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Informed trading around acquisitions: Evidence from corporate bonds ☆

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Abstract

This paper examines the prevalence of informed trading in corporate bonds prior to takeover announcements. We find significant pre-announcement trading activities and price movements in target bonds, in directions consistent with the nature of pending information. Improved transparency in the bond markets achieved by the implementation of the Trade Reporting and Compliance Engine (TRACE) system reduces the incidence of informed trading. Further, there is some weak evidence that dealers affiliated with merger and acquisition advisors sell in anticipation of negative news, pointing to a possible channel of information leakage. Such negative news seems to be incorporated into bond prices no slower than into the target stocks.
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1. Introduction

Information-based trading has received much attention from academia, practitioners, and regulators. Motivated by unusual spikes in stock trading prior to corporate takeovers, in 2008 the U.S. Securities and Exchange Commission (SEC) established the Hedge Fund Working Group for the purpose of addressing securities law violations and insider trading by hedge funds.[2] While such attention to insider trading in the stock markets reflects the regulators' continuing scrutiny of potential abuse of material nonpublic information, it also raises questions and accompanying concerns about the relatively scant surveillance of the workings of the corporate bond market, given its size and importance in corporate financing.[3] In particular, does informed trading occur in the corporate bond market? What is the potential influence of the improvement in market transparency brought by recent implementation of the Trade Reporting and Compliance Engine (TRACE) on informed trading? Further, how do informed traders time and distribute their trading activities across the issuer's stock and bonds given the nature of new information? And finally, is it possible to explore the potential channels for information leakage prior to its public release?

In this paper, we address these questions by examining trading activities in the corporate bond market prior to merger and acquisition (M&A) announcements. Corporate bonds provide a more effective tool than traditional stock prices for examining the potential leakage of information prior to its public releases. As target shareholders generally gain in a merger, a run-up in stock prices prior to the announcement of the takeover can either be attributed to the leakage of information, or market anticipation. It is difficult to distinguish between these two possibilities by studying prices and trading volume of target equity. Target bondholders, in contrast, do not always benefit in a takeover. In fact, target bondholders only benefit when their bonds carry greater risk than those of the acquiring company, and will lose out otherwise. Therefore, "directional" trading strategies, i.e., selling target bonds that stand to lose or buying target bonds that stand to gain prior to the public announcement, requires information about both target and acquirer characteristics, and consequently is less likely to be due to market anticipation of a takeover and more likely to be informed.

We use all completed M&A deals from 1994 to 2006 where both the target and acquirer have bonds that are included on the Mergent Fixed Income Securities Database (FISD). The FISD corporate bond data have been studied before in the literature [e.g., Hong and Warga (2000) and Cai, Helwege, and Warga (2007) among others]. We find that relative to a control group, target bonds are significantly more likely to be traded in the three-month period prior to an announcement. Accompanying this higher volume, abnormal target bond returns in the three-month pre-announcement period are significantly associated with the relative risk of target bonds to acquirer bonds. In other words, pre-announcement abnormal bond returns are positive when the target bond stands to gain and negative when the target bond stands to lose. This is in contrast to target stocks, whose pre-announcement stock returns are always positive.

The fact that the pre-announcement bond returns are significantly related to acquirer characteristics suggests the role of information rather than anticipation of the acquisition.

[2]See regulatory keynote address by Linda Thomsen, director of the SEC enforcement division, at the second annual capital markets summit at the U.S. Chamber of Commerce on March 26, 2008.

[3]As of June 2009, total U.S. corporate debt outstanding was $6.8 trillion, which is about 47% of the stock market capitalization. See http://www.sifma.org/uploadedFiles/Research/Statistics/StatisticsFiles/CM-US-Bond-Market-Outstanding-SIFMA.xls, and http://www.aametrics.com/pdfs/world_stock_and_bond_markets_nov2009.pdf.

Nevertheless, we conduct a Factiva search for takeover related news articles for all the target firms in the three months prior to the actual announcement. Approximately 40% of our sample bonds belonged to firms that had pre-announcement merger rumors. However, excluding these bonds subject to rumors does not impact our results both in magnitude or significance of the estimated coefficient. In addition, one may argue that it may be possible to anticipate potential gains/losses in target bonds without information on the acquirer. For example, low-risk target bonds are more likely to lose in an acquisition as the likelihood that the potential acquirer bonds are riskier is high. If our results are due to such anticipation on the target, then low-risk target bonds should experience lower returns, irrespective of the risk of the acquirer bonds. However, we find that last bond returns for low-risk target bonds that are acquired by relatively risky acquirers are significantly lower than the returns of low-risk target bonds acquired by relatively less risky acquirers. Similar results are found for high risk bonds—last bond returns are higher for the group that was acquired by relatively less risky acquirers. In summary, the results are unlikely to be due to merger rumors, market speculation or anticipation. Lastly, this result of pre-announcement directional trading — selling the bonds that stand to lose and buying those that stand to gain — is robust to different proxies for capturing gain/loss for target bonds, and to different pre-announcement windows.

Our sample period of 1994 to 2006 spans the initiation of the TRACE system in 2002. Centralized reporting and immediate dissemination on bond transactions implemented by the TRACE system facilitate effective monitoring of the market and improves the transparency of the market. This allows us to explore the potential effect of improved transparency on the observed incidence of informed trading in corporate bonds. We find little evidence of informed trading for target bonds in the post-TRACE period. Bessembinder and Maxwell (2008) document that the post-TRACE period saw significant increase in trading in the CDS markets, so we check whether this reduction in insider trading post-TRACE is due to its migration to the credit default swap (CDS) market. However, we find that most of our target firms are small and do not have traded CDS contracts. Our findings suggest an important and significant role of transparency and disclosure in limiting informed trading.

Further, as the National Association of Insurance Commissioners (NAIC) bond transaction data used in this study provides information identifying the broker/dealer, as well as the direction of their transactions, we also examine if affiliation of the bond dealers with the investment banks involved in the M&A transactions is a potential channel of information flow. Although we have the advantage of observing the trades of the affiliated dealers, we only observe a subset of all their transactions (i.e., those with insurance companies). Based on this, we find some weak evidence that (1) bond trades where affiliated dealers trade are associated with higher bond returns, and (2) affiliated bond dealers tend to sell more of the bonds that stand to lose relative to non-affiliated dealers. These results are suggestive of conflicts of interest and information flows within financial institutions.

If such informed trading does occur in the corporate bond market, how is it related to the trading activities in the issuer's equity? We find that bond trades are informative and are followed by significant cumulative abnormal returns in the equity markets. This evidence of significant abnormal equity returns around bond trades is seen for all bonds except those target bonds that do not stand to gain or lose.

A further appeal of the bond market is the low regulatory oversight. This is partly due to the ambiguity in Rule 10b-5, of the Securities Exchange Act of 1934. Rule 10b-5 prohibits “any” fraudulent or deceptive scheme “in connection with the purchase and sale of any security by any individual with fiduciary duty to a firm's shareholders.” However, the legal rule of liability with

respect to corporate bonds has never been as broad as the literal language of Rule 10b-5, which is partially due to the ambiguous nature of "fiduciary" duty owed to bondholders. On the other hand, Rule 14e-3 appears to clearly bar insider trading in corporate bonds during the takeover process. The lack of reporting on bond trades and the resulting market opacity also makes it difficult to detect any violation of the insider trading law in the corporate bond market. Although this lack of regulatory oversight and the relative opacity of the bond market may render it a preferred venue for informed trading, the low overall liquidity of the bond market might limit these opportunities.

The rest of the paper is organized as follows. Section 1 discusses the related literature while Section 2 presents information on the sample data and methodology. We examine the information content of pre-announcement abnormal bond returns and conduct various robustness tests in Section 3. In Section 4 we discuss the impact of market transparency on informed trading. Section 5 explores the potential channels of information leakage, and Section 6 focuses on the flow of information across stock and bond markets. Section 7 concludes.

2. Related literature

Our study relates to several strands of literature. First, it is linked to the literature on insider trading and its influences on market prices. Several studies find evidence of abnormal volume and price increases during periods of known insider trading (Cornell and Sirri, 1992; Meulbroek, 1992; Meulbroek and Hart, 1997; Chakravarty and McConnell, 1997, 1999; Fishe and Robe, 2004). However, if it is not known when insider trading occurs, it is difficult to conclude its prevalence from a study of stock price and volume in the period prior to announcement. Indeed, by examining trading in target firms prior to M&A announcements, other studies (Jarrell and Poulsen, 1989; King and Padalko, 2005; Gao and Oler, 2012) conclude that the observed abnormal trading activities and the resulting price run-ups are consistent with market anticipation of a takeover announcement, and hence cannot be used as evidence of insider trading.

We differentiate between insider trading and market anticipation by examining pre-announcement activity in the corporate bond market. Unlike target equity, target bonds do not always gain in an acquisition. Early theoretical work suggests that target bondholders could lose if the target's creditworthiness exceeds that of the acquirer. On the other hand, target bondholders could gain if the coinsurance effect of combining the two imperfectly correlated cash flows result in a reduction in default risk (Levy and Sarnat, 1970; Lewellen, 1971; Higgins and Schall, 1975; Galai and Masulis, 1976; Shastri, 1990). Though earlier empirical studies failed to find significant abnormal bond returns prior to M&A announcements (Kim and McConnell, 1977; Asquith and Kim, 1982; Eger, 1983; Dennis and McConnell, 1986; Maquieira, Megginson, and Nail, 1998),[4] Billett, King, and Mauer (2004) use relatively new data and find significant support for the theoretical predictions. In particular, they find that target bonds rated below the acquirer's earn significant positive returns while those rated no lower than the acquirer's experience significant negative returns. As returns to target bond holders depend on acquirer characteristics, any evidence of pre-announcement trading in a direction consistent with acquirer characteristics suggests a possible leakage of information, rather than market anticipation.

Second, this paper fits into the literature on the conflicts of interest within financial intermediaries. Acharya and Johnson (2007, 2010) and Ivashina and Sun (2011) document

[4]See Kim and McConnell (1977), Asquith and Kim (1982), Eger (1983), Dennis and McConnell (1986), and Maquieira, Megginson, and Nail (1998).

evidence that banks potentially use information from lending relationships to trade CDSs and equity. Ritter and Zhang (2007) find that lead underwriters allocate hot IPOs to affiliated funds. Agrawal and Chen (2008) document that analyst recommendations are positively related to conflicts of interest with investment banking and brokerage business [see also Ellis, Michaely, and O'Hara (2011) and Ritter and Zhang (2007)]. Our paper is also related to and complements Bodnaruk, Massa, and Simonov (2009), who find that equity investment desks affiliated with acquirer investment banks increase their investment in target equities prior to takeover announcements. Although they conduct robustness tests to control for potential anticipation of the takeover, our use of corporate bonds allows us to better rule out this possibility. Moreover, the timing of bond trades and dealer identification information contained in the NAIC database allows us to examine trading activities close to the announcement of the takeover, rather than be restricted to examining equity positions at the end of calendar quarters. Further, changes in bond regulation over this time period allow us to shed some light on potential approaches to control insider trading. Along with Bodnaruk, Massa, and Simonov (2009), our findings of some abnormal trading behavior by dealers who are affiliated with M&A advisors provide insights into the potential channels of information leakage in these corporate events, and the resulting conflicts of interest within financial intermediaries.

Third, our study is also related to several recent papers that examine the influence of market transparency brought by the implementation of the TRACE system.[5] TRACE-induced transparency has been shown to reduce transaction costs in bonds (Edwards, Harris, and Piwowar, 2007), lower spreads for large trades in a sample of BBB bonds (Goldstein, Hotchkiss, and Sirri, 2007), cut transaction costs by 50% for TRACE-eligible bonds and by 20% for non-eligible ones (Bessembinder, Maxwell, and Venkataraman, 2006), and decrease volatility and reaction time to news (Ronen and Zhou, 2013). However, implementation of TRACE could also shift trading from bond markets to other venues like CDSs (Bessembinder and Maxwell, 2008).

Finally, the question of where does information-based trading occur first has been receiving much attention in the literature. Datta and Iskandar-Datta (1996) find significant bond price response to *The Wall Street Journal's* Insider Trading Spotlight publication of insiders' stock trading. By studying the stock price reaction prior to and around potentially informed bond trades, our paper sheds light on the importance of bond markets for informed traders.

3. Data, methodology, and summary statistics

3.1. Sample

Our sample consists of all completed M&As from 1994 through 2006.[6] Of the 3,406 deals for which we were able to retrieve deal information from SDC and firm characteristics from Compustat, 642 involve a target and an acquirer that have bond characteristic information from the FISD database. These 642 target firms had a total of 2,344 bonds outstanding during the M&A period. We use several data screens and, in particular exclude bonds with change in

[5]The TRACE system began in July 1, 2002 and requires its members to report corporate bond market transactions within 75 minutes (now 15 minutes). Dissemination of trade information was gradually phased in, and since February 7, 2005, all corporate bonds are subject to immediate dissemination.

[6]The sample included transactions that involved full acquisitions or acquisition of majority interest, and where both the target and acquirer were public firms. This resulted in 4,168 deals, which was further reduced to 3,406 after ensuring that both target and acquirer were covered in CRSP and Compustat.

control provisions.[7] Since credit rating changes tend to be accompanied by abnormal volume and price changes, we excluded bonds that experienced any rating changes in the three-month pre-announcement period, resulting in a sample of 1,924 bonds by 469 firms.

We obtained trade information for this sample of bonds from the FISD's NAIC bond transactions file. This data file includes all purchases and sales of public fixed income securities by insurance companies, who are required to report all their bond trades to NAIC. However, as it covers only bond transactions by insurance companies, it provides a far from complete record of trading in this OTC dealer market. This raises the concern of whether insurance companies are representative participants in the U.S. corporate bond market. Campbell and Taksler (2003) document that insurance companies hold about a third of all public corporate bond issues and Hong and Warga (2000) report that insurance companies account for a quarter of all high-yield bond transactions. This suggests that at the least they are an important participant in the bond market. For further assurance on the validity of the FISD NAIC bond data, we examine the period from February 7, 2005 to December 31, 2009 where both data on FISD and TRACE are available.[8] We find that although the average coverage of FISD is only 8.09%, the mean price difference between the two is 0.003%. This coupled with the fact that there are no good alternative data on bond transactions prior to the implementation of TRACE, has made the NAIC dataset somewhat of a standard in bond studies. These data have also been analyzed in a number of papers such as Campbell and Taksler (2003), Krishnan, Ritchken, and Thomson (2006), Bessembinder, Maxwell, and Venkataraman (2006), and Cai, Helwege, and Warga (2007). We applied the reversal filter from Edwards, Harris, and Piwowar (2007) in order to exclude trades with suspicious data pricing errors. And finally, equity data for the target firms were retrieved from CRSP.

3.2. Trading frequency and volume

As discussed above, several studies find significant increases in equity volume during episodes of insider trading. The possible leakage of information in the corporate bond market prior to its public announcement should also be marked by abnormally high trading activities. We begin by examining the propensity of target bonds to be traded in the three-month pre-announcement period. We first calculate the total number of trades and turnover for each bond within this period.[9] We then benchmark these two measures to those of a control group of bonds, which consists of all other bonds (not subject to any takeover) that had a similar credit rating and time to maturity as the target bond over the same period.[10] For meaningful comparisons, we excluded bonds whose control group consists of less than 5 bonds, ending up with a sample of 1,611 bonds by 442 target firms. On average, the control-adjusted number of trades and turnovers are 1.357 trades and 1.2% respectively, and are both significant (Table 1).

[7]We remove 13 bonds due to missing value of coupons, 66 bonds due to missing day counts, 79 bonds with floating coupon rates, 21 bonds with non-semi-annual coupon payments, and 67 bonds with missing information on first coupon date. Bonds that are in default and bonds that are callable following the merger have also been removed. Finally, we exclude bonds that have a change in control provisions and a bond price that is below par. As most of change in control provisions specify that bonds are putable at par, these provisions are not meaningful if bonds are trading above par.

[8]The initial public dissemination through TRACE started on July 1, 2002 for a small number of selected bonds. The dissemination expanded over time and on February 7, 2005 it began to cover OTC bonds of all but Rule 144A corporate bonds. Consequently, we examine the period after February 7, 2005.

[9]Turnover is calculated by dividing the aggregate three month trading volume by the bond's issue size.

[10]We consider two bonds with maturities within one year of each other to have similar time to maturity. Further, all bonds in the control group should have no credit rating changes during this three-month period.

Table1
Trading in target bonds within three months prior to merger announcements.

This table presents summary information on the trading activities in target bonds in the three months before the announcement of mergers, both in terms of *Number of Trades* and *Turnover*. *Turnover* is calculated by dividing the total dollar trading volume in bonds by their issue size. We examine the raw value of trading frequency and turnover, as well as their adjusted value by subtracting the average of a control sample. For each of the target bonds, the control group consists of all other bonds, not subject to any takeover, that had a similar credit rating and time to maturity, and also did not experience any credit rating changes over the same period. *** Significant at the 1% level.

	Number of Trades		*Turnover*	
	Raw values	Control adjusted	Raw values	Control adjusted
		Panel A: bond level		
Mean	1.866	1.357	1.939%	1.203%
t-stat	15.00***	11.20***	15.04***	9.51***
# of Bonds	1,611	1,611	1,611	1,611
		Panel B: firm level		
Mean	1.430	0.908	1.507%	0.867%
t-stat	8.42***	5.56***	10.54***	6.32***
# of Firms	442	442	442	442

To examine if this higher trade volume observed at the bond level is also seen at the firm level, we calculate the weighted average trading frequency and turnover across all bonds by a single firm, with the weights being the bond issue size. Consistent with the bond level results, there exist significant evidence of high trading frequency and volume at the firm level prior to the public release of corporate takeovers (Panel B). In summary, target bonds have a significantly higher frequency and volume of trading in the three months prior to announcement. It is worth highlighting that this higher frequency and volume of trade for target firms does not imply the presence of informed trading. A similar pattern of higher trading volume is expected under market anticipation as well. The tests that potentially separate the two hypotheses are based on bond returns and are discussed next.

3.3. Abnormal bond returns

To examine the price movements within the three-month preannouncement period, we require that a bond has to be traded at least two days within this time window. A total of 329 bonds issued by 123 firms meet this criterion and comprise the sample for the remainder of our study. For each of our sample bonds, we also calculate the abnormal bond returns in a way similar to that of Cai, Helwege, and Warga (2007) and Bessembinder, Kahle, Maxwell, and Xu (2009). Since bond trades of different sizes tend to occur at very different prices, we calculate daily volume weighted average price to get a better estimate of the value of the bond at date *t*. Bessembinder, Kahle, Maxwell, and Xu (2009) also favor weighting individual bond trades by size, rather than using the last trade of the day.[11] We then add the accrued interest to get the full

[11] Bessembinder, Kahle, Maxwell, and Xu (2009) also suggest excluding non-institutional trades (defined as trades under $100,000) in calculating the weighted average daily prices. As our sample consists only of bond trades by insurance companies, we do not eliminate trades less than $100,000 from our sample.

Table 2
Descriptive information on sample target bonds and their issuing firms.

This table presents descriptive information for the 329 target bonds which have traded at least two trading days within the three-month period prior to the announcement of the acquisition and their issuing firms. The book value of *Total Asset*, *Market Value of Equity*, and *Financial Leverage* are retrieved from Compustat. Bond characteristic information, including the *Offering Amount* (face value), Maturity Date, and *Credit Ratings* are from the Mergent FISD database. We assign a numeric value to each credit rating from Standard and Poor's, with 1, 2, …, 11 denoting AAA, AA, …, NR, respectively. The rating difference between a target bond and the acquirer's bonds, *CreditDiff*, is calculated by subtracting the average rating of acquirer bonds (weighted by issue size) from the rating of the target bond. Panel A provides summary information of the characteristics of the sample target bonds and their issuing firms. Panel B includes a detailed distribution of target bonds across credit rating categories.

Panel A: Summary information on target bonds and their issuing firms

	Mean	Median	Std. Dev.	*N*
Issuing firm characteristics				
Total Asset ($ Million)	25,054	4,860	54,888	123
Market Value of Equity ($ Million)	8,683	4,000	13,903	123
Financial Leverage (*Total Debt*/*Total Assets*)	0.316	0.301	0.221	123
Number of traded bonds per firm	2.675	2.000	3.001	123
Number of total bonds per firm	7.642	5.000	8.408	123
Target bond characteristics				
Offering Amount ($ Million)	370	250	363	329
Maturity (number of years till maturity)	9.192	6.808	9.060	329
Credit Rating (AAA=1, AA=2, …D=10, NR=11)	3.997	4	1.437	329
CreditDiff	0.244	0	1.753	329

Panel B: The distribution of target bonds across credit ratings

Rating	1	2	3	4	5	6	7	8	9	10	11
# of Bonds	0	13	123	115	45	24	2	0	0	0	7
% Bonds	0	3.95	37.39	34.95	13.68	7.29	0.61	0	0	0	2.13

bond price for date *t*. The actual bond return is calculated as the percentage change in the full price across two trading days.

Table 2 provides descriptive information on our sample bonds and their issuing firms. The average market value of the equity of our sample target firms is 8.7 billion, with an average financial leverage of 0.32. While these target firms on average have about 8 bonds outstanding, less than 3 of them are traded during the three-month pre-announcement period. Further, these 329 sample bonds on average have about 9 years till maturity and are rated between BBB and A by Standard & Poor's during the sample period, with almost 72% of our sample target bonds rated either BBB or A (Panel B).[12]

As discussed in Section 1, target bonds could gain or lose depending on their credit rating relative to that of the acquirer bonds. To capture the difference in the credit rating, we first estimate the acquirer's average credit rating across all its bonds, which is the weighted average rating with the weights being issue size.[13] The difference between an individual target bond rating and the acquirer's average bond rating, referred to as *CreditDiff*, captures the potential gain for the target. The larger this *CreditDiff*, the lower the target bond rating relative to the average acquirer rating, and the more the target bond is expected to gain. This is so because lower-rated bonds have higher numerical values. In particular, if the *CreditDiff* is negative it signifies that the target bonds are likely to lose from the acquisition. As seen in Table 2, target bonds are rated slightly lower than the acquirer bonds, with an average of 0.24 for the *CreditDiff* variable.

We then estimate abnormal bond returns by subtracting the market returns, proxied by the returns in the Lehman Brothers Corporate Indices for bonds with similar credit ratings and maturity from raw returns.[14] Since trading on inside information is more likely to occur in the days immediately prior to the announcement of the merger, we examine the abnormal bond returns over the last two days when trading occurred prior to the announcement, which we refer to as the last abnormal return. We also examine the cumulative abnormal returns (*CARs*) over the three-month period by accumulating abnormal returns over all bond transactions in this period. As illustrated in Fig. 1, the last abnormal return and the three-month *CAR* can be represented as AR_1 and (AR_1+AR_2), respectively.

The abnormal returns around takeover announcements are also calculated using two trading days, where the first trading day is the last day the bond is traded prior to announcement, and the second trading day is the first day the bond is traded after the announcement. To calculate this cross-announcement return, we require the second day to be within three months of the acquisition announcement, which is available for only 271 out of the total 329 sample bonds. In Fig. 1, the cross-announcement abnormal return is represented by AR_3. Consistent with Billett, King, and Mauer (2004), we find that target bonds on average earn significant abnormal returns of 0.82% across announcements.

To examine whether pre-announcement returns in target bonds are associated with their tendency to gain/loss following a takeover announcement, we classify our sample bonds into groups based on their *CreditDiff* measure, and calculate the average last return for each group. As shown in Fig. 2, an increase in the *CreditDiff*, capturing the potential of the target bond to gain, is associated with an increase in the last bond return prior to the merger announcement.

[12]We assign a numeric value to each credit rating from Standard and Poor's, with 1, 2, …, 11 denoting AAA, AA, …, NR, respectively.

[13]As some of a firm's bonds are not traded in the same period, we use each bond's issue size (instead of its market value as in Billett, King, and Mauer (2004)) as the weight to calculate the average credit rating for the acquirer.

[14]We classified a bond into intermediate (long-term) if its time to maturity is less (no less) than 10 years following Lehman Brothers rules in constructing their indices for bonds with different maturities.

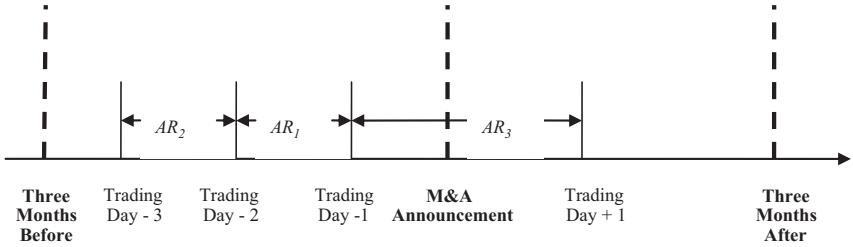

Fig. 1. Timing of bond trades around M&A announcement.

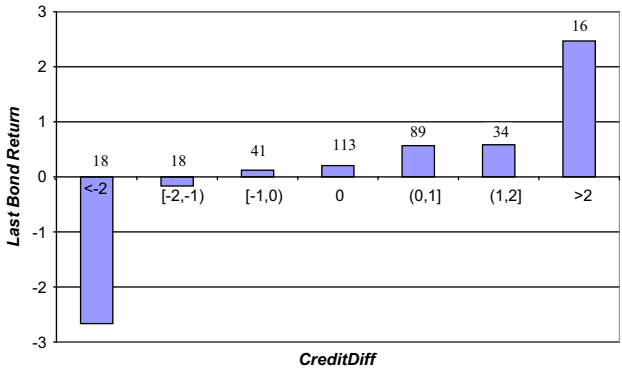

Fig. 2. CreditDiff and Last Bond Return. *Last Bond Return* is the target bond abnormal return for the last trading day prior to the announcement of the takeover. The abnormal return is the difference between the bond return and the return to credit and maturity matched Lehman Bond Index. *CreditDiff* is the difference between the credit rating of the target bond and the weighted average rating of acquirer bonds. We group target bonds into seven categories based on their *CreditDiff* measure: <-2, $[-2,-1)$, $[-1,0)$, 0, (0,1], (1,2], >2. The number on top of the bar refers to the number of bonds in that group that were included to calculate the average *Last Bond Return*.

4. Informed trading: target bond prices and acquirer characteristics

4.1. Abnormal pre-announcement bond returns

In this section, we do multivariate analysis to explore the informational content of pre-announcement abnormal bond returns. If informed trading exists in the bond market prior to the announcement, then *CreditDiff* should be positively related to pre-announcement abnormal returns. Although this is seen in Fig. 2, in this section we control for other bond and firm characteristics that might be related to the pre-announcement returns.

Our tests control for bond credit ratings and maturities as the abnormal bond returns are estimated by subtracting the return in the Lehman Index matched on credit rating and maturity over the same period. In addition, we control for potential bond liquidity effects by including a bond's *Age* and *Issue Size*. Finally, we control for firm-specific characteristics, such as *Issuer Size* (market value of the issuer), *Leverage* (the ratio of total debt to total assets), and *Profit Margin* (net income to sales ratio) from the last fiscal year prior to the acquisition announcement.

Table 3
Pre-announcement abnormal bond returns.

The dependent variable for the regression analysis reported in this table is the last abnormal bond return (*AR*) prior to the announcement of the merger. *CreditDiff* is the difference between the credit rating of the target bond and the weighted average rating of the acquirer bond. *Issuer Size* is the market value of the target firm, *Leverage* is the total debt to asset ratio for the target, and *Profit Margin* is the net income to sales ratio for the target firm. We also control for bond liquidity using its age and issue size. *Age* is the number of years since bond issuance and *Issue Size* is the bond offering amount. Only target bonds that traded at least twice in the three months prior to the announcement were included. *P*-values are reported in parentheses below. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively. The standard errors are corrected for firm-level clustering.

	I	II	III
Intercept	0.143	0.382	1.361
	(0.355)	(0.251)	(0.256)
CreditDiff	0.495	0.491	0.530
	(0.0001)***	(0.0001)***	(0.0001)***
Age		−0.054	−0.102
		(0.453)	(0.276)
Issue Size		−0.232	−0.331
		(0.633)	(0.454)
Issuer Size			0.101
			(0.570)
Leverage			−1.207
			(0.105)
Profit Margin			0.489
			(0.675)
Adj. R^2 (%)	7.02	7.24	8.59
Number of observations	329	329	329

The base specification, whose results are reported in Table 3, is as follows:

$$AR_i = \alpha + \beta_{CreditDiff} \times CreditDiff_i + \beta_{Issue\ \ Size} \times IssueSize + \beta_{age} \times Age + \beta_{size} \times IssuerSize + \beta_{leverage} \times Leverage + \beta_{PM} \times ProfitMargin \quad (1)$$

where AR_i denotes the *i*th target bond's last abnormal return, and other variables are as discussed above. Note that if the variable of interest, *CreditDiff*, has a positive coefficient, it implies that there is a price run-up (decline) in target bonds, which is associated with the potential for gain (loss) from the impending merger.

As seen in Table 3, the coefficient of *CreditDiff* is positive and significant at the 1% level. The results are robust to controlling for target bond and firm characteristics. A significant positive coefficient on *CreditDiff* implies that target bonds that have a better (worse) rating than the acquirer have significant negative (positive) abnormal returns. The coefficient on *CreditDiff* of 0.53 (Column III) implies that almost 49% of the total gain arising from the acquisition of target bonds, rated one category lower than the acquirer bonds, are realized prior to the public announcement.[15]

[15]Since the average pre-announcement return is 0.263% and the average return across M&A is 0.82%, the overall average return from the M&A is 1.083%. The return of 0.53% for one credit rating difference is about 49% of the total return.

Table 4
Robustness check.

The dependent variable for all Panels except Panel G is the last abnormal bond returns (*AR*) prior to the announcement. For Panel G, it is the *three-month CAR*. The sample includes all bonds that are traded at least two days within the three months prior to announcement. For Panel A, firm level last return is the weighted average last return for all bonds issued by the same firm weighted by issue size. Panel B uses median acquirer bond ratings, while Panel C uses finer notches of rating to estimate *CreditDiff*. *CreditDiff* is the difference between the credit rating of the target bond and the weighted average rating of acquirer bonds. *TermDiff* is the log of the weighted average number of years to maturity for the acquirer bonds minus the log of the number of years to maturity for target bond. *Psuedo CreditDiff* is the difference between the target bond rating before the M&A announcement and its rating within three months after the M&A. *Issuer Size* is the market value of the issuing firm, *Leverage* is the ratio of total debt to total assets, and *Profit Margin* is the ratio of net income to sales. *Age* is the number of years since bond issuance and *Issue Size* is the bond offering amount. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively. Standard errors are corrected for firm level clustering and *P*-values are in parentheses below.

	Panel A: firm level	Panel B: median rating of acquirer bonds	Panel C: fine rating category	Panel D: *Termdiff*	Panel E: including LBOs & private acquirers
Intercept	0.899	1.330	1.286	−0.99	1.257
	(0.450)	(0.270)	(0.294)	(0.323)	(0.262)
CreditDiff	0.574	0.459	0.187		
	(0.0001)***	(0.001)***	(0.000)***		
Termdiff/Psuedo CreditDiff				0.343	0.550
				(0.0604)*	(0.0001)***
Age	−0.056	−0.108	−0.106	−0.025	−0.094
	(0.607)	(0.249)	(0.268)	(0.76)	(0.293)
Issue Size	−0.387	−0.247	−0.266	0.296	−0.183
	(0.548)	(0.571)	(0.567)	(0.527)	(0.710)
Issuer Size	0.002	0.089	0.092	−0.187	0.059
	(0.994)	(0.626)	(0.622)	(0.256)	(0.733)
Leverage	−1.348	−1.393	−1.195	−1.339	−1.732
	(0.163)	(0.074)*	(0.117)	(0.185)	(0.030)**
Profit Margin	0.046	0.255	0.530	1.546	−0.798
	(0.975)	(0.848)	(0.697)	0.334	(0.424)
Adj. R-Square (%)	31.54	7.31	7.82	3.01	9.48
Number of observations	123	329	328	329	376

	Panel F: six month window	Panel G: three-month *CAR*	Panel H: excluding bonds with rumors
Intercept	0.573	−2.276	1.149
	(0.609)	(0.133)	(0.545)
CreditDiff	0.423	0.744	0.519
	(0.000)***	(0.001)***	(0.005)***
Age	−0.106	−0.042	−0.087
	(0.268)	(0.511)	(0.278)
Issue Size	−0.266	−0.053	0.733
	(0.567)	(0.904)	(0.4400)
Issuer Size	0.092	−0.045	−0.015
	(0.622)	(0.795)	(0.960)
Leverage	−1.195	−0.842	−2.263
	(0.117)	(0.298)	(0.016)**
Profit Margin	0.530	−0.116	−2.226
	(0.697)	(0.927)	(0.182)
Adj. R^2 (%)	7.82	9.86	9.59
Number of observations	441	329	199

4.2. Robustness check

In this section we examine the sensitivity of our results to (1) analysis conducted at the aggregate firm level, (2) alternate ways to estimate the potential for gain or loss of target bonds, (3) using a six-month period prior to announcement for our analysis, (4) an alternate proxy for pre-announcement returns, (5) extending the sample to also include private acquirers and leveraged buyout transactions (LBOs), and (6) controlling for potential takeover rumors and its effect on bond prices.

While the focus of our analysis in at the bond level, we also conduct our analysis at the firm level to address concerns of possible correlation among bonds issued by the firm and overweighing firms with multiple bond issues (Bessembinder, Kahle, Maxwell, and Xu, 2009). A firm's abnormal bond return is estimated by averaging the last abnormal return across bond issues by the same firm weighted by its issue size. *CreditDiff* is then redefined as the difference between the weighted average rating of target bonds and that of the acquirer bonds. Panel A of Table 4 shows that the new redefined *CreditDiff* continues to be positive and significant, with its economic magnitude somewhat higher than that estimated at the bond level.

To examine if the results are sensitive to the methodology of estimating *CreditDiff*, we estimate the model using three alternative measures. First, we use acquirer median bond rating rather than its mean bond rating to calculate *CreditDiff*. This ensures that the acquirer ratings are not influenced by a few bond issues with extreme ratings. As seen in Panel B, this does not materially change our results. Second, we use finer credit ratings from Standard and Poor's to estimate the *CreditDiff* variable. Consider, for example, a target bond with a rating of A+ while the acquirer rating is A-. Our new measure, based on finer bond ratings, will capture this difference even though their broad credit ratings are the same. The coefficient of the new *CreditDiff* continues to be highly significant, as seen in Panel C of Table 4. The estimated coefficient is smaller, which is not surprising as this measure captures smaller changes in credit differences. Third, we use a measure not based on credit ratings, to capture whether the target bonds stand to gain or lose. Shastri (1990) and Billett, King, and Mauer (2004) show that target bonds gain more when the acquirer has bonds with longer maturity. To capture maturity-related potential gain or loss of target bonds, we define a *TermDiff* variable, which is the log of the weighted average number of years to maturity for the acquirer bonds, minus the log of the number of years to maturity for the target bond. When *TermDiff* is positive (i.e., the acquirer bonds have higher average maturity than the target bond), the target bond stands to gain. As seen in Panel D of Table 4, the coefficient of *TermDiff* is positive and significant, implying that pre-announcement last bond returns are increasing in the gain of target bonds.

In Panel E of Table 4, we expand our sample to also include M&As where the acquirer is a private firm or where the acquirer bonds were not covered in FISD. Note that this sample includes LBO transactions. As acquirers in these transactions do not have bond ratings, we are unable to estimate our *CreditDiff* variable to capture the extent of expected gain or loss for target bonds. Therefore, we use actual bond rating changes within three months of the M&A to create a *Pseudo CreditDiff* variable. This *Psuedo CreditDiff* can be created for all target bonds irrespective of whether the acquirer bonds are covered under FISD. For example, consider a BBB target bond that is acquired by a private acquirer and subsequent to the merger the bond was downgraded to B. In this case, the *Psuedo CreditDiff* takes the value −2.

Though *Pseudo CreditDiff* is a noisy measure of the expected gain or loss for the target bonds, and it expands our sample of bonds to 376. As this measure is based on actual bond rating changes, it takes into account changes in control provisions that were not explicitly mentioned

(and hence not taken into account in our ex ante measure) but nevertheless impact pre-announcement returns. As shown in Panel E of Table 4, we continue to find significant pre-announcement bond returns. Bonds that experience a downgrade (upgrade) after the merger have significant negative (positive) returns prior to the merger announcement.[16]

Next, we increased the window of investigation from three months to six months by including those target bonds that were traded at least two days in the six-month period, with the last trade occurring within the three months before the public announcement. This has the advantage of increasing our sample from 329 bonds to 441 bonds, although potentially adding noise to our estimation. Our results are robust: the coefficient of *CreditDiff* remains positive and highly significant (Panel F). As an alternative to the last abnormal return, we also use three month cumulative abnormal bond returns. The results, as provided in Panel G, are again qualitatively similar.

We also examine the sensitivity of our result to rumors about a potential merger. There is frequent media coverage that firms are likely takeover targets and it is possible that our results showing pre-announcement trading might be confined to bonds of firms with such rumors. As mentioned earlier, target bonds can gain or lose in a merger depending on the credit rating of the acquirer. Therefore, to trade profitably in the bond market, it is not sufficient to know whether a firm is a likely target as there needs to be information about the potential acquirer. However, we still examine whether or not our results are driven by bonds that are subject to these merger rumors.

We conduct a news search for any mention that our sample firms are potential targets prior to the announcement date. This search was done through Factiva for the three months prior to the announcement date. We found that about 130 bonds belong to 41 firms where there was at least one news report prior to the announcement of them being potential targets. As Factiva may not cover all new reports and some news reports may not be reliable, we examine if targets with rumors have significant equity returns in line with greater market anticipation. The average three-month equity return for targets with rumors is a significant 1.9%, while that of targets not subject to rumors is an insignificant 0.6% (Table 5). In Panel H of Table 4, we exclude all bonds that were subject to rumors and find that even in this clean sample, the coefficient of *CreditDiff* is estimated with similar magnitude and significance.

Lastly, we examine the likelihood that potential gain or loss to target bonds can be anticipated and do not require knowledge of the credit rating of the acquirer. Such anticipation can arise as low-risk target bonds are much more likely to lose in an acquisition as the likelihood that the potential acquirer is relatively riskier is high. Under this market anticipation hypothesis, low- (high-) risk target bonds should lose (gain) prior to the announcement irrespective of the credit rating of the eventual acquirer.

To examine this possibility, we first define high-risk target bonds as those with a credit rating below A, which is the median rating of our sample target bonds. Target bonds rated no lower than A are classified as low-risk bonds. We further divide the low-risk target bonds into two groups based on their riskiness compared to acquirer bonds. As shown in Panel A of Table 6, of the 78 target bonds that are low risk, 34 are acquired by riskier acquirers (Group 1), while 44 are acquired by less risky acquirers (Group 2). Similarly, a total of 138 high-risk target bonds are divided into Group 3 if acquired by riskier acquirers (43 bonds) and Group 4 if acquired by less risky acquirers (95 bonds).

[16]We also used the actual abnormal bond return for the M&A, which is the sum of the last abnormal return and the across M&A return as a proxy for the expected gain or loss for the target bonds. The results are qualitatively similar. These results have not been reported for brevity.

Table 5
Equity returns of target firms with and without pre-announcement rumors.

This table displays equity returns for target firms with and without takeover rumors. We present both mean and median values of the equity returns over the three months prior to the acquisition announcement, and the *P*-value of the *t*-test/signed-rank test on whether the mean/median is different from zero. *N* is the number of firms in each category. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

	Mean	*t*-test (*P*-value)	Median	Signed-rank Test (*P*-value)	*N*
Firms without Rumors	0.006	0.572	0.002	0.915	82
Firms with Rumors	0.019**	0.041	0.007*	0.071	41

Table 6
Target bond risks and pre-announcement abnormal bond returns.

This table presents the mean and median of last bond returns for different groups of target bonds, formed based on their own credit risks and their relative riskiness compared to the acquirer bonds. Group 1 consists of low-risk target bonds acquired by riskier acquirers. Group 2 consists of low-risk target bonds acquired by less risky acquirers. Group 3 consists of high-risk target bonds acquired by riskier acquirers. Finally, Group 4 consists of high-risk target bonds acquired by less risky acquirers. In Panel A, target bonds rated no lower than A are classified as low-risk bonds, and those otherwise are classified as high-risk bonds. In Panel B, we use BBB as the cutoff to classify target bonds into low-risk and high-risk groups. *N* is the number of bonds in each group.

	Mean (%)	Median (%)	*N*
Panel A: Use A as the cutoff			
Low-Risk Target Bonds			
Riskier Acquirer (Group 1)	−0.89	0.055	34
Less Risky Acquirer (Group 2)	0.676	0.221	44
Test for difference in Groups 1 & 2	0.087*	0.171	
High-Risk Target Bonds			
Riskier Acquirer (Group 3)	−0.364	−0.062	43
Less Risky Acquirer (Group 4)	0.841	0.489	95
Test for difference in Groups 3 & 4	0.015**	0.007***	
Panel B: Use BBB as the cutoff			
	Mean (%)	Median (%)	Nobs
Low-Risk Target Bonds			
Riskier Acquirer (Group 1)	−0.414	0.038	64
Less Risky Acquirer (Group 2)	0.456	0.179	86
Test for difference in Group 1 & Group 2	0.087*	0.15	
High-Risk Target Bonds			
Riskier Acquirer (Group 3)	−1.495	−1.303	13
Less Risky Acquirer (Group 4)	1.329	0.54	53
Test for difference in Group 3 & Group 4	0.008***	0.002***	

Under the market anticipation hypothesis, the mean returns for Group 1 should be similar to those for Group 2. However, under the informed trading hypothesis, the returns for Group 2 should be higher than for Group 1.[17] Consistent with informed trading, the average last bond

[17]We are grateful to an anonymous referee for suggesting this test of the difference between market anticipation and information-based trading.

return for Group 1 is −0.89 and significantly lower than 0.676 for Group 2. The results are similar for median returns, although not significant at conventional levels. Similar results are seen for high-risk target bonds. Consistent with informed trading, the average bond return for Group 3 is -0.364, which is significantly lower than 0.841, the return for Group 4.[18] In Panel B, we use BBB as the cutoff for classifying low- and high-risk target bonds and find similar results. In summary, the result on pre-announcement bond returns is consistent with information-based trading.

5. Market transparency and informed trading

In this section, we examine the influence of the implementation of the TRACE system on the evidence of informed trading in bonds prior to the announcement date. Several studies in the equity literature have examined the effect of transparency on market quality, resulting in contradictory conclusions. Taking advantage of recent available bond transaction data from TRACE, a few papers study the impact of price dissemination through the TRACE system on corporate bond liquidity and transaction costs. Using the same NAIC bond transaction data as in our study, Bessembinder, Maxwell, and Venkataraman (2006) find trade execution costs for institutional investors dramatically drop following the initiation of public reporting through the TRACE system. Consistent transparency effects from TRACE data are documented by Edwards, Harris, and Piwowar (2007) and Goldstein, Hotchkiss, and Sirri (2007).

In this section, we also examine the effect of the implementation of TRACE on informed trading in the corporate bond markets. The improved liquidity brought by the implementation of TRACE would be attractive to informed traders. This should translate into higher informed trading after TRACE implementation. However, this positive impact on informed trading would be offset by other negative effects. First, the reduction in transaction costs also implies that many with only small and marginal information advantages will also be motivated to trade. This smaller information content post-TRACE may not be significant enough to be captured by our tests. Second, improved transparency after TRACE increases the likelihood of regulatory oversight and sanctions. This increased cost of informed trading is likely to deter informed trading after TRACE. The last two arguments point to a lower or no evidence of informed trading after TRACE.

We first classify target firms into pre- and post-TRACE targets based on whether the target firm has bonds subject to TRACE dissemination at the time of M&A announcements. We then estimate the following model to address whether pre-announcement price changes and net selling by target-affiliated dealers exhibit different patterns during these two periods:

$$\begin{aligned} AR_i = {} & \alpha + \beta^{pre-\ Trace}_{CreditDiff} \times pre-\ TRACE \times CreditDiff_i \\ & + \beta^{post-\ Trace}_{CreditDiff} \times post-TRACE \times CreditDiff_i \\ & + \beta_{Issue\ \ Size} \times Issue\ \ Size + \beta_{age} \times Age + \beta_{size} \times IssuerSize \\ & + \beta_{leverage} \times Leverage + \beta_{PM} \times ProfitMargin, \end{aligned} \tag{2}$$

where the independent variable is abnormal bond returns, and *pre-TRACE* (*post-TRACE*) is a dummy variable that takes a value of 1 if the issuing firm is in its pre-TRACE (*post-TRACE*) period at the time of the merger announcement. Other variables are defined as in Model (1).

[18] Of the 123 target bonds with a credit rating of A or higher, 58 target bonds were acquired by acquirers with a similar credit rating. These bonds have not been included in the analysis in Panel A of Table 6. Similarly, of the 193 target bonds with a credit rating below A, 55 bonds were acquired by acquirers with a similar rating and have not been included in Groups 3 or 4.

Table 7
The influence of TRACE implementation on informed trading in corporate bonds.

This table examines the effect of TRACE implementation on informed trading in corporate bonds. The dependent variables are the last abnormal bond returns (*AR*) in the three months prior to the announcement. *Pre-* (*Post-*) *TRACE Dummy* takes the value one for bonds whose issuer's debt instruments are subject to TRACE dissemination at the time of the merger announcement. *CreditDiff* is the difference between the credit rating of the target bond and the weighted average rating of acquirer bonds. We include both bond-level specific controls, such as *Age* and *Issue Size*, as well as firm-level controls, including *Issuer Size*, *Leverage*, and *Profit Margin*, which are defined similarly as in Table 3. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively. Standard errors are corrected for firm-level clustering and *P*-values are represented in parentheses below.

	Panel A: full sample	Panel B: only bonds without rumors
Intercept	1.2129	1.17756
	(0.296)	0.4236
*CreditDiff *Pre-TRACE Dummy*	0.599	0.502
	(0.0001)***	(0.0018)***
*CreditDiff *Post-TRACE Dummy*	0.145	0.770
	(0.522)	(0.243)
Age	−0.091	−0.094
	(0.326)	(0.449)
Issue Size	0.003	0.713
	(0.993)	(0.527)
Issuer Size	0.096	−0.022
	(0.582)	(0.926)
Leverage	−1.159	−2.327
	(0.126)	(0.078)***
Profit Margin	0.316	−2.4423
	(0.760)	(0.40)
Adj. R^2 (%)	9.31	9.67
Number of observations	329	199
Test on the difference between Pre- and Post-TRACE	0.0677*	0.348

As seen in Panel A of Table 7, the coefficient for the term *CreditDiff*pre-TRACE* is 0.599 and is significant at 1% level. In contrast, the coefficient for *CreditDiff*post-TRACE* is 0.145 and is not significant. The difference between these coefficients is also significant. This finding suggests that there is little evidence of informed trading after the implementation of the TRACE system. One potential reason for this could be that this time period coincided with the growth of the CDS market, which may have become the first choice of informed traders. However, as many target firms are small and without traded CDS contracts, we do not think that development of the CDS markets explains all of our results.[19]

We also estimate the model in our sample of bonds that were not subject to any rumors. As seen in Panel B of Table 7, the coefficient of *CreditDiff* is significant only for the pre-TRACE period. Though this suggests an absence of informed trading in the post-TRACE period, the *t*-test for the difference in the coefficient is not significant. Note that there are only 27 bonds included in the post-TRACE non-rumor sample, indicating a low power of the test.

[19]We were able to check the availability of CDS contracts for our sample firms for the 2005–2006 time period using proprietary data. As this is the very end of the time period, it has the highest likelihood of CDS trading. We found that of the 13 firms in our sample with announcement dates in this time period, 4 had CDS contracts traded in the quarter prior to the announcement.

6. Information leakage: what is the potential source?

If trading on nonpublic information about pending corporate takeovers does occur in the corporate bond market, what is the source of this information? Several recent studies point to a promising direction. In particular, Acharya and Johnson (2010) find that the number of financing participants in private equity buyouts is related to the likelihood of insider trading prior to the bid announcement. Bodnaruk, Massa, and Simonov (2009) show that advisory banks take positions in the target's equity before the announcement of the M&A deal. If information flows within financial institutions as suggested by the papers above, it is possible that bond dealers who are affiliated with the investment advisors in the acquisition are informed about the transaction prior to its announcement.

We retrieved a list of advisory investment banks for each M&A deal from SDC, and hand matched it with bond dealers to generate a variable on the affiliation between bond dealers and advisory investment banks. In creating this affiliation variable, we considered various mergers between investment banks during this time period. For example, Travelers acquired Smith Barney in 1988 and was acquired by Citigroup in 1997. In 1998, if Citigroup was an investment advisor in an acquisition deal and the bond dealer was Smith Barney, they were classified.

Table 8
Affiliated bond dealers and pre-announcement abnormal bond returns.

This table examines the role of affiliated bond dealers on pre-announcement bond returns. The dependent variables are the last abnormal bond returns (*AR*) in the three months prior to the announcement. *CreditDiff* is the difference between the credit rating of the target bond and the weighted average rating of acquirer bonds. *AF Dummy* takes the value one when there was at least one affiliated dealer trading in the target bond during the three months prior to the takeover announcement. Affiliated dealers are those that are affiliated with investment advisors in the acquisition. We include both bond-level specific controls, such as *Age* and *Issue Size*, as well as firm-level controls, including *Issuer Size*, *Leverage* and *Profit Margin*, which are defined as in Table 3. Panel A and Panel B present the estimation results for the full sample, and the sample of bonds without rumors during pre-announcement period, respectively. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively. Standard errors are corrected for firm-level clustering and the *P*-value is presented in parentheses below each estimate.

	Panel A: full sample	Panel B: only bonds without rumors
Intercept	1.3542	1.1617
	(0.2591)	(0.5416)
CreditDiff	0.3671***	0.4136**
	(0.0035)	(0.0464)
CreditDiff **Affiliated Dummy*	0.7853*	0.3222
	(0.0764)	(0.3995)
Age	−0.1091	−0.1005
	(0.2265)	(0.1847)
Issue Size	−0.2745	0.687
	(0.4998)	(0.4673)
Issuer Size	0.0616	−0.0473
	(0.7346)	(0.8816)
Leverage	−1.0307	−2.28**
	(0.1782)	(0.0122)
Profit Margin	−0.0091	−2.4646
	(0.9944)	(0.1224)
Adj. R^2 (%)	10.77	10.02
Number of observations	329	199

The first implication of trading by potentially informed affiliated dealers is that bonds traded by these affiliated dealers should experience greater price changes. To test for this conjecture, we first create an *AF Dummy*, which takes the value of one when there is at least one affiliated dealer trading in the target bond during the three-month pre-announcement period, and zero otherwise. We then include the interaction of *CreditDiff* with *AF Dummy* in our estimation of Model (1). As shown in Table 8, the coefficient of the interaction term is positive and significant at the 10% level, implying that the last bond returns are directionally greater when an affiliated dealer is involved. However, this higher price impact when affiliated dealers trade appears to be confined to bonds with takeover rumors. There is no significant impact of affiliated dealers in the sample of bonds with no rumors (Panel B).

The second implication of informed affiliated dealers is that they are likely to buy bonds that stand to gain and sell bonds that stand to lose. To test this, we estimate net selling by affiliated brokers as the aggregate net sales by all affiliated brokers on the last trading date before the announcement. We then estimate the following model:

$$NetSell_i = \alpha + \beta_{CreditDiff} \times CreditDiff_i + \beta_{Issue\ \ Size} \times Issue\ \ Size + \beta_{age} \times Age + \beta_{size} \times IssuerSize + \beta_{leverage} \times Leverage + \beta_{PM} \times ProfitMargin, \tag{3}$$

where the explanatory variables are the same as those included in model (1). Informed trading by affiliated dealers implies that the coefficient of *CreditDiff* is negative and significant. As seen in Panel A Column I of Table 9, the coefficient of *CreditDiff* is not significant.

As Acharya and Johnson (2007) document greater sensitivity to negative news, we examine if affiliated dealers are more active when they face potential losses (i.e., in bonds that stand to lose in the merger). To capture bonds that strictly lose, we create a *Loss Dummy* that takes the value 1 if the target firm bonds are rated better than the best rated bond of the acquirer. As seen in Column II of Panel A in Table 9, the coefficient of the *Loss Dummy* is positive and significant. There is also some evidence of net selling by affiliated dealers in bonds that stand to lose. However, it is possible that even non-affiliated dealers are net sellers of bonds that stand to lose. To examine this possibility, we also estimate a model of net selling by non-affiliated bond dealers. As shown in Column III of Panel A, the coefficients of *CreditDiff* and *Loss Dummy* are not significant. This difference in net selling by affiliated and non-affiliated dealers in bonds that stand to lose is significant at the 1% level. This evidence of net selling by affiliated dealers gets stronger when we examine transactions closer to the public announcement. The most significant evidence of affiliated net selling occurs one week prior to the announcement of the merger (Column IV of Panel A).

These results should be interpreted with care. As we observe only a subset of affiliated broker transactions (i.e., the ones with insurance companies), we cannot measure whether they were net buyers or sellers in the aggregate. Since the results are based only on a subset of affiliated dealer transactions, they are at best suggestive.

Finally, we examine whether, like the price impact results discussed earlier, this evidence on the role of affiliated dealers is also confined to bonds with rumors. As seen in Panel B of Table 9, we find no evidence of a significant role of affiliated dealers in the sample of bonds without rumors. Overall, the results offer weak and suggestive evidence that the transfer of information within financial institutions is one of the likely sources of information prior to its public announcement.

Table 9
Pre-announcement trading by affiliated bond dealers.

The dependent variable for Columns I, II, and IV is net selling (*NetSell*) by affiliated bond dealers, and it is net selling (*NetSell*) by non-affiliated dealers for Column III. The explanatory variables of interest are *CreditDiff* and *Loss Dummy*. *CreditDiff* represents the difference between the credit rating of the target bond and the weighted average rating of acquirer bonds. *Loss Dummy* takes the value one when the target credit rating is better than the best rated acquirer bond, and zero otherwise. We include both bond-level specific controls, such as *Age* and *Issue Size*, as well as firm-level controls, including *Issuer Size*, *Leverage* and *Profit Margin*, which are defined as in Table 3. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively. Standard errors are corrected for firm-level clustering.

	Three-month window			One-week window
	I	II	III	IV
Panel A: full sample				
Intercept	−1.342	−0.130	−1.417	2.061
	(0.600)	(0.845)	(0.549)	(0.206)
CreditDiff	−0.100	0.080	−0.129	0.403
	(0.601)	(0.387)	(0.477)	(0.198)
Loss Dummy		0.986	−0.177	3.175
		(0.096)*	(0.901)	(0.037)**
Age	0.075	0.081	−0.008	0.453
	(0.747)	(0.048)**	(0.971)	(0.052)*
Issue Size	−1.311	−0.333	−0.953	−1.343
	(0.161)	(0.394)	(0.213)	(0.082)*
Issuer Size	−0.057	0.052	−0.144	0.706
	(0.888)	(0.698)	(0.669)	(0.084)*
Leverage	2.026	0.457	1.325	0.505
	(0.210)	(0.211)	(0.392)	(0.744)
Profit Margin	4.706	1.007	3.965	1.864
	(0.066)*	(0.370)	(0.116)	(0.536)
Adj. R−Square (%)	1.18	2.40	1.89	14.50
Nobs	329	329	329	97
Panel B: only bonds without rumors				
Intercept	−1.546	−1.535	−1.553	0.363
	(0.046)	(0.047)	(0.538)	(0.540)
CreditDiff	−0.004	−0.023	−0.373	0.129
	(0.906)	(0.516)	(0.221)	(0.170)
Loss Dummy		−0.216	−3.187	0.543
		(0.307)	(0.148)	(0.099)*
Controls included but not displayed				
Adj. R^2 (%)	4.96	5.11	3.44	6.75
Nobs	199	199	199	53

7. Where do informed traders trade first?

In this section, we examine trading in the target bond market in conjunction with that in the target's stock to explore the preferred venue of informed traders. As the timing of the bond trades is known, we can examine abnormal target stock price movements around last bond trading. This is consistent with the prior return results as the price of the bond on the last bond trading day is used to calculate the last abnormal return for the bond. If informed traders primarily trade in target stock, then abnormal stock returns should precede bond trades. Further, there should be little impact of bond trading on subsequent abnormal stock returns.

Table 10
Trading across issuer's equity and debt.

In Panel A, *PRIORCAR* (*POSTCAR*) is the day −5 (0) to day −1 (+4) cumulative abnormal stock returns. The cumulative stock returns are expressed as percentages. The days are relative to day 0, which is the day of the last bond trade. In Panel B, *PRIORCAR* (*POSTCAR*) is the day −5 (+2) to day −2 (+5) cumulative abnormal stock returns. The abnormal stock returns are calculated as the difference between the daily stock return and the equally weighted market return. Firms whose bonds gain (lose) from the merger consist of all firms that have at least one bond with a positive (negative) *CreditDiff*. *CreditDiff* is the difference in the bond credit rating and the mean credit rating of the acquirer bonds. The *t*-test and sign rank test report *P*-values from tests on the difference in the *PRIORCAR* and *POSTCAR*. *CAR* (*−1,1*) is the three-day *CAR* around merger announcement (not last bond trade). *Last Bond Return* is the average last bond return. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

		All firms	Firms whose bond gain	Firms whose bonds lose	Firms whose bonds rated similar to acquirer
Panel A: five-day window					
PRIORCAR (*−5,−1*)	Mean	0.83	0.61	0.81	1.23
	Median	0.000	0.000	0.000	0.2
POSTCAR (*0,4*)	Mean	5.05	6.05	5.79	2.56
	Median	0.88	1.55	1.51	0.06
t-test		4.03***	3.37***	2.517***	0.72
signed rank test		2.65***	2.67***	1.84*	0.25
Panel B: four-day window					
PRIORCAR (*−5,−2*)	Mean	0.92	0.82	0.57	1.4
	Median	0.14	0.06	0.0	0.39
POSTCAR (*2,5*)	Mean	3.97	5.76	3.47	1.2
	Median	1.27	2.56	1.35	0.74
t-test		3.26***	3.31***	1.45	0.14
signed rank test		2.49**	3.1***	1.16	0.52
CAR (*−1,1*)		13.69	16.03	12.9	9.9
Last Bond Return		0.28	1.08	−1.11	0.15
Nobs		123	59	31	33

To test this, we estimate five-day *CAR*s in stocks before, as well as after, the last bond trading day (day 0) for this analysis. If informed traders trade their information in the bond markets, abnormal equity returns in the five days after the last bond trade (*POSTCAR*) should be higher than the abnormal returns in the five days prior to the last bond trade (*PRIORCAR*). As the abnormal stock returns are estimated for the firm, the last bond trading day for the firm is the last day of trading across all its traded bonds. For our sample of 123 targets with traded bonds in the three months prior to announcement, the average last bond trading day is about 18 days prior to the announcement of the acquisition.

As seen in Table 10, the mean value of *PRIORCAR* is 0.83% and this is significantly lower than the *POSTCAR* value of 5.05%, implying that on average the last bond trade is informative and conveys information that is not already incorporated in the equity markets. Acharya and Johnson (2007) document that credit markets react faster to negative information. Therefore, we examine whether trades in bonds that stand to lose are more informative. As firms carry bonds with different credit ratings, we classify a firm as a losing firm if it has at least one bond that is going to lose (i.e., with a negative *CreditDiff*). Similarly, a firm is classified as a winning firm if it has at least one bond that stands to gain. There is only one firm in our sample that spans both these categories and it is classified it in the intermediate group with target firms whose bonds

Table 11
Which bonds are more likely to be traded?.

This table provides summary information on the characteristics of bonds that are traded prior to M&A announcements versus those that are not traded. Group 1 consists of 123 targets that had at least one bond traded, whereas Group 2 consists of 346 targets that had no bonds that traded in the three months prior to the announcement. Group 1 firms had a total of 329 bonds that traded (Group 1a) and 447 bonds that did not trade (Group 1b) in the three months prior to the announcement. Group 2 firms had a total of 993 bonds that did not trade in the three months prior to announcement. Total number of trades and total trade volume ($ million) is over the two-year period prior to the three months before the public announcement. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

	Group 1 bonds			Group 2 bonds
	Group 1a bonds	Group 1b bonds	*T*-test on the difference	
Offering amount ($ Million)	370.170	273.590	(0.001)***	193.050
Credit rating	3.990	4.640	(0.001)***	5.604
Time to maturity	9.192	8.742	(0.505)	9.207
Age	2.827	7.366	(0.001)***	5.729
Embedded options:				
Putable	0.030	0.060	(0.053)**	0.079
Convertible	0.039	0.105	(0.001)***	0.223
Redeemable	0.432	0.633	(0.001)***	0.732
Rule 144a	0.073	0.188	(0.001)***	0.158
Medium term note	0.000	0.034	(0.001)***	0.021
Seniority	0.933	0.969	(0.02)**	0.969
Total number of trades	43.570	10.290	(0.001)***	10.740
Total trade volume ($ Million)	307.190	122.450	(0.001)***	124.730
Number of observation	329	447		993

were rated similarly to those of the acquirer. Of the 123 firms in our sample, 59 stand to gain, 31 stand to lose, and the remaining 33 belong to the intermediate group.

We find significantly higher *POSTCAR* than *PRIORCAR* for both the groups with bonds that stand to gain, as well as firms with bonds that stand to lose. It is only for the group where there is no clear gain or loss in the target bonds is there no significant difference in *PRIORCAR* and *POSTCAR*. This evidence is in line with the hypothesis that the last bond trade is informative. The results when we examine median differences are qualitatively similar.

To check the robustness of our results to the five-day window, we report in Panel B of Table 10 the results with a different window. Specifically, *PRIORCAR* is defined as *CAR*s in stocks over day −5 to −2 and *POSTCAR* as *CAR*s in stocks over the days +2 to +5. The results are similar. The only exception is that the difference in *PRIORCAR* and *POSTCAR* for firms that have bonds that stand to lose is not statistically significant at convectional levels.

Lastly, we examine why outstanding public bonds for some targets do not trade in the three months prior to the announcement. One potential reason for the lack of trading is likely to be bond characteristics associated with low liquidity. We first examine bonds issued by the 123 target firms in our sample, and study the differences between the 329 bonds that traded at least two days and the 447 bonds, issued by the same firms, that did not trade for at least two days. We then examine the 993 bonds issued by 346 target firms that did not have any bonds that traded twice in the three months prior to the announcement of the merger.

As seen in Table 11, there are significant differences in the traded and non-traded bonds of our sample firms. Briefly, we find that liquid and traded bonds are younger, have higher offering

amounts and better credit ratings, are less likely to have embedded options, and are more likely to be public. For targets with no traded bonds, we find characteristics more likely to be associated with lower liquidity. These bonds also have low liquidity, few trades, and low trading volume historically (i.e., in the two years prior to the announcement).[20] In summary, firms with no bond trading in the three months prior to announcement are firms whose bonds have low liquidity.

8. Conclusion

Taking advantage of the unique case provided by corporate bonds, this paper documents evidence of informed trading on pending takeovers in the corporate bond market. Unlike target shareholders, who always benefit in a merger deal, target bondholders could either lose or gain, depending on whether the takeover increases or reduces the credit risks embedded in the bonds. We find that target bonds experienced abnormal trading volumes prior to the public announcement of the M&A, and that their prices increase (decline) before they are acquired by firms with better (worse) rated bonds. As profitable trading in bonds requires information for target and acquirer characteristics, our findings are more likely to be attributed to insider information rather than market anticipation. This is reaffirmed as our results continue to hold when we exclude all bonds that were subject to any merger rumors in the three months prior to the announcement.

We also finds some evidence that one possible channel for such information leakage could be the affiliation of the bond dealers with investment banks involved in the acquisition. Finally, the longstanding opacity and the resulting potential misuse of nonpublic information in the corporate bond market have drawn much effort from regulators toward increasing the transparency of the market. Our findings of less insider trading during the post-TRACE periods seem to validate the role of transparency in reducing the opportunities for taking advantage of uninformed traders.

References

Agrawal, A., Chen, M., 2008. Do analysts conflicts matter? evidence from stock recommendations. Journal of Law and Economics 51, 503–537.

Acharya, V., Johnson, T., 2007. Insider trading in credit derivatives. Journal of Financial Economics 84, 110–141.

Acharya, V., Johnson, T., 2010. More insiders, more insider trading: evidence from private equity buyouts. Journal of Financial Economics 98, 500–523.

Asquith, P., Kim, E., 1982. The impact of merger bids on the participating firms' security holders. Journal of Finance 37, 1209–1228.

Bessembinder, H., Kahle, K., Maxwell, W., Xu, D., 2009. Measuring abnormal bond performance. Review of Financial Studies 22, 4219–4258.

Bessembinder, H., Maxwell, W., 2008. Transparency and the corporate bond market. Journal of Economic Perspectives 22, 217–234.

Bessembinder, H., Maxwell, W., Venkataraman, K., 2006. Market transparency, liquidity externalities, and institutional trading costs in corporate bonds. Journal of Financial Economics 82, 251–288.

Billett, M., King, T., Mauer, D., 2004. Bondholder wealth effects in mergers and acquisitions: new evidence from the 1980s and 1990s. Journal of Finance 59, 107–135.

Bodnaruk, A., Massa, M., Simonov, A., 2009. Investment bank as insiders and the market for corporate control. Review of Financial Studies 22, 4989–5026.

[20] Hotchkiss, Jostova, and Warga (2007) find that bonds of public companies are more likely to be traded than those with private equity. As our sample consists of only public firms, this characteristic is not relevant for our study.

Cai, N., Helwege, J., Warga, A., 2007. Underpricing in the corporate bond market. Review of Financial Studies 20, 2021–2046.
Campbell, J., Taksler, G., 2003. Equity volatility and corporate bond yields. Journal of Finance 58, 2321–2349.
Chakravarty, S., McConnell, J., 1997. An analysis of prices, bid/ask spreads, and bid and ask depths surrounding Ivan Boesky's illegal trading in Carnation's stock. Financial Management 26, 18–34.
Chakravarty, S., McConnell, J., 1999. Does insider trading really move stock prices? Journal of Financial and Quantitative Analysis 34, 191–209.
Cornell, B., Sirri, E., 1992. The reaction of investors and stock prices to insider trading. Journal of Finance 47, 1031–1059.
Datta, S., Iskandar-Datta, M., 1996. Does insider trading have information content for the bond market? Journal of Banking and Finance 20, 555–575.
Dennis, D., McConnell, J., 1986. Corporate mergers and security returns. Journal of Financial Economics 16, 143–187.
Edwards, A., Harris, L., Piwowar, M., 2007. Corporate bond market transaction costs and transparency. Journal of Finance 62, 1421–1451.
Eger, C., 1983. An empirical test of the redistribution effect in pure exchange mergers. Journal of Financial and Quantitative Analysis 4, 547–572.
Ellis, K., Michaely, R., O'Hara, M., 2011. Competition in investment banking. Review of Development Finance 1, 28–46.
Fishe, R., Robe, M., 2004. The impact of illegal insider trading in dealer and specialist markets: evidence from a natural experiment. Journal of Financial Economics 71, 461–488.
Galai, D., Masulis, R., 1976. The option pricing model and the risk factor of stock. Journal of Financial Economics 3, 53–81.
Gao, Y., Oler, D., 2012. Rumors and pre-announcement trading: why sell target stocks before acquisition announcements? Review of Quantitative Finance and Accounting 39, 485–509.
Goldstein, M., Hotchkiss, E., Sirri, E., 2007. Transparency and liquidity: a controlled experiment on corporate bonds. Review of Financial Studies 20, 235–273.
Higgins, R., Schall, L., 1975. Corporate bankruptcy and conglomerate merger. Journal of Finance 30, 93–113.
Hong, G., Warga, A., 2000. An empirical study of corporate bond market transactions. Financial Analysts Journal 56, 32–46.
Hotchkiss, E., Jostova, G., Warga, A., 2007. Determinants of corporate bond trading: a comprehensive analysis. Working Paper.
Ivashina, V., Sun, Z., 2011. Institutional stock trading on loan market information. Journal of Financial Economics 100, 284–303.
Jarrell, G., Poulsen, A., 1989. Stock trading before the announcement of tender offers: insider trading or market anticipation? Journal of Law, Economics, and Organization 5, 225–248.
Kim, E., McConnell, J., 1977. Corporate mergers and the co-insurance of corporate debt. Journal of Finance 32, 349–365.
King, M., Padalko, M., 2005. Pre-bid run-ups ahead of Canadian takeovers: how big is the problem? Bank of Canada (Working Paper).
Krishnan, C., Ritchken, P., Thomson, J., 2006. On credit-spread slopes and predicting bank risk. Journal of Money, Credit, and Banking 38, 1545–1574.
Levy, H., Sarnat, M., 1970. Diversification, portfolio analysis and the uneasy case for conglomerate mergers. Journal of Finance 25, 795–802.
Lewellen, W., 1971. A pure financial rational for conglomerate merger. Journal of Finance 26, 521–537.
Maquieira, C., Megginson, W., Nail, L, 1998. Wealth creation versus wealth redistributions in pure stock-for-stock mergers. Journal of Financial Economics 48, 3–33.
Meulbroek, L., 1992. An empirical analysis of illegal insider trading. Journal of Finance, 1661–1699.
Meulbroek, L., Hart, C., 1997. The effect of illegal insider trading on takeover premia. European Economic Review 1, 51–80.
Ritter, J., Zhang, D., 2007. Affiliated mutual funds and the allocation of initial public offerings. Journal of Financial Economics 86, 337–368.
Ronen, T., Zhou, X., 2013. Trade and information in the corporate bond market. Journal of Financial Markets 16, 61–103.
Shastri, K., 1990. The differential effects of mergers on corporate security values. Research in Finance 8, 179–201.