percent pre-TRACE to 44 percent post-TRACE.

Goldstein and Hotchkiss (2007) study the dispersion in prices for customer purchases from dealers, for transactions completed in the same bond on the same day. They document greater dispersion in retail as compared to institutional trades, and that the degree of dispersion decreased once bond transactions were reported to the public through TRACE.

Collectively, these results are consistent with the reasoning that dealers extracted rents from customers in the opaque market, and more so from less-informed customers. In the absence of transaction reporting, customers found it difficult to know whether their trade price reflected market conditions. The introduction of TRACE reduced dealers' information advantage relative to customers, and also reduced cross-sectional variation in the degree to which customers are well-informed regarding bond values. With transaction reporting, customers are able to assess the competitiveness of their own trade price, by comparing it to recent and subsequent transactions in the same and similar issues.

A number of articles in the financial and trade press support the general conclusion of the academic studies that trading costs declined with transaction reporting, particularly for retail traders. A commentator from a fixed income research service stated that "before TRACE, it wouldn't be unheard of for a trader to use the fact that there was no way of verifying the information that he gave about where a bond was trading to his advantage" (as quoted in Bravo, 2003). In contrast, a fixed income trader at an investment company, referring to the post-TRACE environment, was quoted in Vames (2003) as saying, "You don't have to go to three or four different people to find out where something is trading.... [W]hen you have access to (TRACE) information, you have a better idea where things are before you make your first call." A bond trader (as quoted in Laughlin, 2005) stated: "Increased transparency has clearly helped the small investor and the smaller funds.... [M]any investors now think the real benefit of TRACE lies in knowing that they are not being raked over the coals." A "Lex" (2006) column in the *Financial Times* noted: "[B]ig dealer banks now make less money on each trade. Few observers will lose much sleep over that."

Overall, the statistical and anecdotal evidence indicates that the introduction of post-trade transparency in the corporate bond markets has significantly reduced the costs that investors pay to dealer firms for executing their trades in corporate bonds.

## **Transparency: Additional Effects**

Of course, trade execution costs do not comprise the only measure of market quality or liquidity. In this section, we discuss some additional changes in the corporate bond market post-TRACE. Due to a paucity of hard data, we rely mainly on reports in the trade press and on our interviews with market participants.

### *Profitability and Employment*

Bessembinder, Maxwell, and Venkataraman (2006) and Edwards, Harris, and Piwowar (2007) each calculate based on their respective empirical estimates that TRACE reduced the costs to investors of trade execution--or equivalently, corporate bond dealers' market-making revenue--by approximately \$1 billion per year. The trade press reports lower dealer profits and reductions in the number of personnel devoted to bond trading post-TRACE. An *International Herald Tribune* article concluded in late 2006 that "transparency has hastened the demise of one of Wall Street's oldest professions," and quoted a representative of an executive search firm: "One-fourth of all corporate bond traders, analysts, brokers and sellers have lost their jobs in the past two years" (Pittman and Salas, 2006b). An extended version of the same article quoted a bond dealer as saying: "The future of this business is bleak. Your opponent basically knows your cards ..." (Pittman and Salas, 2006a). The same article quotes the former owner of a bond-

dealing firm as stating: “Maybe it was excessive, maybe we earned more than we should have.... some of us (individual traders) would walk away with upwards of \$1 million (pre-TRACE)... what gives NASD the right to say its wrong to make \$1 million trading bonds?” This firm went out of business after the introduction of TRACE.

### *Willingness to Hold Inventory*

One argument against proposals to increase transparency in a dealer market is that dealers will become reluctant to enter trades as principals – that is, by themselves purchasing bonds from customers or selling to customers bonds owned by the dealer, and instead will only be willing to work orders on an “agency basis”— to search for potential counterparties (Gemmill, 1996). In interviews, numerous corporate bond market participants voiced similar concerns. We were told that, post-TRACE, bond dealers no longer hold large inventories of bonds for some of the most active issues; for less active bonds, they now serve only as brokers. As noted, individual corporate bond issues trade on average only two or three times per day, and for illiquid issues even less often. With trade reporting, it may be possible to ascertain when a dealer may have taken a large position into inventory, and the price paid. Knowledge of the dealer’s inventory may allow market participants to forecast the dealer’s upcoming trades undertaken to rebalance inventory, which may in turn cause price movements adverse to the dealer.

Similarly, a *Wall Street Journal* article quoted a group of “worried” bond dealers as saying (Bravo, 2003): “They would be less inclined to commit capital to illiquid securities if the details of those transactions were to be disclosed in real time. That is because dealers ....usually work quietly to manage their risk. If they feel that the entire market knows how many bonds they bought and at what price, they will be less likely to engage in those transactions.” These

concerns have been amplified by the recent growth in bond trading on the part of hedge funds (Karmin, 2007). Market participants tell us that hedge funds often seek to complete bond trades as large as \$25 million.

Market participants with whom we spoke, including both dealers and the traders at investment firms who are their customers, were nearly unanimous in the view that trading is more difficult after the introduction of TRACE. Whereas it may have previously been possible to complete a sizeable bond purchase with a single phone call to a dealer who held sufficient quantities of the bond in inventory, the post-TRACE environment may involve communications with multiple dealers, and delays as the dealers search for counterparties. A bond trader with a major insurance company told us that there is less liquidity, in that market makers carried less “product,” and it has become more difficult to locate bonds for purchase in the post-TRACE environment. A bond trader for a major investment company responded to the publication of Bessembinder, Maxwell, and Venkataraman (2006) by sending the authors an unsolicited e-mail stating: “I want to be able to execute a trade even if a bond dealer does not have a simultaneous counterparty lined up.... [T]oo much price transparency reduces dealers’ willingness to commit capital.... [T]he focus on the bid-ask spread is too narrow, and a case of being penny-wise and pound-foolish.”

We note, however, that data reported by the Securities Industry and Financial Markets Association and reported in Table 3 shows a slight upward trend in corporate bond trading activity, from \$17.9 billion dollars per day during 2001 to \$22.7 billion dollars per day during 2006. Apparently, the corporate bond market continues to find ways to complete trades, even if transacting is no longer as simple as it was pre-TRACE.

### *Substitution into Alternate Asset Classes*

Traders at bond-dealing firms indicated in interviews that a common reaction to the decline in revenues from dealing in corporate bonds has been to integrate the trading of corporate bonds, syndicated bank loans, and credit default swaps (which are derivative securities that make payments in the case of default on specified corporate bonds) into a single unit. More broadly, the change described to us involves shifts of financial and human capital away from the corporate bond markets into alternative asset classes, including syndicated bank loans and credit default swaps. Notably, both syndicated bank loans and credit default swaps are contracts rather than securities, thus falling outside the jurisdiction of the Securities and Exchange Commission, and thus are exempt from public reporting of trade prices. One trading firm manager told us that bank loan trading, in particular, has become the “alpha [excess return] generator du jour,” and that “as regulators nip away ... the participants move to other securities. Ten years from now something else will replace bank loans for the in-crowd.”

One way to circumvent TRACE, which applies to publicly-issued bonds, is for a firm to issue privately placed bonds (sometimes referred to as Rule 144a securities, for the section of the Securities Act of 1933 that provides exemption from registration requirements). However, some bonds initially issued as private are subsequently registered with the Securities and Exchange Commission, thereby becoming publicly-traded securities. A private bond issue designed to allow for later public registration will typically include “registration rights.” Privately issued bonds without registration rights are referred to as “144a for life” bonds. Table 4 reports on the percentage of all U.S. corporate bond issues that are “144a for life” in recent years. The data includes bonds issued by U.S. corporations with a minimum issuance size of \$100 million, but excludes financial and regulated industries. In 2001, before TRACE, “144a for life” bonds were

7.3 percent of dollar volume and 9.6 percent of issues. The percentage of dollar volume in “144a for life” bonds jumped to 27.8 percent in 2003, the first full year after TRACE initiation, and grew to 39.8 percent in 2004, before declining to 16.9 percent in 2006.

Recent years have seen substantial growth in the issuance and trading of packages of syndicated bank loans, which constitute a substitute for corporate bonds. Table 2, presented earlier, documents this shift. Leveraged loan issuance (packages of bank loans issued to non-investment grade borrowers) grew from \$215 billion in 2001 (the last full-year before TRACE) to \$581 billion by 2006. In contrast, investment-grade bond issuance decreased from \$588 billion in 2001 to \$430 billion by 2006, and non-investment grade bond issuance declined from \$80 billion in 2001 to \$39 billion in 2006. In terms of trading activity, summarized in Table 5, corporate bond volume grew only modestly from 2001 to 2006, while syndicated loan trading volume almost tripled from \$75.8 billion per day in 2001 to \$198.7 billion per day in 2006.

Also consistent with a shift towards alternative asset classes, the credit default swap market experienced phenomenal growth in recent years relative to bonds. Table 6 reports on outstanding notional principal in these credit default swaps, which grew from \$919 billion in 2001 to \$34.4 trillion in 2006. One dealer suggested to us that, prior to TRACE introduction, ten times as much capital was allocated to corporate bond trading than to credit default swaps, but that the ratio has now been reversed. Because credit default swaps make payments contingent on corporate bond defaults, credit default swaps can be combined with Treasury securities to replicate effectively the payments made by corporate bonds. Dealers may have, to some extent, shifted from trading in the now-transparent corporate bond markets to trading economically-equivalent securities in the still-opaque credit default swaps markets.

Of course, we do not ascribe all of these broad changes in debt market activity to the introduction of TRACE. Other factors are likely significant as well, including the growth in hedge fund trading, leveraged buyout activity that has taken securities private, and the effect of regulatory changes including the Sarbanes-Oxley Act. Further, the interpretation of these shifts towards issuing and trading non-public contracts that are not subject to TRACE reporting depends to some extent on who initiated the change in activity. To the extent that the shift to privately placed bonds and bank loans was initiated by corporate borrowers, and in response to TRACE, it suggests that the net costs of TRACE may exceed the benefits. This argument is based on the idea that corporate bonds should sell for higher initial prices, other things equal, if buyers anticipate more liquid secondary markets (for example, see the survey by Amihud, Mendelson, and Pedersen, 2005). Issuers should therefore internalize both the positive and negative consequences of TRACE. Alternately, the shift to private markets could simply reflect agency issues if issuers failed to fully anticipate the potential effect of illiquidity on issue prices and underwriters and lenders persuaded corporations to issue private securities that could be traded more profitably.

#### *Proprietary Trading and Research*

A number of industry participants told us that bond dealers have either reduced expenditures for research regarding bond valuation, or have stopped providing the research to customers, instead using it for proprietary trading. A trader for a major market-making firm noted that the easiest way to cut expenses in the wake of lower bid-ask spreads was to reduce the number of analysts on the payroll. Some bond dealers, including Citibank, no longer provide external research on the corporate bond market.

Prior to TRACE, dealers primarily made money by facilitating trading. After TRACE, the dealers substituted toward proprietary trading, which essentially makes them competitors with their clients. A trader for an insurance company told us that, prior to TRACE, bond dealers would sometimes share the benefits of their research by allowing the insurance company to acquire an undervalued bond that the dealer's research had discovered, but that these practices discontinued after TRACE introduction. It remains an open question whether reductions in research coverage post-TRACE have reduced the informational efficiency of the corporate bond markets.

#### *Expanded Trading Opportunities*

A number of market observers noted that the availability of transaction prices has made additional trading strategies feasible. In particular, investors using quantitative investment strategies or algorithmic trading (computer generated trades that rely on real-time data inputs) now have larger amounts of more timely data to analyze. Further, the NASD and Bloomberg have cooperated to produce investment-grade and high-yield bond price indices based only on reported transaction prices ("Market Buzz," 2005).

An electronic limit order market in corporate bonds was introduced by MarketAxess in early 2002. Corporate bond trading volume on MarketAxess during the first quarter of 2002, before the advent of TRACE, was \$7 billion. Volume grew to \$20 billion by the first quarter of 2003, and to \$56 billion by the first quarter of 2007 (according to <<http://phx.corporate-ir.net/phoenix.zhtml?c=176475&p=irol-volume>>). We believe that TRACE improved the viability of the electronic market. In the presence of information asymmetries, less-informed traders will often be dissuaded from participating in a limit order market, knowing that their

orders will tend to be “picked off” by better-informed traders if the price is too aggressive, but left to languish if not aggressive enough. TRACE likely increased traders’ willingness to submit electronic limit orders by allowing traders to choose limit prices with enhanced knowledge of market conditions.

## **Conclusion**

The introduction of transaction price reporting for corporate bond trades through the TRACE system in 2002 comprised a major shock to this previously opaque market. Investors have benefited from the increased transparency, through substantial reductions in the bid-ask spreads that they pay to bond dealers to complete trades. Conversely, bond dealers have experienced reductions in employment and compensation, and dealers’ trading activities have moved toward alternate securities, including syndicated bank loans and credit default swaps.

The primary complaint against TRACE, which is heard both from dealer firms and from their customers (the bond traders at investment houses and insurance companies), is that trading is more difficult as dealers are reluctant to carry inventory and no longer share the results of their research. In essence, the cost of trading corporate bonds decreased, but so did the quality and quantity of the services formerly provided by bond dealers. This set of consequences reminds us of the aftermath of airline deregulation. As Kahn (1988) notes, after deregulation airfares decreased on average, but so did quality of airline service. Still, Kahn argues that economic efficiency was greatly enhanced by the movement of prices towards marginal costs. We anticipate similar efficiency improvements from increased competition in the provision of liquidity for corporate bonds post-TRACE. Traders employed by insurance companies and

investment management firms bear costs associated with decreases in services provide by bond dealers, but these higher costs are offset by lower trade execution costs that benefit the investors who ultimately own the bonds transacted, and that more accurately reflect the marginal economic costs of completing transactions.

The debate regarding optimal transparency of the corporate bond markets continues. Corporate bonds trade less frequently and in larger sizes as compared to equities, which allows the possibility that the optimal degree of transparency for bond markets may differ from that of the highly transparent equity markets. The National Association of Securities Dealers has proposed expanding the transaction data disseminated to the public to also include information on whether the trade was dealer-to-dealer or dealer-to-customer, and if the latter, whether the dealer bought or sold bonds. Perhaps not surprisingly, bond dealers are opposed (Laughlin, 2006). The European Central Bank has for years considered implementing transaction reporting for corporate bonds traded in Europe, but the initiative remains under study and controversial (González-Páramo, 2007). The chief economist of the U.S. Securities and Exchange Commission has raised the question of whether pre-trade transparency should be introduced in the corporate bond markets (Spatt, 2006). The question of what degree of transparency in security markets is desirable will remain the subject of study and debate for the foreseeable future.

## References

- Amihud, Y., H. Mendelson, and L. Pedersen, 2005, Liquidity and Asset Prices, *Foundations and Trends in Finance*, 1, 269-364.
- Bessembinder, H., W. Maxwell and K. Venkataraman, 2006, Market Transparency, Liquidity Externalities, and Institutional Trading Costs in Corporate Bonds, *Journal of Financial Economics*, 82, 251-288.
- Bessembinder, H., K. Kahle, W. Maxwell, and D. Xu, 2007, Measuring Abnormal Bond Returns, *working paper*, University of Arizona.
- Bloomfield, R., and O'Hara, M., 1999, Market transparency: Who wins and who loses? *Review of Financial Studies* 12, 5-35.
- Boehmer, E., Saar, G., and Yu, L., 2005, Lifting the veil: An analysis of pre-trade transparency at the NYSE, *Journal of Finance*, 60, 783-815
- Bravo, Richard A. "Corporate-Bond Pricing System May be Too Open, Critics Say", *Wall Street Journal*, April 15, 2003, page C13.
- Chakravarty, S., and A. Sarkar, 2003, Trading costs in three U.S. bond markets, *Journal of Fixed Income*, 13, 39-48.
- Easley, D., and M. O'Hara, 1987, Price, Trade Size and Information in Securities Markets, *Journal of Financial Economics*, 19, 69-90.
- Edwards, A., Harris, L., and Piwowar, M., 2006, Corporate bond market transparency and transactions costs, *Journal of Finance*, forthcoming.
- Fleming, M., 2003, Measuring Treasury Market Liquidity, *Economic Policy Review*, v9n3, 83-108.
- Gemmill, G., 1996, Transparency and liquidity: A study of block trades on the London Stock Exchange under different publication rules, *Journal of Finance* 51, 1765-1790.
- Hong, G. and Warga, A., 2000, An empirical study of bond market transactions, *Financial Analysts Journal* v56n2, 32-46.
- Kahn, A.E., 1988, Surprises of Airline Deregulation, *The American Economic Review*, 78, 316-322.
- Goldstein, M., Hotchkiss, E., and Sirri, E., 2007, Transparency and liquidity: A controlled experiment on corporate bonds, *Review of Financial Studies*.

- Goldstein, M., and E. Hotchkiss, 2007, “Dealer behavior and the trading of newly issued corporate bonds, working paper, Boston College.
- González-Páramo, José Manuel. 2007. “MiFID - non-equities market transparency: the ECB’s perspective,” September 11. At <http://www.ecb.int/press/key/date/2007/html/sp070911.en.html>.
- Green, R., and B. Biais, 2007, The Microstructure of the Bond Market in the 20th Century, working paper, Carnegie Mellon University.
- Karmin, Craig. 2007. “Credit Crunch: Market Ride: Hedge Funds Do About 30% of Bond Trading, Study Says” *Wall Street Journal*, August 30, p. C3.
- Kyle, A., 1985, “Continuous auctions and insider trading”, *Econometrica*, 53, 1315-1336.
- Laughlin, Kate. 2005. “Three Years On, The TRACE Impact for Bond Traders, Technology Can Now Trump Analysis”, *Investment Dealers Digest*, July 4.
- Laughlin, Kate. 2006. “Regulation: TRACE woes could continue,” *High Yield Report*, June 26.
- “LEX Column: Sweet Clarity.” 2006. *Financial Times*, October 2, p. 20.
- Madhavan, A., 1995, Consolidation, fragmentation, and the disclosure of trading information, *Review of Financial Studies*, 8, 579-603.
- Madhavan, A., Porter, D., and Weaver, D., 2005, Should securities markets be transparent? *Journal of Financial Markets*, 8, 265-287.
- “Market Buzz: NASD, Bloomberg Unveil Indices Based Only on Actual Transaction Prices.” 2005. *High Yield Report*, October 24
- Naik, N., Nueberger, A., and Viswanathan, S., 1999, Disclosure regulation in markets with negotiated trades, *Review of Financial Studies* 12, 873-900.
- Pagano, M., and Roell, A., 1996, Transparency and liquidity: A comparison of auction and dealer markets with informed trading.” *Journal of Finance* 51, 579-611.
- Pittman, Mark, and Caroline Salas. 2006a. “Bond Traders Lose \$1 Billion Income on Transparency”, *Bloomberg News Wire*, October 24. Available at [http://www.bondsonline.com/News\\_Releases/news10240601.php](http://www.bondsonline.com/News_Releases/news10240601.php).
- Pittman, Mark, and Caroline Salas, 2006b. “Trace-ing a path to unemployment: Bond market regulation hits traders in the profit margin”, *International Herald Tribune*, October 25. At <http://www.iht.com/articles/2006/10/24/bloomberg/bxtrade.php>.

Schultz, P., 2001, Corporate bond trading costs: A peek behind the curtain, *Journal of Finance* 56, 677-698.

Spatt, Chester S. 2006. "Speech by SEC Staff: Discussion: An Overview of Bond Market Transparency." January 6. At <<http://www.sec.gov/news/speech/spch010606css.htm>>.

Vames, Stephen. 2003. "NASD Expands Bond-Price Reports – Data on Corporate Issues Becomes More Transparent; Market Effects to be Studied", *Wall Street Journal*, March 4, p. C15.

Ann: Please turn this table into two columns, not two rows.

Table 1  
Outstanding U.S. Bond Market Debt in 2006  
(\$ Billions)

Municipal	Treasury <sup>2</sup>	Mortgage Related <sup>3</sup>	Corporate Debt <sup>1</sup>	Federal Agency Securities	Money Markets <sup>4</sup>	Asset-Backed <sup>1</sup>	Total
2,404.1	4,322.9	6,492.4	5,374.2	2,660.1	4,007.5	2,130.4	27,391.6

Source: Securities Industry and Financial Markets Association (www.sifma.org)

<sup>1</sup> The Securities Industry and Financial Markets Association estimates.

<sup>2</sup> Interest bearing marketable public debt.

<sup>3</sup> Includes GNMA, FNMA, and FHLMC mortgage-backed securities and CMOs and private-label MBS/CMOs.

<sup>4</sup> Includes commercial paper, banker's acceptances, and large time deposits. Beginning in 2006, bankers' acceptance is excluded.

<sup>5</sup> Denotes break in series due to the inclusion of additional data on private-label MBS/CMOs.

Table 2  
Issuance Volume by Security Class

	Equity Markets		Corporate Debt		
	Initial Public Offerings	Seasoned Equity Offerings	High Yield Bonds	Investment Grade Bonds	Leveraged Loans
1996	59.5	75.8	72.6	149.0	-
1997	73.8	121.4	131.7	149.7	194.0
1998	53.0	65.1	137.3	289.5	273.0
1999	76.7	96.2	91.3	313.5	308.0
2000	100.7	129.3	44.4	325.6	290.1
2001	43.1	83.1	79.6	587.8	215.8
2002	40.8	71.8	58.5	425.3	264.5
2003	47.3	67.2	130.3	443.9	306.8
2004	72.5	87.2	134.4	337.8	464.3
2005	56.2	99.8	93.5	336.0	487.9
2006	55.0	97.2	38.8	430.7	581.1

Source: Lehman Brothers

Table 3  
Average Daily Trading Volume in the U.S. Bond Markets  
(\$ Billions)

	Municipal	Treasury <sup>1</sup>	Agency Mortgage Backed Securities <sup>2</sup>	Corporate Debt	Federal Agency Securities <sup>3</sup>	Total
1996	-	203.7	38.1	-	31.1	272.9
1997	-	212.1	47.1	-	40.2	299.4
1998	7.7	226.6	70.9	-	47.6	352.9
1999	8.3	186.5	67.1	-	54.5	316.5
2000	8.8	206.5	69.5	-	72.8	357.6
2001	8.8	297.9	112.0	17.9	90.2	508.9
2002	10.7	366.4	154.5	18.9	81.8	629.9
2003	12.6	433.5	206.0	20.7	81.7	749.5
2004	14.8	499.0	207.4	21.2	78.8	814.8
2005	16.9	554.5	251.8	21.0	78.8	916.0
2006	22.5	524.7	254.6	22.7	74.4	889.8

Source: Securities Industry and Financial Markets Association

<sup>1</sup>Primary dealer activity.

<sup>2</sup>Includes GNMA, FNMA, and FHLMC mortgage-backed securities

<sup>3</sup>Excludes all issues with maturities of one year or less and convertible securities.

Table 4  
Percentage of all corporate bonds issued without registration rights (144a  
for life)

Year	Based on Dollar Volume	Based on Number of Issues
2000	9.0%	15.6%
2001	7.3%	9.6%
2002	11.9%	13.6%
2003	27.8%	35.0%
2004	39.8%	37.3%
2005	31.0%	36.8%
2006	16.9%	23.7%

Note: The table provides the percentage of the issuance volume and number of deals of corporate bonds that have no registration rights. We include debt issued by U.S. corporation with a minimum issuance size of \$100 million, excluding all financial and regulated industries Source: SDC.

Table 5

Trading volume of the corporate bonds versus syndicated loan markets

Year	Corporate Bonds		Syndicated Loans	
	Daily Volume [billions]	Change from Prior Year	Daily Trading Volume [billions]	Change from Prior Year
2001	17.90	n.a.	75.82	-2.8%
2002	18.90	5.6%	64.90	-14.4%
2003	20.70	9.5%	87.42	34.7%
2004	21.20	2.4%	113.49	29.8%
2005	21.00	-0.9%	135.52	19.4%
2006	22.70	8.1%	198.67	46.6%

Sources: Reuters (secondary loan trading volume) and SIFMA (corporate debt trading volume).

Table 6

Credit Default Swaps

(notional value in billions of dollars)

Year	Credit Default Swaps Outstanding	Change from Prior Year
2001	918.87	n.a.
2002	2,191.57	138.5%
2003	3,779.40	72.5%
2004	8,422.26	122.8%
2005	17,096.14	103.0%
2006	34,422.80	101.3%

Source: ISDA.