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The Informational Role of Bond Analysts

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ABSTRACT

This study uses a large sample of sell-side bond analysts' reports to examine the properties of recommendations provided by bond analysts and the impact of these recommendations on bond securities. First, we document that the distribution of bond analysts' buy, hold, and sell recommendations is skewed positively, but less so than the distribution of equity analysts' recommendations. The positive skewness in bond analysts' recommendations is greater for

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low than for high credit quality bonds. Second, we find that bond analysts' reports generate bond trading and return reactions that are both economically significant and greater for low credit quality bonds. The bond market reaction is greater for bond analysts' reports than for equity analysts' reports. Finally, while both bond and equity analysts lead rating agency announcements, we find no evidence of a difference in timeliness between bond and equity analysts' reports. Overall, our results are consistent with bond analysts issuing more negative reports than equity analysts and providing more information about low credit quality bonds as a result of the asymmetric demand for negative information by bond investors.

> Fixed income research analysts play an important role in informing the marketplace about particular issues or securities. Indeed, such analysts and the research they provide are critical in promoting market efficiency in the fixed income price discovery process.
>
> —Bond Market Association (BMA 2004)

1. *Introduction*

Sell-side bond analysts, employed by brokerage firms, collect and interpret information about public corporate bond securities and the firms that issue them; they also provide investment recommendations to bond market participants. While these analysts represent potentially important information providers in the bond market, at least according to the Bond Market Association, little research exists to prove this claim. This gap is problematical, as the U.S. corporate bond market is a large and economically significant source of capital for U.S. corporations.[1]

Our research objective is to investigate the effects of unique bond-market features on bond analysts' recommendations and the impact of these recommendations on bond securities. Four distinguishing bond market features likely affect bond analysts' recommendations. First, bond investors are almost exclusively institutions. Therefore, the average level of investor sophistication is higher than in the equity market. Institutional investors likely have access to multiple sources of information (including their own research) and better understand how to utilize the bond analysts' recommendations. Second, bonds are graded by independent certified rating agencies, such as S&P, Moody's, or Fitch, that receive fees from the firms that issue the bonds as compensation for the rating and have preferential access to information not publicly available. Because rating agencies are alternative information intermediaries with extensive reputational capital at stake, their disclosures

[1] Bessembinder and Maxwell [2008] provide summary statistics about the bond markets. For example, the outstanding principal in U.S. corporate bonds in 2006 was $5.37 trillion. During the decade 1997 to 2006, U.S. firms issued $4.6 trillion in corporate bonds, which is approximately three times the $1.5 trillion of equity issued via initial and seasoned public common stock offerings, over the same period.

provide potentially relevant information that can serve as an independent check on the accuracy and reliability of bond analysts' research. Third, the prices of most bond securities are determined more objectively than those of equity securities as the value of bond securities is largely established by macroeconomic factors, such as interest rates and historical credit spreads. Alternative bond securities with similar cash flows and credit risk can be close substitutes for bonds covered by bond analysts, and thus can serve as pricing benchmarks. We expect these three distinctive bond market features to result in bond analysts, relative to equity analysts, adding less strategic bias through their interpretation of news (i.e., either presenting news in a more or less favorable light than it truly is or by selectively reporting the news).

The fourth distinct feature of the bond market is the payoff function of bond securities, which limits the upside potential to investors who have fixed claims against the borrowing firm. This important feature generates an asymmetric demand for negative information on the part of bond investors. We expect that less strategic behavior by bond analysts compared with equity analysts and a greater demand for negative information by bond investors compared with equity investors leads to systematic differences in the distribution of, and the bond market reaction to, bond analysts' recommendations.

Our analysis takes advantage of a sample of 15,918 (hand collected and coded) analysts' reports for 633 firms over the years 2002 to 2006. Our first set of tests finds that bond analysts' buys and sells represent 39.1% and 13.6%, respectively, of total recommendations. This positive skewness in the recommendation distribution is consistent with analysts injecting positive strategic bias into their recommendations, possibly to gain investment banking business, to improve access to management, or to expand the number of potential investors trading in the bond. This distribution, however, is skewed less positively for bond analysts than it is for equity analysts. This result suggests that bond analysts, relative to equity analysts, act less strategically and provide more negative information as a result of the asymmetric bond investor demand for negative information. Consistent with this interpretation, we find that the positive skewness in bond analysts' recommendations is lower when credit quality is higher. For superior-rated firms (i.e., AA- and AAA-rated), the percentage of buys (14.1%) is less than half that of sells (33.7%), which is consistent with both the lack of upside return potential for these high-quality bonds and bond investors' more asymmetric demand for negative information. For high-yield bonds (rated below BBB), there is less expected asymmetric demand for negative information and bond analysts' recommendations are positively skewed (46.1% buys vs. 8.6% sells). In comparison, the skewness of equity analysts' recommendations changes little as credit quality decreases.

As a proxy for strategic behavior, we use analysts' affiliation, measured by whether the broker employing the analyst recently led the underwriting or arranged a firm's debt issue. We find that, relative to unaffiliated bond analysts, affiliated analysts' recommendations are more positively skewed. An affiliation effect is not evident in the distribution of equity analysts' recommendations, supporting the notion that analyst affiliation does not drive the difference in positive recommendation skewness between bond and equity analysts.

Our next set of analyses documents that the bond market reaction is greater for bond analysts' recommendations than for equity analysts' recommendations. An incremental 0.90% of bonds' principal is traded over the five-day window centered on the date of bond analysts' reports. This "reaction" is about one half larger than the bond volume reaction to equity analysts' reports. Furthermore, the bond volume reaction is greater for the recommendations of bond versus equity analysts, especially when bond analysts disagree with equity analysts. These results are consistent with bond analysts issuing reports that are more relevant to bond investors, in particular when the interests of bond holders are more likely to conflict with those of equity investors. The bond volume reaction to buys is particularly weak for equity analysts compared with bond analysts, supporting the idea that a greater expected positive strategic bias on the part of equity analysts leads to more discounting of their recommendations.

In considering how analysts' reports fare in the face of other sources of information specific to the bond market, we compare the volume reactions to analysts' reports with the reaction to rating agency and firm disclosure announcements. While the bond volume reaction per bond analyst report is about two-fifths that per rating change, bond reports are issued over 10 times more frequently, which is suggestive of their economical importance. And, while firm disclosures (earnings announcements, conference calls, and management forecasts) also impact the bond market, they seem to be associated with a bond volume reaction that is lower than the response to bond analysts' reports. These results are robust to the inclusion of controls for credit default swaps' (CDS) price changes, which represent a potentially higher and more relevant benchmark because CDS prices have been shown to quickly incorporate new information (e.g., Hull, Predescu, and White [2004], Acharya and Johnson [2007]).

Bond return reactions corroborate these higher abnormal volume reactions. The price of bonds increases (decreases) by 30 (20) basis points over the five-day window around bond analysts' buys (sells), relative to the price change around bond analysts' holds. Given that the average bond issue size in our sample is approximately $480 million, the value of a portfolio with this issue would increase (decrease) by about $1.44 ($0.96) million around a bond analyst's buy (sell) relative to a portfolio invested in Treasury Bills with the same maturity and paying a similar coupon rate.

In a third set of analyses, we document that the bond market reaction to both bond and equity analysts' reports is higher for bonds with low credit quality, consistent with bonds' increased price sensitivity to news when a firm is closer to default. Given the low sensitivity of news for high-quality bonds, it is perhaps not surprising that bond analysts issue reports about twice as frequently for firms with low credit quality bonds, versus superior-rated firms. In contrast, equity analysts produce more reports about superior-rated firms. When we examine the effect of affiliation, we find no evidence of difference in the bond market reaction to affiliated versus unaffiliated bond analysts. This result suggests that any discounting of affiliated bond analysts' reports due to conflicting incentives is offset by their superior knowledge of the firm.

In our last set of analyses, we investigate whether bond analysts' reports are timelier than those of equity analysts with respect to credit rating agency announcements. The evidence is consistent with bond analysts' leading (i.e., Granger causing) rating agency downgrades and upgrades, as well as watch-list additions. We find no evidence, however, of a timeliness difference between bond and equity analysts. Hence, the stronger bond market reactions we observe for bond analysts are not due to their issuing more timely recommendations. Instead, the different market reaction indicates that bond investors find bond analysts' reports more relevant.

Our study contributes directly to the limited literature on bond analysts. Johnston, Markov, and Ramnath [2009] provide evidence that sell-side bond analysts' choice of firms covered varies systematically with the costs and benefits of providing research coverage and that bond analysts affect equity stock prices. Because our tests directly examine bond market effects and control for alternative events, our inference that bond analysts provide new information to bond investors is more justifiable. Documenting a bond market reaction is challenging because the U.S. corporate debt market is both less transparent and less liquid than the equity market (see, e.g., Hong and Warga [2000]). We also contribute to the literature on analysts broadly defined by showing that fundamental differences between the two markets systematically affect both the patterns of bond analysts' recommendations and the bond market's reactions to them. Furthermore, while extant studies document that the distribution of equity analysts' recommendations is positively skewed (e.g., Barber et al. [2001], Malmendier and Shanthikumar [2007]), we provide unique evidence on the distribution of bond analysts' recommendations.

Our work is also related to research on bond market information intermediaries. A number of studies examine the information and properties of certified rating agencies.[2] Beaver, Shakespeare, and Soliman [2006] study the differential properties of certified versus noncertified bond-rating agencies. Our paper explores the effectiveness of bond analysts as alternative information providers in the bond market.

Finally, our evidence of significantly greater bond analyst coverage of and larger market reactions for low credit quality bonds, combined with larger bond market reactions to sell recommendations, suggests that bond

[2] See, e.g., Pinches and Singleton [1978], Holthausen and Leftwich [1986], Hand, Holthausen, and Leftwich [1992], and Dichev and Piotroski [2001].

investors demand more information about the downside than the upside return potential. This asymmetric demand for information in debt markets is seen as one of the main drivers of accounting conservatism (e.g., Ball [2001], Watts [2003], Ball and Shivakumar [2005], Ball, Robin, and Sadka [2008]). Thus our research further supports the significant impact of debt markets on accounting reporting.

The next section discusses the institutional background and develops our hypotheses. Section 3 describes the data and the sample selection process. Sections 4 and 5, respectively, present our empirical analyses of bond analysts' recommendations and the bond market's reactions to them. Section 6 investigates the timeliness of bond analysts' reports relative to rating agencies' disclosures. Section 7 concludes.

2. *Bond Analysts and Bond Markets*

In section 2.1, we describe the activities of bond analysts and briefly compare them to those of equity analysts. This discussion is based on our reading of bond analysts' reports and institutional articles, and our conversations with practitioners. Section 2.2 develops our hypotheses.

2.1 DESCRIPTION OF BOND ANALYSTS' ACTIVITIES

Bond analysts identify whether firms' credit fundamentals are improving or weakening, and forecast whether firms' bond securities are likely to outperform (or underperform) relative to bonds of comparable risk with similar contractual features. This analysis is reflected in an investment recommendation (i.e., buy, hold, or sell) issued to bond investors. In addition, bond analysts' reports provide an extensive review of firms' financial performance, including detailed examinations of EBITDA, free cash flow, capital expenditures, and liquidity and leverage ratios. The implications of firms' growth potential on these measures are often discussed. To obtain accurate valuation and pricing information for debt securities, bond analysts can work in close cooperation with sales and trading personnel as well as equity analysts (BMA [2004]).

Bond analysts pay special attention to credit rating changes, changes in outlooks, and additions to watchlists by credit rating agencies, information essential in the valuation of corporate bond securities. In recent years, they have started to include information on credit derivatives, which offer investors protection against firms defaulting on their debt (Ronan [2006]). Bond analysts also provide a comprehensive analysis of event risks stimulated by shareholder-bondholder conflicts of interest. Event risks include a variety of financial engineering techniques that enhance share price performance but increase uncertainty and reduce the value of bond holdings (Currie [2005]); the most common examples are share repurchases, divestments of assets, spin-offs, leveraged buyouts, and debt-funded acquisitions. Bond analysts provide detailed coverage of exposure to such risks and discuss their potential or realized impact on rating changes, bond valuation, and firms' long-term credit prospects. Their reports can also discuss whether bond covenants offer investors sufficient protection against the event risk in question.

The extant literature, such as Beaver [1998, p. 10], and Lang and Lundholm [1996], defines equity analysts' tasks as either collecting new or interpreting existing information.[3] The same holds true for bond analysts. For example, bond analysts provide predictions about important upcoming events (e.g., earnings announcements and relevant credit events), consistent with collecting new information, and offer analysis and explanation subsequent to these events, consistent with interpreting existing information. Analysts' interpretations of news may also provide potentially new valuable information for investors.

2.2 HYPOTHESES DEVELOPMENT

Both bond and equity analysts' reports primarily serve the needs of their respective investors. Because of differences in security payoffs and market characteristics, the two investor groups have different informational needs. We make several predictions both *across* bond and equity analysts and *within* the bond analyst group. The two dimensions we examine are: (1) the skewness in the distribution of analysts' buy, hold, and sell recommendations and (2) the bond market reaction to analysts' reports. Within these two dimensions, we consider two cross-sectional settings: high versus low credit quality; and affiliated versus nonaffiliated analysts. In the case of bond market reactions, we also consider the recommendation level (e.g., sell vs. buy) and instances when bond analysts' recommendations disagree with the recommendations of equity analysts.

2.2.1. Distribution of Recommendations. Both bond and equity analysts can add bias via recommendations that differ from their true views. For example, by issuing a buy (sell) recommendation when the analyst truly believes the security deserves a hold, the analyst adds positive (negative) bias. Alternatively, analysts can add positive (negative) bias if the assessment of the news is unfavorable (favorable) for investors but the analyst chooses to not issue a sell (buy) report. Said differently, analysts can add bias by censoring information.

The demand for positive analyst bias arises from a number of sources. For example, it has been alleged that affiliated equity analysts routinely issue overly optimistic disclosures (i.e., act strategically) to win lucrative investment banking business (SEC [2003a, 2003b], Smith, Craig, and Solomon [2003]). Consistent with this notion, affiliated equity analysts issue more

[3] For example, Lang and Lundholm [1996], Francis, Schipper, and Vincent [2002], and Frankel, Kothari, and Weber [2006] support the notion that analysts primarily interpret information. In contrast, Ivkovic and Jegadeesh [2004] conclude that analysts' dominant source of value is their independent collection of information.

positive recommendations and more optimistic earnings growth forecasts than unaffiliated equity analysts, and are slower to downgrade in the face of negative news.[4] For their part, affiliated bond analysts suffer similar conflicts of interest because firms frequently issue debt, often redeem the debt before maturity, and usually have multiple debt issues outstanding. Significant fees from underwriting bond securities put pressure on bond analysts to optimistically bias their research to help sell the deal (Lucchetti and Craig [2004]).[5] Another reason for both bond and equity analysts to provide positively biased news about firms is to retain access to management (e.g., Francis and Philbrick [1993], Das, Levine, and Sivaramakrishnan [1998], and Lim [2001] provide equity-analyst evidence). The October 2000 passage of Regulation Fair Disclosure (which prohibits firms from making selective, nonpublic disclosures to favored analysts) should reduce, but not necessarily eliminate, this management-access effect. A third reason for positive bias is that buys issued by equity analysts are positively associated with increased equity trading, and hence increased trading commissions (SEC [2001]). According to Boni and Womack [2002], while brokerage firms' sales people can encourage trade by approaching any client with a "buy" recommendation, many client investors are reluctant or unable to sell because they do not currently own the security. Similarly, we expect that bond analysts who wish to appeal to a broader client base will add positive bias to their recommendations.

A basic premise of benefiting from strategic behavior is that at least some investors cannot undo biased recommendations. Those who are more sophisticated are more likely to have the capability and resources to unravel analyst bias. Consistent with this idea, Ljungqvist et al. [2007] show that the positive skewness in equity analysts' recommendations is decreasing in

[4] See, e.g., Lin and McNichols [1998], Michaely and Womack [1999], Dechow, Hutton, and Sloan [2000], and O'Brien, McNichols, and Lin [2005].

[5] The environment for equity analysts changed in 2002 when the Global Analyst Settlement was passed to address the investment banking conflicts of interest (SEC [2003a,b]). During the 1990s, analyst compensation could be linked directly to investment banking profitability and be influenced by investment banking personnel (SEC [2001]). With the passage of the Global Analyst Settlement, this practice is no longer allowed (SEC [2003a]). Furthermore, NASD and the NYSE passed rules in 2002 that require analysts' reports to display the percentage of the issuing broker's recommendations that are buys, holds, and sells. Barber et al. [2006] state that the rules were presumably meant to pressure those brokers and analysts who consistently issued a relatively high percentage of buy recommendations to adopt a more balanced rating distribution. Barber et al. [2006] and Kadan et al. [2008] document that these rules reduced, but did not eliminate, the positive skewness. Bond analysts' independence from investment banking also increased after 2002. For example, the BMA [2004] published a report on potential conflicts of interest in bond research departments, and many of the recommended restrictions were similar to those of equity departments: not allowing bankers to evaluate or compensate analysts, not using analysts to solicit or market investment banking services, and not permitting traders or bankers to influence the content or timing of research (see also Institutional Investor [2004], Lucchetti and Craig [2004]). See, also Barniv et al. [2009], who document the effect of these recent regulatory reforms on analyst behavior. Our data span the period after the settlement and thus we cannot investigate the effects of this act on our analysis.

institutional investor holdings. De Franco, Lu, and Vasvari [2007] provide results suggesting that when equity analysts mislead investors by publicly issuing positive recommendations that contradict their private negative views, wealth is transferred from individual to institutional equity investors. This is consistent with large (small) traders discounting (literally following) equity analysts' recommendations (see also Malmendier and Shanthikumar [2007]).

Compared with equity analysts, we expect that bond analysts add less strategic bias. Institutions account for the vast majority of the dollar volume of bond trading, and without smaller, less sophisticated investors, there is no one to "fool" in the bond market. The chairman of the SEC links bond analysts' ability "to resist the pressure to hype" favored client firms to the "counterweight provided by the institutional nature of the buy-side customer base" (SEC [2005]). Furthermore, bond analysts contend with more objective information about bond prices from rating agencies, comparable bond securities, and in recent years, additional market-based benchmarks provided by credit default swaps.

To combine these arguments, while both bond and equity analysts should exhibit positive strategic bias, we expect less strategic behavior from bond analysts. This supports our prediction that bond analysts' recommendations will be skewed less positively than the recommendations of equity analysts. We add one more reason to support such a prediction: the asymmetric payoff of bonds. Bond returns are, by their nature, negatively skewed because of the limited upside, which increases demand among bond investors for negative information. This increase could lead bond analysts to issue more negative reports. In summary, these arguments support our first hypothesis:

H1: The distribution of bond analysts' recommendations is skewed less positively than that of equity analysts' recommendations.

The strength of the null of H1 depends on whether analysts primarily interpret information or collect new private information. Implicit in our argument above is that analysts add bias when they interpret information. The opportunity to add bias when gathering information is more limited because it is difficult to tell before it is collected whether the new information will be favorable.

The asymmetric payoff to bonds, mentioned above, suggests our first cross-sectional prediction to H1. As the firm's credit quality decreases, the negative skewness of bond returns decreases, and hence the payoffs of risky bond securities resemble the payoff of equity securities. Consistent with this effect, Collin-Dufresne, Goldstein, and Martin [2001] find that the positive relation between bond and equity returns is increasing as a bond's credit quality worsens. In turn, decreases in the negative skewness of bond returns lead to decreases in the demand for negative bias. In comparison, as credit quality changes we do not expect any changes in the distribution of equity returns, and consequently no change in the distribution of equity analysts' recommendations. This leads to the following hypothesis:

H1a: The distribution of bond analysts' recommendations is skewed more positively as credit quality decreases while the distribution of equity analysts' recommendations is not affected as credit quality decreases.

As mentioned above, there are a number of potential incentives for analysts to add positive bias. We test whether affiliation, an easily identifiable and important incentive, is positively related to analysts' recommendation skewness (other incentives, such as retaining management access or increasing trading commissions, are less easily observable). Given that we expect less strategic behavior from bond analysts, we also expect that affiliation would provide them with weaker incentives to add positive bias. Thus, our hypothesis is

H1b: The distributions of bond and equity analysts' recommendations are skewed more positively for affiliated analysts than for unaffiliated analysts, and this affiliation-associated positive effect on skewness is greater for equity analysts than for bond analysts.

Although we sign this prediction, two reasons support the null of hypothesis H1b. First, an alternative explanation for the positive relation between affiliation and positively skewed recommendations, put forward by Kolasinski and Kothari [2008], is that firms about to issue new securities simply select investment banks with analysts who truly have positive views of the firm. In this explanation, there is no strategic behavior and therefore no expected difference in recommendation skewness between bond and equity analysts. Second, firms in our sample issue large amounts of bonds, which could lead to a relatively stronger affiliation effect for bond analysts.

2.2.2. Bond Market Reaction. The extant literature shows that the equity market reacts to equity analysts' disclosures, consistent with the idea that these analysts' reports are informative.[6] While we expect that the bond markets will react to both bond and equity analysts' reports, we predict the reaction will be stronger for bond analysts. As already mentioned, we expect less strategic behavior by bond analysts than by equity analysts. Assuming analysts' bias is partly anticipated, bond investors will rationally discount biased analyst recommendations by reacting less strongly, causing bond analysts'

[6] Studies demonstrate that equity analysts' disclosures affect equity volume. For example, Irvine [2004] shows that brokers' equity trading volume is significantly higher in stocks covered by the equity analysts they employ, specifically in the weeks following analysts' forecasts and recommendations. Other studies show that equity analysts' disclosures produce short-window abnormal equity returns consistent with the direction and magnitude of the forecast or recommendation revision (e.g., Lys and Sohn [1990], Stickel [1995], Womack [1996], Francis and Soffer [1997]).

recommendations to be discounted less. Furthermore, some firm-specific news will require a debt-specific interpretation, perhaps due to bondholder-stockholder conflicts of interest. For example, an increase in share repurchases could be neutral or good news for equity holders but be bad news for bond holders. Bond analysts' reports are focused on the informational needs of bond investors and should elicit stronger bond market reactions. As a result, our second hypothesis is

H2: The bond market reaction to bond analysts' recommendations is greater than the bond market reaction to equity analysts' recommendations.

In support of the null of H2, the resources available to equity analysts are greater and they cover comparatively fewer firms—perhaps only a dozen, while a bond analyst covers 30 to 40 issuers (Lee [2002]). Extant research by Clement [1999] among others shows that the number of firms covered is negatively related to measures of analyst's performance, such as accuracy. This differential in the number of firms followed could lead equity analysts to produce reports with superior informational value relative to those of bond analysts. Furthermore, if most of the information in bond and equity analysts' reports is about changes in the economic asset value of firms (e.g., changes in expected future levels of operating performance), then the reports should contain similar discussions and the differential bond market reaction between bond and equity analysts should be insignificant. This prediction is further supported by increased cooperation between debt and equity analysts in recent years (Ronan [2006], Lee [2002]).

We also analyze bond market reactions conditional on the recommendation level. First, given the concavity in the relation between bond prices and the firm's asset value, we expect that for a given magnitude of change in firms' asset value, the bond market reaction is greater for negative news (i.e., sells) than for positive news (i.e., buys). Easton, Monahan, and Vasvari [2009] provide support for this latter idea in the case of earnings news. This is expected for both bond and equity analysts' recommendations. Second, as we expect bond analysts to provide a debt-specific interpretation to bond investors, the bond market should react more strongly to their recommendations. Third, we expect the bond market to discount strategically motivated buy recommendations less for bond analysts than for equity analysts. Based on the above, our hypothesis is

H2a: The bond market reaction to bond analysts' buy (sell) recommendations is greater than the bond market reaction to equity analysts' buy (sell) recommendations.

Our next cross-sectional hypothesis investigates more specifically the role of bondholder-stockholder conflicts of interest. In particular, we expect bond analysts' recommendations to agree with equity analysts' recommendations, when, for example, discussing their assessment of operating fundamentals, a situation in which there is a low conflict of interest. We expect bond and equity analysts to disagree when conflicts of interest are high (e.g., when free cash flows are used to invest in riskier projects or repurchase shares).

By agree (disagree) we mean that both bond and equity recommendations are the same (different) for the same firm and time period. When bond analysts disagree with equity analysts, it is more likely that bond analysts' information is more relevant to bond investors, especially if the disagreement follows from the bondholder-stockholder conflicts of interest.[7] In this case, we expect bond investors to pay particular attention to the recommendations of bond analysts. Hence, our hypothesis is

H2b: The bond market reaction to bond analysts' recommendations is greater when bond and equity analysts disagree than when they agree.

The last two cross-sectional hypotheses examine the role of credit quality and analysts' affiliation. As we do not expect these effects on bond market reaction to differ between bond and equity analysts, we state our predictions within the group of bond analysts. For high credit quality bonds, the bond price changes very little for a given change in firm value. However, for low credit quality bonds, changes in bond prices should be positively related to changes in firm values, which make information more valuable to bond investors.[8] Our hypothesis is

H2c: The bond market reaction to bond analysts' recommendations increases as credit quality decreases.

We expect recommendations issued by affiliated analysts to be discounted more than recommendations issued by unaffiliated analysts, as investors should anticipate affiliation-associated strategic behavior. Lee [2002] discusses that bond analysts' research immediately following new bond issues is, "designed to flatter the issuing company" and that only few investors will actually read it. Furthermore, even if bond analysts issue more positive recommendations for nonstrategic reasons as in Kolasinski and Kothari [2008], there will still be some discounting of the news. Thus, our final cross-sectional hypothesis is

H2d: The bond market reaction to bond analysts' recommendations is lower for affiliated analysts than for unaffiliated analysts.

[7] As a more general argument, the literature shows that when analysts issue disclosures that differ from other analysts, the market response is greater. Cooper, Day, and Lewis [2001], Clement and Tse [2005], and De Franco and Zhou [2009] show that equity analysts who issue more "bold" forecasts (i.e., forecasts that are more orthogonal to other analysts) illicit stronger short-window equity-return reactions. While actual definitions of bold forecasts vary slightly in the literature, all contain the idea that they deviate more from the consensus analyst forecast.

[8] In support of this idea, the BMA [2004] states that, "there is greater potential for research to affect high-yield and distressed corporate bonds."

However, in support of the null of H2d, affiliated analysts likely know the firm and the firm's management better, which could lead them to produce more informative reports.

3. *Data and Sample*

Bond analysts' report data are discussed in section 3.1. Section 3.2 describes our bond trading volume and price data. Section 3.3 presents descriptive statistics about our sample firms and bond issues.

3.1 COLLECTING AND CODING OF BOND ANALYSTS' REPORTS

We obtain bond analysts' reports from First Call Thomson ONE Analytics. For each report we code the name of the analyst and brokerage firm who issues the report, report date, name of the company the report is about, and the analyst's recommendation. If the broker has not already done so, we standardize bond analysts' recommendations into three categories: buy, hold, or sell.[9] Current rating information (Moody's or S&P) is also collected from the report.[10] Only reports with a recommendation are included in the analysis.

We obtain reports about U.S. corporate firms with bond securities for the years 2002–2006 because this period aligns with the availability of bond trading data from the Trade Reporting and Compliance Engine (TRACE) database. We exclude reports about: Real Estate Investment Trusts; financial institutions, such as banks or insurance companies; companies domiciled in non-U.S. countries; macroeconomic variables; and industry indices. We also exclude reports that are aggregated either by industry or time, which often repeat previously published information (e.g., Stickel [1995]).

3.2 BOND VOLUME AND PRICE DATA

We analyze secondary market corporate bond trades retrieved from the National Association of Securities Dealers' (NASD) TRACE system. TRACE data are relatively new. On July 2002, the NASD began to report some bond transactions through TRACE, and by February 2005, essentially all corporate bond trades were reported through TRACE. Studies by Bessembinder, Maxwell, and Venkataraman [2006], Edwards, Harris, and Piwowar

[9] The tabulated analyses in this study are based on recommendation *levels*. The extant literature (e.g., Womack [1996], Francis and Soffer [1997]) also studies changes in equity recommendations. For the sub sample of reports with data available to determine recommendation changes (approximately 70%), we conduct sensitivity analyses of most of our tests when feasible. The untabulated results are consistent with the recommendation-level analyses.

[10] Research assistants (RAs) assisted us by reviewing, identifying, and recording this information from the reports. To ensure high-quality coding of the reports, about 20% of the reports were randomly selected and coded more than once by different RAs. Based on this double coding, 97% of reports were coded completely correct the first time. The 3% of reports with errors identified during this checking process were corrected before our final sample was selected.

[2007], and Goldstein, Hotchkiss, and Sirri [2007] demonstrate that bond investors benefited from the increased transparency of TRACE, which reduced the bid-ask spreads that investors pay to dealers when trading, particularly for smaller size trades. TRACE provides the date, price, and size of bond trades.[11]

Prior studies of bond transactions typically used the Mergent Fixed Income Securities Database (FISD), which contains only bond trades reported by property and life insurers and state insurance departments. Hong and Warga [2000] and Campbell and Taksler [2003] estimate that insurance companies hold between 30% and 40% of corporate bonds. Because TRACE coverage of firms is not complete until February 2005, we augment our TRACE bond data with that of FISD. If on a certain day a bond issue does not have any trades reported in TRACE but FISD indicates that a trade occurred, we include the FISD trade information in our tests. A missing trade in TRACE is almost always because TRACE did not cover that specific issue at the time.

We match the bond report data with the combined TRACE-Mergent data at the firm level by manually merging the bond analysts' reports using the issuer's firm name. We successfully match about 82% of our bond analysts' report data.[12] We then match the borrowers with bond analysts' reports and bond trading information in the merged TRACE-Mergent FISD data set with Compustat. Finally, to facilitate the comparison between bond and equity analysts, we limit the sample to firms with publicly traded equity. Untabulated analysis shows that the results are similar to the tabulated results if we exclude this public-equity restriction.

Panel A of table 1 provides a summary of the number of reports we collect and code. Our final sample consists of 15,918 reports. This translates into 15,025 report days because on some days more than one bond analyst issues a report for the same firm. Tests analyzing the number of reports or the distribution of recommendations (i.e., tables 3 and 7) are conducted at the report level. We use observations at the firm-day level for our bond trading volume and price return tests (i.e., tables 4 to 6). Panel B of table 1 provides a breakdown of the reports for each of the 10 brokers included in our sample. Four of the brokers are included in the top 10 broker-fixed income

[11] For investment grade bonds, if the par value of the transaction is greater than $5 million, the quantity field in TRACE contains the value of "5MM+." We set these transaction values to $5 million. For high-yield and unrated bonds, TRACE codes trades of above $1 million as "1MM+." We set these transaction values to $1 million. Due to these choices, the magnitude of the bond volume effects we document is understated.

[12] When possible, we code bond-issue-specific information: coupon rate, principal value, maturity date, and seniority. We match only about 55% of our bond report sample at the firm-issue level because analysts often provide insufficient information to identify the bond issue and allow for a reliable match. Furthermore, in those cases in which analysts provide debt-issue-specific recommendations per firm, these recommendations are rarely different from each other. Untabulated sensitivity analyses using firm-issue-level observations produce qualitatively similar results.

TABLE 1
Sample Selection

Panel A: Sample selection process

	Reports	
Filters	Number	Percent
Reports with recommendations collected and coded from First Call	28,378	100.0
Intersection with TRACE/Mergent FISD	23,335	82.2
Intersection with Compustat	19,931	70.2
After eliminating observations without data	19,103	67.3
After eliminating observations of private firms	15,918	56.1
Report observations at the firm-day level	15,025	

Panel B: Sample partitioned by broker

	Reports	
Broker Name	Number	Percent
BNP Paribas	298	1.9
Banc of America*	2,272	14.3
Bank One Capital Markets	438	2.8
Bear Stearns*	2,326	14.6
CIBC World Markets	450	2.8
Deutsche Bank	2,031	12.8
Morgan Keegan	99	0.6
Merrill Lynch*	3,939	24.7
Scotia Capital	658	4.1
UBS*	3,407	21.4
Total	15,918	

This table summarizes the sample selection process (panel A), and the breakdown of bond analysts' reports by the 10 brokers included in the sample (panel B). In panel B, an * immediately following the broker name indicates that the broker's fixed-income research department is ranked as one of the 10 best, as determined in *Institutional Investor*'s September 2006 issue.

research departments, as published in *Institutional Investor*'s September 2006 issue.

3.3 DESCRIPTIVE STATISTICS

Table 2 presents selected descriptive statistics about our sample. Detailed definitions of variables are presented in appendix A. Panel A shows that the bonds discussed most often in bond analysts' reports range in size from $200 to $400 million and have a remaining time to maturity of 7.5 to 10 years. Following prior research (Harris and Piwowar [2006], Edwards, Harris, and Piwowar [2007]), we compute a complexity index based on bond characteristics that cause bonds to be more difficult to value. Untabulated analysis indicates that trading occurs on 46% of days per firm, and the average number of trades per day conditional on trading is 5.1.

The first columns of panel B present characteristics of the firms in our sample. The last columns of panel B show the characteristics of firms with bonds not covered by our bond analysts.[13] Compared with this group, firms

[13] This comparison group includes firms with and without publicly traded equity. Restricting this comparison group to firms with publicly traded equity (like our sample firms) does not affect any inferences.

TABLE 2

Descriptive Statistics on Sample Firms and Bonds

Panel A: Bond characteristics

Feature	Number	Percent	Feature	Number	Percent
Issue size			**Years to maturity**		
Less than $200M	2,818	18.8	Less than 1 year	205	1.4
From $200M to $400M	7,068	47.0	From 1 year to 5 years	2,485	16.5
From $400M to $600M	2,672	17.8	From 5 years to 7.5 years	3,977	26.5
From $600M to $800M	1,129	7.5	From 7.5 years to 10 years	4,476	29.8
More than $800M	1,338	8.9	More than 10 years	3,882	25.8
Complexity index					
Less than 1	2,936	19.5			
From 1 to 2	9,515	63.3			
More than 2	2,574	17.1			

Panel B: Firm characteristics

	Bond-Analyst Sample			Sample of Mergent Firms with No Bond Analysts		
	Mean	Median	No. of Obs.	Mean	Median	No. of Obs.
Total assets ($M)	12,004***	5,152	1,999	3,662	1,161	6,180
Leverage	0.36**	0.32	1,999	0.35	0.29	6,176
Interest coverage	7.34***	4.34	1,976	10.37	4.56	6,035
Profitability	0.12***	0.12	1,993	0.10	0.11	6,147
Sales growth	0.11	0.07	1,995	0.11	0.07	6,086
Market-to-book	2.44*	1.94	1,963	2.71	2.06	4,504

Panel C: Timing of other events around bond analyst reports

	Five-Day Periods (Day 0 = Date of Bond Analyst Report)		
	Before Report (Day −7 to −3)	At Time of Report (Day −2 to +2)	After Report (Day +3 to +7)
Equity analyst reports	3,378 (22.5%)	4,742 (31.6%)	3,301 (22.0%)
Rating changes	195 (1.3%)	335 (2.2%)	218 (1.5%)
Watchlist additions	131 (0.9%)	278 (1.9%)	86 (0.6%)
Outlook additions	101 (0.7%)	182 (1.2%)	117 (0.8%)
Earnings announcements	1,755 (11.7%)	4,331 (28.8%)	931 (6.2%)
Conference calls	1,884 (12.5%)	4,591 (30.6%)	1,337 (8.9%)
Management forecasts	989 (6.6%)	2,165 (14.4%)	569 (3.8%)
Any event	5,236 (34.8%)	8,080 (53.8%)	4,558 (30.3%)

This table provides descriptive statistics for the 15,025 reports at the firm-day level (see table 1 for sample selection procedure). Panel A describes the bond characteristics of our sample. Panel B compares the firm characteristics of our sample with the characteristics of firms with bonds not covered by our bond analysts. Panel C shows the number of other events around the issue date of bond analyst reports. The percentage reported in parentheses is the number of reports scaled by the total number of bond analyst reports. Variables are defined in appendix A. ***, **, and *denote significance at the 1%, 5%, and 10% levels, respectively, using two-tailed tests.

in our sample are larger, have lower interest coverage and market-book ratios, and have modestly higher leverage and profitability. These differences are consistent with Johnston, Markov, and Ramnath [2009], who formally study which firms receive more bond analyst research.[14]

[14] We also investigate the Fama-French industries with the highest concentrations of bond analysts' reports. Telecommunication and Automotive represent the two most common industries, and contain 16.0% and 10.3% of sample reports, respectively. Utilities, Energy, and Fun

3.4 TIMING OF OTHER EVENTS RELATIVE TO BOND ANALYSTS' REPORTS

Bond analysts exercise discretion in their decision to issue reports. Panel C of table 2 shows the frequency of other events around bond analysts' reports. For example, for 22.5% of bond analysts' reports, an equity analyst's report is issued in the five-trading-day window prior (day −7 to −3) to bond analysts' reports (on day 0). 31.6% of the bond analysts' reports are contemporaneous (day −2 to +2) with an equity analyst's report. For 22.0% of bond analysts' reports, an equity analyst's report is issued in the five-trading-day window after (day +3 to +7) the bond analysts' report.

In general, there is some clustering of other events around the bond analysts' reports, consistent with bond analysts' role of interpreting existing information. A similar pattern is found in the equity literature. For example, Stickel [1989], Jennings [1987], and Bowen, Davis, and Matsumoto [2002] document that equity analysts' forecast revisions are more likely to occur on the days around earnings announcements, management forecasts, and conference calls, respectively. In reading a subset of the reports, we are not aware of any examples of bond analysts responding to equity analyst reports (or vice versa), so the clustering of equity and bond analysts' reports is consistent with both bond and equity analysts responding to or anticipating the same event. We highlight that for many bond analysts' reports, there is no other disclosure, which is more consistent with bond analysts collecting new information.

This clustering supports our use of these other events as controls in our tests. In untabulated analysis, we replicate our tests without the subsample of 8,080 bond analyst reports that are contemporaneous with any other event. These tests consist of 6,945 reports at the firm-day level, and produce similar results and inferences to the tabulated analyses.

4. *Empirical Analysis of Bond Analysts' Recommendations*

In this section, we examine the distribution of bond analysts' buy, hold, and sell recommendations. Table 3, panel A presents this analysis, while panel B presents analogous tests for equity analysts.[15] The number of equity analysts' recommendations is much larger than it is for bond analysts because we draw on the full sample of brokers from the IBES equity recommendation database.

4.1 UNCONDITIONAL DISTRIBUTION

The first column of panel A in table 3 shows that the unconditional distribution of bond analysts' recommendations is skewed positively—39.1%

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are the next industry groups with the highest concentration of bond analysts' reports. Untabulated analysis shows that no industry has undue influence; i.e., excluding bond analysts' reports from a particular industry does not affect our empirical findings.

[15] This analysis is conducted at the report level. In untabulated analysis, we aggregate reports to create a consensus recommendation by all analysts that issue a report for the firm on the same day. All inferences are similar to the tabulated results.

(13.6%) of the total recommendations are buys (sells)—raising the question of whether bond analysts strategically add positive bias. While this skewness may partly reflect an asymmetric bond investor demand for negative

TABLE 3

Distribution of Bond Analysts' Buy, Hold, and Sell Recommendations

Panel A: Distribution of bond analysts' recommendations

		By Credit Rating			By Affiliation	
	All (1)	AA and Up (2)	BBB-A (3)	Below BBB (4)	Affiliated (5)	Unaffiliated (6)
Buys	6,229	47	1,559	4,623	1,507	4,722
(% of total)	(39.1%)	(14.2%)	(28.2%)	(46.0%)	(45.6%)	(37.4%)
Holds	7,529	159	2,845	4,525	1,454	6,075
(% of total)	(47.3%)	(48.2%)	(51.5%)	(45.0%)	(44.0%)	(48.2%)
Sells	2,160	124	1,126	910	346	1.814
(% of total)	(13.6%)	(37.6%)	(20.4%)	(9.1%)	(10.5%)	(14.4%)
Total	15,918	330	5,530	10,058	3,307	12,611
(% of all)		(2.1%)	(34.7%)	(63.2%)	(20.8%)	(79.2%)

Chi-square tests of difference in distribution (*p*-value)

AA and Up (2) vs. BBB-A (3)	66.0***	(<0.001)
BBB-A (3) vs. below BBB (4)	665.3***	(<0.001)
Affiliated (5) vs. unaffiliated (6)	83.7***	(<0.001)

Report-issuance intensity

	AA and Up	BBB-A	Below BBB
Reports per firm	12.2	18.6	24.2

Panel B: Distribution of equity analysts' recommendations

		By Credit Rating			By Affiliation	
	All (1)	AA and Up (2)	BBB-A (3)	Below BBB (4)	Affiliated (5)	Unaffiliated (6)
Buys	15,861	1,111	8,942	5,808	2,129	13,732
(% of total)	(44.0%)	(44.7%)	(44.3%)	(43.3%)	(45.6%)	(43.7%)
Holds	16,228	1,119	9,213	5,896	2,054	14,174
(% of total)	(45.0%)	(45.0%)	(45.7%)	(43.9%)	(44.0%)	(45.1%)
Sells	4,000	255	2,024	1,721	483	3,517
(% of total)	(11.1%)	(10.3%)	(10.0%)	(12.8%)	(10.4%)	(11.2%)
Total	36,089	2,485	20,179	13,425	4,666	31,423
(% of all)		(6.9%)	(55.9%)	(37.2%)	(12.9%)	(87.1%)

Chi-square tests of difference in distribution (*p*-value)

AA and Up (2) vs. BBB-A (3)	0.4	(0.824)
BBB-A (3) vs. below BBB (4)	63.7***	(<0.001)
Affiliated (5) vs. unaffiliated (6)	7.1***	(0.029)

Report-issuance intensity

	AA and Up	BBB-A	Below BBB
Reports per firm	92.0	67.7	32.3

Panel C: Tests of difference in distribution between bond analysts (panel A) and equity analysts (panel B)

		By Credit Rating			By Affiliation	
	All (1)	AA and Up (2)	BBB-A (3)	Below BBB (4)	Affiliated (5)	Unaffiliated (6)
Chi-square tests	131.1***	227.8***	685.3***	83.9***	0.3	178.2***
(*p*-value)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(0.99)	(<0.001)

(*Continued*)

TABLE 3 — *Continued*

Panel D: Bond analysts' recommendations by whether they disagree with equity analysts' recommendations

Bond Analysts Recommendations	By Equity Analyst Recommendation Buys (1)	Holds (2)	Sells (3)	Bond Analysts Disagree with Equity Analysts (4)	Total (5)
Buys	1,564	1,544	394	1,938	3,502
(% of total)	(44.7%)	(44.1%)	(11.3%)	(55.3%)	
Holds	1,992	2,052	525	2,517	4,569
(% of total)	(43.6%)	(44.9%)	(11.5%)	(55.1%)	
Sells	486	684	235	1,170	1,405
(% of total)	(34.6%)	(48.7%)	(16.7%)	(83.3%)	

This table provides an analysis of analysts' recommendation levels. Panel A covers bond analysts and panel B equity analysts. In each panel, column 1 shows the unconditional distribution of analysts' buy, hold, and sell recommendations. Columns 2 to 4 partition the distribution by credit rating categories and provide the number of reports issued per firm by category. Columns 5 and 6 partition the distribution by analyst affiliation (or lack thereof). The top number in each cell is the number of reports. The number in parenthesis is the percentage of total recommendations for that column. The bottom number in each column is the total number of reports for the column. The bottom number in parentheses is the percentage of all recommendations. Each panel presents chi-square statistics from tests of whether two distributions *within* the panel are different from each other. The number in parentheses is the chi-square statistic *p*-value. For example, in panel A the first test statistic provides evidence whether the distribution of bond analysts' reports about firms with ratings of AA and up differs from the distribution of similar reports for firms with BBB to A ratings. Panel C presents chi-square statistics from tests of whether two distributions *across* panels A and B are different from each other. For example, column 1 of panel C provides the test statistic whether the unconditional distribution of bond analysts' recommendations in column 1 of panel A is different from the unconditional distribution of equity analysts' recommendations in column 1 of panel B. Panel D provides descriptive statistics on how frequently bond and equity analysts' recommendations disagree.

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively, using two-tailed tests. Variables are defined in appendix A.

information, it is clearly not the dominant effect. Untabulated analysis indicates that the number of bond analysts' reports is spread fairly evenly across years and that all years display a positive skewness. The unconditional distribution of equity analysts' recommendations in column 1 of panel B shows that the percentage of equity buys (sells) is 44.0% (11.1%). In support of H1, the distribution of recommendations is skewed more positively for equity analysts than for bond analysts. The difference in the distribution is statistically significant. (See panel C for chi-square tests of statistical differences in distributions between bond and equity analysts.) This result is consistent with two notions: Compared with equity analysts, bond analysts act less strategically and produce more negative information.

4.2 DISTRIBUTION BY CREDIT QUALITY

In columns 2 to 4, we partition the recommendations into three groups by credit rating. Superior-rated firms have a rating of AA or better (according to firm's S&P senior debt rating). The second group includes investment-grade firms rated BBB to A. High-yield firms, rated below BBB, comprise the third group. Panel A shows that bond analysts issue only a small number of reports for superior-rated firms (approximately 2% of all reports); a majority of reports (63.2%) are about firms with high-yield bonds. While this difference is partly due to less coverage of superior-rated firms (27 vs. 416 high-yield firms), bond analysts also issue fewer reports per superior-rated firm (12.2) than per high-yield firm (24.2). This difference in report-issuance intensity is consistent with bond investors' greater demand for information about high-yield bonds because of their greater sensitivity to news. Panel B shows that equity analysts' reports display the opposite pattern, the majority of equity analysts' reports concern investment-grade firms, further supporting our proposition that bond analysts' reports are particularly important for high-yield bond investors.

Returning back to panel A, the distribution of bond analysts' recommendations for superior-rated firms is skewed negatively. The percentage of sells (37.6%) is more than double the percentage of buys (14.2%) and the distribution becomes more positive as the firms become riskier. The percentage of buys increases to 28.2% then to 46.0%; the percentage of sells decreases to 20.4% when we examine the other investment grade, and to 9.1% for high-yield firms. Chi-square tests of differences in the distributions by rating group are statistically significant.[16] In comparison, panel B shows that the skewness of equity analysts' recommendations changes little as credit quality decreases. While the distribution of recommendations for BBB-A-rated firms (in column 3) is more positively skewed than the distribution of recommendations for Below-BBB-rated firms (in column 4) using a statistical test, there is little economic difference. These patterns are consistent with H1a, and support the idea that recommendations may in part be skewed less positively for bond analysts because of the asymmetric bond investor demand for negative information.

4.3 DISTRIBUTION BY AFFILIATION

Columns 5 and 6 in panel A provide the recommendation distributions of affiliated and unaffiliated bond analysts, respectively. Bond analysts are classified as affiliated if the broker employing the analyst is the lead underwriter for a bond or is the lead arranger of a syndicated loan issued by the firm in the 12 months prior to the report. About 21% of bond analysts' reports are issued by affiliated analysts. Affiliated bond analysts are more likely to issue buys (45.6%) than sells (10.5%) and their distribution is skewed more positively than that of unaffiliated bond analysts, whose buys (sells) represent 37.4% (14.4%). The difference in the distribution is statistically significant. Untabulated analysis indicates that the recommendation distribution patterns across credit quality and affiliation we document in panel A do not subsume each other.

The corresponding columns 5 and 6 in panel B present the results for affiliated and unaffiliated equity analysts, respectively. Equity analysts are classified as affiliated if the broker employing the analyst is the lead manager of the syndicate underwriting the firm's initial public or secondary

[16] In untabulated analysis, as an alternative way to partition firms based on risk, we categorize each firm by whether its bonds are distressed, which is defined as bonds that trade 10% below face value and are rated below BB−. It is important to also consider the credit rating to avoid classifying bonds issued at a discount as distressed. We also use alternative discount thresholds such as 30% and 20%. All inferences are similar to those in the panel A analysis.

offering during the sample period.[17] While, as expected, affiliated equity analysts' recommendations are more positive than those of unaffiliated equity analysts the difference in our sample is surprisingly small compared with the extant literature. In our sample, affiliated (unaffiliated) equity analysts' buys equal 45.6% (43.7%) and sells equal 10.4% (11.2%) of total recommendations. Malmendier and Shanthikumar [2007, table 1], using a different sample of firms and a time period of October 1993 to December 2002, find that affiliated (unaffiliated) equity analysts' buys equal 72.0% (57.6%) and sells equal 2.3% (4.8%) of total recommendations. In summary, although we find that affiliation is associated with positively skewed bond analysts' recommendations, a lack of affiliation effect for equity analysts' recommendations precludes support for H1b. Hence, affiliation-associated positive skewness does not explain the difference in positive recommendation skewness between bond and equity analysts.

5. *Empirical Analysis of Bond Market Reaction to Bond Analysts' Reports*

This section describes our bond market reaction tests and results. We first discuss our measures of bond market reactions in section 5.1., then proceed to the univariate and multivariate analyses, presented in sections 5.2 and 5.3, respectively.

5.1 BOND MARKET REACTION MEASUREMENT

We focus on how the bond market reacts to bond analysts' reports. The majority of event studies examining bond-related announcements in the extant literature actually use equity returns to measure investor reaction. These studies implicitly assume that the news affects bond and equity holders similarly. This, however, may not be the case. Alexander, Edwards, and Ferri [2000a] find that events associated with conflicts between bondholders and stockholders (e.g., adoption of a risky project, stock repurchases, or changes in dividend payments) lead to bond and equity returns that move in opposite directions. Goh and Ederington [1993] show that rating downgrades due to changes in firms' leverage do not convey negative information for stock holders because these announcements likely lead to a wealth transfer from bondholders to stockholders. Parrino and Weisbach [1999] show that the bondholder-stockholder conflict leads to substantial distortion in investments. Furthermore, while bond and stock returns are correlated at the aggregate level, measured, for example, using portfolios of firms, or using monthly or annual observations, the individual firm-level correlation is weak (Alexander, Edwards, and Ferri [2000a], Collin-Dufresne,

[17] We also restrict the sample of equity analysts defined as affiliated to those whose brokers lead a security in the last 12 months prior to the report, a window resembling that used to define affiliated bond analysts. Untabulated analysis indicates that this definition results in a much smaller sample of affiliated equity analysts because equity issuance for our sample firms is less frequent than bond issuance. These results, however, are similar to the tabulated analyses.

Goldstein, and Martin [2001], Hotchkiss and Ronen [2002]). When bond price reactions are used, often the sample is small (e.g., Alexander, Edwards, and Ferri [2000a] study 139 events across 39 bonds; Hotchkiss and Ronen [2002] study 99 events for 36 bonds) or the event window is coarse (e.g., Hite and Warga [1997] examine monthly returns). Hand, Holthausen, and Leftwich [1992] is an exception, studying bond price reactions using short-event windows and a larger sample (approximately 250 watchlist additions and 1,100 rating changes).

An important reason why previous studies use the equity market reaction is that the low frequency of bond trade data makes it difficult to conduct short-window tests in bond markets (see, e.g., Goodhart and O'Hara [1997], Hotchkiss and Ronen [2002]). While our sample is not immune to this concern, we have the benefit of TRACE data, which, as mentioned above, captures practically all bond trades by all bond investors. Previous data were limited to FISD data, which only includes trades by insurance companies. In addition, compared with other studies, we have the advantage of a large sample of events (i.e., 15,025 report observations at the firm-day level).

Our bond market reaction tests rely primarily on changes in trading volume. If bond analysts' reports matter to bond investors then they should generate additional trading. Volume reactions are associated with new information (e.g., Karpoff [1987], Kim and Verrecchia [1991]) as well as information that leads to a divergence of opinions among investors (e.g., Harris and Raviv [1993], Kim and Verrecchia [1994]). Cready and Hurtt [2002] study the differential ability of equity volume and equity price return metrics to assess equity investor response to information events. They find that volume-based metrics provide more powerful tests of investor response than do return-based metrics. When feasible, we supplement the bond-volume tests with bond return tests. The issue with using bond returns is that the requirement of bond prices just before and after the event leads to a dramatically smaller sample, and hence less powerful tests.

5.2 UNIVARIATE ANALYSIS

Our analysis starts with a figure that plots the daily average trading volume (measured on the vertical axis) in event time (measured on the horizontal axis). The graphs include the 30 trading days before and 30 trading days after the event, where day 0 is the date of the event. A single aggregate volume measure for each event day is created by taking each bond's dollar volume of principal traded on the event day scaled by the bond issue size, and then averaging this measure over all firms and bond issues. Figure 1, panels A and B plots the volume reaction to reports by bond and equity analysts, respectively, partitioned by buys, holds, and sells. The two figures show that the volume spikes on day 1 and that it is also higher than normal on the days immediately around day 1, consistent with the bond market reacting to bond and equity analysts' reports. The reaction between bond and equity analysts, however, differs conditional on the recommendation level. Bond analysts' sell and buy recommendations are more informative than their hold recommendations. For equity analysts, while there is a spike

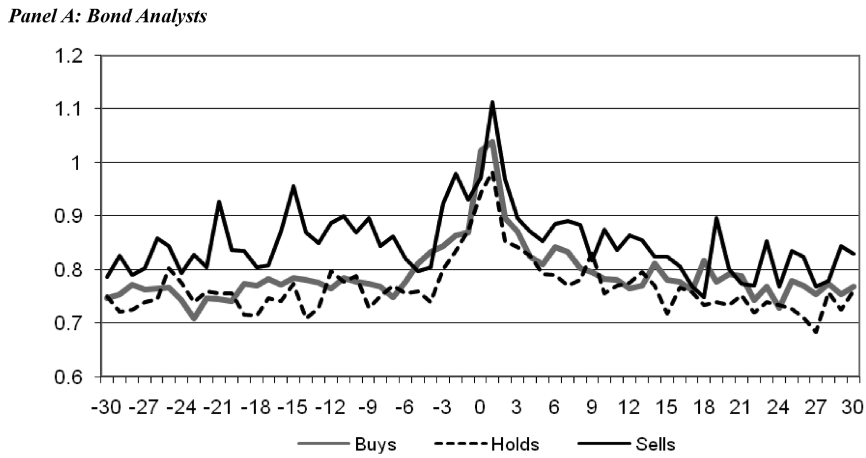

FIG. 1.—Plot of bond volume around analysts' reports by recommendation level. This figure plots the average daily trading bond volume for buy, hold, and sell analysts' reports from 30 trading days before to 30 trading days after day 0. Day 0 is the date the analyst report was published. Panel A presents the figure for bond analysts; panel B does so for equity analysts. See appendix A for variable definitions.

upwards around the date of a sell or a hold, the bond market reaction to equity analysts' buy recommendations is muted.

Table 4, columns 1 to 4 present summary statistics of abnormal volume tests for bond analysts, equity analysts, rating changes, and watchlist additions events. *Abnormal Volume* is the average daily firm volume (scaled by the bond issue size) during the five-day event window centered on day 0 (the date of the event) less the average daily volume for the nonevent 30-day period before and 30-day period after the event window.[18] The sample for

[18] If the nonevent period contains a type of event similar to an observation event (e.g., when calculating trading around bond analysts' events and the nonevent period contains another

TABLE 4

Univariate Bond Market Reaction by Type of Event

	Daily Abnormal Bond Trading Volume				Adjusted Bond Returns			
	Mean (1)	Median (2)	*t*-stat. (3)	No. Obs. (4)	Mean (5)	Median (6)	*t*-stat. (7)	No. Obs. (8)
Bond analysts' reports								
All	0.233***	0.044	45.82	14,686	0.003***	0.002	7.44	7,430
Buys	0.241***	0.050	31.55	5,891	0.005***	0.003	8.00	2,716
Holds	0.202***	0.017	27.73	6,828	0.002***	0.002	3.56	3,551
Sells	0.317***	0.119	19.15	1,967	0.000	0.001	−0.36	1,163
Buys – sells	−0.076***		−4.65		0.005***		4.83	
Equity analysts' reports								
All	0.214***	0.002	53.87	30,886	0.002***	0.002	7.78	13,811
Buys	0.192***	−0.001	34.39	14,085	0.002***	0.002	8.07	6,071
Holds	0.236***	0.009	37.70	13,659	0.001***	0.002	3.31	6,303
Sells	0.218***	0.012	17.31	3,142	0.001	0.002	1.45	1,437
Buys – sells	−0.026*		−1.97		0.001*		1.76	
Rating changes								
All	0.373***	−0.003	9.91	1,279	−0.008***	0.000	−2.69	645
Upgrades	0.178***	−0.007	3.69	394	0.006***	0.003	2.66	193
Downgrades	0.460***	−0.001	9.25	885	−0.014***	−0.003	−3.44	452
Upgrades – downgrades	−0.282***		−3.47		0.020***		3.15	
Watchlist additions								
All	0.470***	0.100	11.20	690	−0.011***	−0.003	−3.89	391
Positive	0.321***	0.082	3.99	119	0.012***	0.007	3.39	72
Negative	0.501***	0.101	10.49	571	−0.016***	−0.006	−4.97	319
Positive – negative	−0.180		−1.62		0.028***		4.06	

This table presents a univariate analysis of bond market reactions to bond-related events. The first set of columns presents the mean, median, *t*-statistic, and number of observations of abnormal daily trading volume averaged over a five-trading-day period centered on the event date. The second set of columns presents the mean, median, *t*-statistic, and number of observations of T-bill-adjusted bond returns calculated over a five-trading-day period centered on the event date. *T*-statistics test whether the mean value is different from zero.

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively, using two-tailed tests. Variables are defined in appendix A.

these events is slightly smaller than that reported above because it only includes events in which the bond was traded in either the event or nonevent periods.

Because our next analysis is an analogous multivariate version of the univariate bond volume tests, we refrain from making inferences using the univariate results. We do offer a few comments. The bond market reaction to negative news for each type of event is stronger than the bond market reaction for positive news. Furthermore, for all events, the mean reaction is greater than the median reaction, indicating positive skewness in the

bond analyst event), any trading in the five-day window centered on the other similar event is excluded from the calculation of the nonevent average daily volume. Untabulated analysis indicates that results are similar if we delete the trading around any type of event that occurs in the nonevent window.

distribution of bond volume reactions. Bond analysts' reports have a positive median bond volume reaction, and hence the percentage of positive reactions is greater than negative reactions (the difference is statistically significant based on an untabulated sign test). The patterns of bond volume reactions in the multivariate analysis (discussed below) are generally similar to those in the univariate tests.

Columns 5 to 8 of table 4 present the univariate bond market reaction test results using bond returns instead of abnormal bond volume. Appendix B outlines how we calculate bond returns. The sample of observations per type of event is smaller because it is limited to firms that have bond trade data available to calculate the bond returns. We do not expect this bias toward more heavily traded firms to affect our inferences because we lose a similar amount of observations across the various events. While we adjust our realized bond returns for changes in the risk-free rate, we do not do so for an expected rate of return. Since our definition of bond returns includes coupon payments, we expect bond returns to be positive on average. When making univariate inferences, we thus focus on the difference in bond returns between positive and negative events. The table 4 pattern of bond return results generally parallels the bond volume results, albeit at lower levels of statistical significance. For instance, the difference between bond analysts' buys and sells is about 0.5% or 50 basis points, which is quite large given the low variability of bond prices compared to equity prices. The difference in bond returns between buys and sells for equity analysts is 0.1%, considerably less than that for bond analysts.

5.3 MULTIVARIATE ANALYSIS

Our first multivariate analysis uses bond trading volume to compare the bond market reaction across events to test hypotheses H2, H2a, and H2b. To test hypotheses H2c and H2d, we present a cross-sectional analysis of the bond market reaction to analysts' reports using both bond trading volume and returns.

5.3.1. Multivariate Analysis of Bond Volume Reactions by Type of Event.

5.3.1.1. Main Tests. Our empirical analysis includes observations for all trading days during the five-year period studied for each of the 633 sample firms. Within this framework, we have the flexibility to model all the events in the same test, and to compare the magnitude of the bond volume reactions across events. For each event, we assign the news to the day of, and to each of the two days immediately before and after, the announcement day (i.e., we use a five-day event window). To test H2, for example, we estimate

$$\begin{aligned} Volume_{it} = {} & \beta_0 + \beta_1 Bond\ Report_{it} + \beta_2 Equity\ Report_{it} + \beta_3 Rating\ Change_{it} \\ & + \beta_4 Watchlist_{it} + \beta_5 Outlook_{it} + \beta_6 Earnings_{it} \\ & + \beta_7 Conference\ Call_{it} + \beta_8 Management\ Forecasts_{it} \\ & + \beta_9 Fed\ Change_{it} + \beta_{10} TB\ Change_{it} + Year\ Effects + \eta_{it}. \end{aligned} \tag{1}$$

Bond Report is an indicator variable that equals one if a bond analyst's report is issued about firm i's bonds in the five-day period centered on day t, zero otherwise. Other event indicator variables are defined in the same way (see appendix A). The intercept captures the bond volume on days that are at least three days distant from any event (i.e., nonevent days), and therefore represents "normal" bond volume. We expect the coefficient on each of the event indicator variables to be positive, consistent with incremental bond volume incurring around each event. For all the multivariate analyses, we estimate *t*-statistics based on standard errors clustered at the firm level. Untabulated sensitivity tests indicate that all inferences remain the same if we include firm fixed effects.

We incorporate into our bond volume reaction tests disclosures by two other major information sources: rating agencies and firms. Certified rating agencies such as Moody's, Standard & Poor's (S&P), or Fitch continue to have access to private information from management following Reg FD because these agencies are exempt from the regulation. Jorion, Liu, and Shi [2005] document that the equity market reaction to rating changes is greater in the post-Reg FD period. This finding suggests that agencies have access to information unavailable to analysts or other market participants. In addition, rating changes are widely and publicly disseminated, unlike bond analysts' recommendations that are targeted to specific client investors.

However, the incentives of bond analysts are geared toward advising their institutional clients, creating an expectation that bond analysts issue more timely information about bond securities. While rating agencies have incentives to issue timely information, they also have the additional goal of rating stability, partly because ratings are used for contracting. This latter objective could lead to less timely information, and hence to less of a bond market reaction to that information. Beaver, Shakespeare, and Soliman [2006] make similar arguments when comparing certified rating agencies to noncertified rating agencies, which have incentives more akin to those of analysts. Beaver et al. find that noncertified rating changes lead certified rating changes and that equity prices respond more to rating changes issued by noncertified rating agencies. An alternative explanation for less timely information by rating agencies is that given their small number, certified agencies have an effective oligopoly in the market for ratings, reducing their incentive to be responsive to investors.[19] An alternative mechanism by which rating agencies deliver more timely information without sacrificing rating stability is by adding companies to their watchlists. Hand, Holthausen, and Leftwich [1992] show that unexpected watchlist additions affect both bond and equity markets. Whether these alternative rating agency events subsume the information in bond analysts' reports is unclear.

Our analysis also includes important mandatory and voluntary firm disclosures—earnings announcements, management forecasts, and conference calls.[20] While the effect of earnings announcements on credit markets

[19] Studies of the timeliness of rating agency disclosures include Hite and Warga [1997] and Ball, Bushman, and Vasvari [2008].

[20] See, e.g., Beaver, Lambert, and Morse [1980], Tasker [1998], and Frankel, Johnson, and Skinner [1999].

have been studied (e.g., Easton, Monahan, and Vasvari [2009]), the credit-market effect of management forecasts and conference calls has not. We make no prediction about the difference in bond volume reactions between firm disclosures and bond analysts' reports. Last, to control for macroeconomic news, we include variables that denote announcements of federal funds rate changes (*Fed Change*) and extreme daily changes in T-bill prices (*TB Change*). The broad and comprehensive set of information events in our bond volume reaction tests provides important benchmarks to evaluate the reactions to bond analysts' reports. Furthermore, by including these events, we mitigate an alternative explanation that bond volume reactions and bond analysts' reports are both caused by other events.

The results of estimating equation (1) are presented in column 1 of table 5, panel A. The coefficient on *Bond Report* is 0.180 (t-statistic = 10.25). Over the five-day event window an incremental 0.90% (5 days $\times$ 0.180% per day) of the bonds' principal is traded around a bond analyst's report. This result is consistent with bond investors reacting to bond analysts' reports, and these reports not being subsumed by the information contained in equity analysts' reports, rating agency announcements, firm disclosures, and macroeconomic news as measured by our other explanatory variables. The results also show that the coefficient on *Equity Report* is 0.112. Consistent with H2, the reaction to reports is greater for bond than for equity analysts. An untabulated test confirms that this difference in coefficients is significantly different from zero (p-value < 0.001).

Given that rating changes are established as important economic events, we use rating change events to gauge the relative economic importance of bond analysts' reports. The coefficient on *Rating Change* is 0.438, which translates into an incremental 2.19% of the bonds' principal being traded around the five days of a rating change. While the coefficient on bond analysts' reports is about two-fifths the coefficient for rating changes, the frequency of bond analysts' reports is much higher (about 10 times as frequent according to our data), implying that bond analysts' reports are also economically important.[21] Watchlist additions also trigger strong bond volume reactions, consistent with their purpose of providing timely credit news. The coefficient on outlook changes is not statistically significant.

Finally, bond analysts' reports seem to produce a greater bond volume reaction than earnings announcements, conference calls, and management forecasts.[22] Changes in the Federal Funds rate are associated with abnormal

[21] The total amount of incremental information associated with information events is modest according to Ball and Shivakumar [2008], who show that the average quarterly earnings announcement is associated with about 1% of total annual information. Our inference that bond analysts' reports are economically significant is based on the bond volume reaction to bond analysts' reports relative to the bond volume reaction to other types of announcements established as economically important.

[22] The coefficient on *Earnings* is negative, which is the opposite of what we expect. Untabulated analysis indicates that this is due to the high positive correlations with the other firm disclosures. Pearson correlations between *Earnings* and *Conference Call*, and *Management Forecast*

TABLE 5

Multivariate Analysis of Bond Trading Volume by Type of Event

Panel A: Main tests

	(1)	(2)	(3)	(4)
Bond Report	0.180***	0.165***	0.157***	0.195***
	(10.25)	(9.78)	(8.37)	(8.02)
Bond Report Buy			−0.017	
			(−0.60)	
Bond Report Sell			0.208***	
			(4.21)	
Equity Report	0.112***	0.105***	0.135***	0.107***
	(12.86)	(12.58)	(12.08)	(12.92)
Equity Report Buy			−0.054***	
			(−4.34)	
Equity Report Sell			0.025	
			(1.17)	
Bond and Equity Report		0.055***		
		(2.58)		
Bond Equity Disagree				0.047**
				(1.96)
Rating Change	0.438***	0.438***	0.125**	0.412***
	(5.73)	(5.73)	(2.22)	(5.81)
Rating Change Downgrade			0.453***	
			(4.49)	
Watchlist	0.436***	0.434***	0.190*	0.427***
	(7.24)	(7.21)	(2.04)	(6.65)
Watchlist Neg			0.274**	
			(2.43)	
Outlook	0.023	0.023	−0.057	0.028
	(0.64)	(0.64)	(−1.34)	(0.83)
Outlook Pos			0.069	
			(0.87)	
Outlook Neg			0.243***	
			(4.00)	
Earnings	−0.022	−0.023	−0.047***	−0.018
	(−1.19)	(−1.25)	(−2.64)	(−1.01)
Earnings Neg			0.094***	
			(2.85)	
Conference Call	0.065***	0.065***	0.068***	0.065***
	(3.90)	(3.90)	(4.19)	(3.93)
Management Forecast	0.042**	0.042**	0.049**	0.036*
	(2.18)	(2.20)	(2.59)	(1.85)
Fed Change	0.026***	0.026***	0.026***	0.025***
	(4.20)	(4.20)	(4.19)	(3.96)
TB Change	−0.001	−0.001	−0.001	−0.002
	(−0.27)	(−0.26)	(−0.29)	(−0.38)
Year effects	Yes	Yes	Yes	Yes
No. of obs.	716,979	716,979	716,979	692,286
Adj./pseudo-R^2	0.7%	0.7%	0.7%	0.6%

(*Continued*)

are 0.72, and 0.49, respectively. If we exclude these other disclosures from the regression, the coefficient on *Earnings* is positive.

TABLE 5— *Continued*

Panel B: Robustness tests

	CDS Sample	2005–2006 Sample	Full Sample	
	Dep. Var = Volume	Dep. Var = Volume	Dep. Var = No. of Trades	Dep. Var = Trade
	(1)	(2)	(3)	(4)
Bond Report	0.144***	0.170***	1.824***	0.287***
	(6.52)	(4.73)	(3.74)	(10.42)
Bond Report Buy	0.032	0.016		
	(0.90)	(0.37)		
Bond Report Sell	0.147***	0.282***		
	(2.83)	(2.94)		
Equity Report	0.084***	0.112***	0.652***	0.243***
	(6.67)	(6.17)	(5.74)	(12.25)
Equity Report Buy	−0.040**	−0.041**		
	(−2.59)	(−2.17)		
Equity Report Sell	0.038	0.060*		
	(1.45)	(1.69)		
CDS Pos Price Change	0.118***			
	(7.57)			
CDS Neg Price Change	0.124***			
	(7.82)			
Rating Change	0.085	0.256**	2.549***	0.099***
	(1.19)	(2.34)	(3.46)	(3.03)
Rating Change Downgrade	0.630***	1.042***		
	(4.36)	(3.96)		
Watchlist	0.254	0.264*	1.691***	0.082*
	(1.57)	(2.01)	(4.18)	(1.94)
Watchlist Neg	0.433**	0.395**		
	(2.30)	(2.39)		
Outlook	−0.122*	−0.267**	−0.055	0.037
	(−1.80)	(−2.29)	(−0.16)	(1.29)
Outlook Pos	0.071	0.237**		
	(0.88)	(2.03)		
Outlook Neg	0.345***	0.405***		
	(3.82)	(3.15)		
Earnings	−0.030	0.002	−0.796	−0.194***
	(−1.31)	(0.08)	(−1.63)	(−6.61)
Earnings Neg	0.115**	0.211***		
	(2.51)	(3.07)		
Conference Call	0.064**	0.069**	0.950*	0.182***
	(3.30)	(2.86)	(1.71)	(6.26)
Management Forecast	0.022	0.005	0.076	0.144***
	(1.01)	(0.16)	(0.41)	(3.98)
Issue Size			3.188***	0.823***
			(7.49)	(14.58)
Fed Change	0.027*	0.015*	0.163***	0.068***
	(3.42)	(1.81)	(4.67)	(12.04)

(*Continued*)

TABLE 5 — *Continued*

Panel B: Robustness tests

	CDS Sample	2005–2006 Sample	Full Sample	
	Dep. Var = Volume	Dep. Var = Volume	Dep. Var = No. of Trades	Dep. Var = Trade
	(1)	(2)	(3)	(4)
TB Change	0.007	0.029***	0.087***	0.000
	(1.09)	(4.27)	(3.80)	(0.04)
Year effects	Yes	Yes	Yes	Yes
No. of obs.	388,691	295,399	716,979	716,979
Adj./pseudo-R^2	0.8%	1.3%	10.5%	17.5%

This table presents a multivariate analysis of bond market reactions to bond-related events using trading-volume-based measures. We regress bond trading volume measures (see column headings) on a set of variables indicating whether an event occurred on the trading day. The estimated coefficient on the indicator variables measures the bond market reaction to each event, while controlling for the other events. Panel A presents the main tests and panel B presents robustness tests. All regressions use daily trading volume as the dependent variable with the following exceptions. Columns 3 and 4 of panel B present alternative tests using the number of trades and whether a trade occurred as the respective dependent variables. The panel B column 4 results are estimated using a logistic regression. The underlying sample includes observations for *all* trading days during the 2002–2006 period studied for each of the 633 sample firms, with the following exceptions. The panel A column 4 regression excludes those bond analysts' reports that we are unable to classify as agree or disagree. The panel B column 1 regression includes firms for which CDS data is available. The panel B column 2 regression includes only trading days for the period February 2005 to December 2006 (the TRACE full-coverage period). We estimate each model as a panel with year fixed effects and cluster the standard errors at the firm level. Coefficient *t*-statistics are in parentheses.

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively, using two-tailed tests. Variables are defined in appendix A.

bond volume, while changes in the T-bill rate are not (in this specification; they are in other specifications). Untabulated analysis shows that our results are robust to controls for SEC 10-K, 10-Q, and 8-K filings.

When both bond and equity analysts issue a report it is difficult to attribute the bond volume reaction to either group of analysts. As an alternative specification, in column 2 of panel A, we estimate equation (1) augmented with *Bond and Equity Report*, an indicator variable that equals one if both bond and equity analysts issue a report at the same time, zero otherwise. The coefficient on this variable is positive, consistent with a stronger bond volume reaction when both bond and equity analysts issue reports. More importantly, the 0.165 coefficient on *Bond Report* is greater than the 0.105 coefficient on *Equity Report* (the difference is statistically significant (p-value < 0.001) in an untabulated test). Furthermore, supporting H2, this result indicates that the bond volume reaction to bond analysts' reports not issued at the same time as equity analysts' reports is greater than it is to equity analysts' reports not issued with bond analysts' reports.[23]

[23] In untabulated analysis, we estimate equation (1) augmented with a set of indicator variables that represent the interaction of a bond analyst's report with each of the other events in our tests. For example, *Bond Report and Rating Change* equals one if a bond analyst issues a report at the same time as a rating change, zero otherwise. Inferences about bond analysts' reports from this analysis are identical to the tabulated results.

Next we test a specification that augments equation (1) with additional indicator variables that allow us to distinguish between positive and negative news for each type of event (we refer to this specification as our signed regression). For example, we include in the regression *Bond Report Buy (Sell)*, which is an indicator variable that equals one if a bond analyst's report is issued about firm *i*'s bonds in the five-day period centered on day *t* and the report includes a buy (sell) recommendation, zero otherwise. In this specification, the coefficient on *Bond Report* captures the incremental volume associated with a bond analyst's hold recommendation, and the coefficients on *Bond Report Buy* and *Bond Report Sell* capture the incremental volume associated with a bond analyst's buy and sell recommendations, respectively, relative to a hold recommendation. Other variables are defined analogously (see appendix A).

Column 3 presents these results. The coefficient on *Bond Report Sell* is 0.208, indicating that the bond volume reaction to bond analysts' recommendations is stronger for sell than for hold recommendations. In contrast, the coefficient on *Bond Report Buy* is not significantly different from zero, consistent with the bond volume reaction to bond analysts' recommendations for buys being about the same as it is for hold recommendations. We compare these results to those of equity analysts. The coefficient on *Equity Report Buy* is negative and significantly different from zero, while the coefficient on *Equity Report Sell* is not significantly different from zero. For equity analysts, the bond volume reaction to buys is lower than it is for holds, while the bond volume reaction to sells is not different from the reaction to holds. These patterns correspond with those documented in panels A and B of figure 1, discussed above. Overall, these results are consistent with H2a, that the bond market reaction is greater for bond analysts' buy (sell) recommendations than for equity analysts' buy (sell) recommendations.

In our last specification, we consider the effect of disagreement between bond and equity analysts. We augment equation (1) with an indicator variable, *Bond Equity Disagree*, that equals one if the bond analyst's recommendation disagrees with the most recent equity analyst's recommendation issued for the same firm in the 21-day window before the bond analyst's report, zero otherwise. Our sample for this particular test excludes those bond analysts' reports that we are unable to classify as agree or disagree because there is no equity analyst's report in the 21-day period prior to the bond analyst's report. Panel D of table 3 provides descriptive statistics about how frequently disagreement occurs. Consider, for example, the first row. When bond analysts issue a buy recommendation, equity analysts' outstanding recommendation is a buy 44.7% of the time (i.e., agree), a hold 44.1% (i.e., disagree) and a sell 11.3% of the time (i.e., disagree). Column 4 of table 5 shows that the coefficient on *Bond Equity Disagree* is positive and statistically significant (at the 5% level). This provides support for H2b, that the bond volume reaction to bond analysts' recommendations is greater when bond analysts disagree with equity analysts.

5.3.1.2. Robustness Tests. We perform a number of additional tests, which we present in panel B of table 5. The informational role of the credit default swaps (CDS) market is documented by a series of studies.[24] It is possible that the bond volume reactions we document around bond analysts' reports are due to information already available in the CDS market. To rule out this possibility, we control for signed changes in CDS spreads by augmenting our signed regression with two indicator variables. *CDS Pos* (*Neg*) *Price Change* equals one if the daily change in firms' five-year CDS spread is positive (negative), zero otherwise. We use five-year CDS contracts because CDS with this horizon are the most commonly traded swaps. Not all firms with bonds have CDS, which limits the size of the sample. After merging CDS spreads obtained from Markit, the sample for this test has about 54% of the observations used in the main tests in panel A. Column 1 of panel B presents these results and shows that the coefficients on these two variables are positive and statistically significant, consistent with a greater bond volume reaction when CDS spreads change. Coefficients on bond and equity analysts' reports have similar economic magnitudes and the inferences remain the same.

In our second robustness test in column 2, we reestimate the signed specification using only TRACE data for the period February 2005 to December 2006 (the period over which TRACE covers the entire bond universe in the United States). Inferences remain unchanged, and hence our results are not sensitive to the inclusion of FISD trading data.

Last, we estimate equation (1) using two alternative dependent variables: the number of trades per day and a dichotomous variable indicating whether a trade occurred (similar to that used by Easton, Monahan, and Vasvari [2009]). The latter test is estimated using a logistic regression. Because more bond trading is positively associated with larger bond issues, we augment the model with the variable *Issue Size*. The results, presented in columns 3 and 4, respectively, are similar to those using *Volume* as the dependent variable. In untabulated analysis, we also reestimate the regressions where volume is the dependent variable using a Tobit model because volume is truncated at zero. All inferences are unchanged.

5.3.2. Cross-sectional Analysis of Bond Volume Reactions to Bond Analysts' Reports. In this section, we examine whether rating levels and bond analysts' affiliation can explain variation in the bond volume and return reaction to bond analysts' reports. We start by estimating the following:

[24] Hull, Predescu, and White [2004] find that the CDS market anticipates credit rating events, while Acharya and Johnson [2007] document the presence of an information flow from the CDS market to the equity market for firms with a large number of bank relationships or under financial distress.

$$
\begin{aligned}
Abnormal\ Vol_{ik} = {} & \alpha_0 + \alpha_1 Buy_{ik} + \alpha_2 Sell_{ik} + \alpha_3 BBB\text{-}A\ Rating_{ik} \\
& + \alpha_4 Below\ BBB\ Rating_{ik} + \alpha_5 Affiliated_{ik} \\
& + \alpha_6 Highly\ Traded_{ik} + \alpha_7 Time\ to\ Maturity_{ik} \\
& + \alpha_8 Complexity_{ik} + \alpha_9 On\ Watch\ Neg_{ik} \\
& + \alpha_{10} On\ Watch\ Pos_{ik} + \alpha_{11} Return\ on\ TB_{ik} \\
& + Year\ Effects + \varepsilon_{ik}.
\end{aligned} \tag{2}
$$

See appendix A for variable definitions. *Abnormal Vol* and continuous variables are winsorized at the 1% and 99% levels for this analysis.

Our tests control for several bond characteristics. We posit that actively traded bonds provide investors with a greater opportunity to profit from a trading strategy based on bond analysts' information. An offsetting effect, however, is that actively traded bonds have publicly available prices (at least after the introduction of TRACE). These historical prices represent an alternative information source available to bond investors, which could substitute for the information in bond analysts' reports. Our first proxy for actively traded bonds is whether the bond trading volume is higher than the median trading volume. Our second proxy is the bond's time to maturity. The literature suggests that corporate bonds are more actively traded following issuance and tend to become less liquid with age (Sarig and Warga [1989], Alexander, Edwards, and Ferri [2000b], Hong and Warga [2000], Chakravarty and Sarkar [2003]). Furthermore, with a shorter (longer) time to maturity, the probability of default becomes trivial (increases), so the bond price becomes less (more) sensitive to new information, particularly with regard to news affecting longer term cash flows. As an additional consideration, some bonds provide more opportunity for bond analysts to provide valuable analysis. Bonds with complex features are more difficult to value by investors, creating a demand for bond analysts' assistance in pricing of the securities. Bonds on a rating agency's watchlist are far more likely to suffer from uncertainty associated with the borrowers' operations or capital structure or whether the borrowers' rating will actually change. In general, the more valuable bond analysts' information, the stronger we expect bond market reactions to be. Last, to control for macroeconomic news, we include the daily T-bill return.

The results of estimating equation (2) are presented in column 1 of table 6. The *Buy* and *Sell* coefficients are positive and significantly different from zero, consistent with the table 5 results. The bond volume reaction is stronger for *BBB-A Rating* and *Below BBB Rating* firms. While there seems to be more trading in general for *BBB-A Rating* than for *Below BBB Rating* firms, this difference is not significant. Overall, the results are consistent with a greater volume reaction to bond analysts' reports about low credit quality bonds, thus supporting H2c. The coefficient on affiliation is not significantly different from zero, offering no support for H2d, which predicts that the bond market reaction to bond analysts' recommendations is lower

TABLE 6

Cross-sectional Analysis of Bond Market Reaction to Bond Analysts' Reports

	Abnormal Trading Volume		Adjusted Bond Returns			
	Bond Analyst All Recom. (1)	Equity Analyst All Recom. (2)	Bond Analyst All Recom. (3)	Bond Analyst Buys Only (4)	Bond Analyst Sells Only (5)	Equity Analyst All Recom. (6)
Buy	0.044**	−0.045***	0.003***			0.001***
	(2.43)	(−4.55)	(2.76)			(2.87)
Sell	0.073***	−0.022	−0.002*			0.000
	(2.94)	(−1.46)	(−1.94)			(0.00)
BBB-A Rating	0.187***	0.103***		0.003	−0.005***	
	(4.49)	(3.94)		(0.80)	(−2.91)	
Below BBB Rating	0.143***	0.032		0.008**	−0.007**	
	(3.69)	(1.11)		(2.34)	(−2.55)	
Affiliated	0.009	0.029		−0.000	0.000	
	(0.44)	(1.40)		(−0.26)	(0.24)	
Highly Traded	0.158***	0.149***		0.002	−0.000	
	(8.33)	(9.31)		(1.29)	(−0.11)	
Time to Maturity	0.033***	0.024***		0.000	−0.001	
	(2.91)	(2.74)		(0.34)	(−0.45)	
Complexity	−0.019	0.034*		0.002	0.002	
	(−0.83)	(2.05)		(1.05)	(0.76)	
On Watch Neg	0.232***	0.291***		−0.003	−0.005	
	(4.67)	(8.12)		(−0.99)	(−1.10)	
On Watch Pos	0.014	0.065		0.003	0.005*	
	(0.32)	(1.20)		(0.59)	(1.65)	
Return on TB	0.018	0.010				
	(1.63)	(1.08)				
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	14,477	28,127	7,430	2,651	1,156	13,811
Adj. R^2	4.5%	3.0%	0.7%	1.5%	1.3%	0.3%

This table examines the effect of credit rating levels and analysts' affiliation on bond trading volume and returns around bond and equity analysts' reports. In the first two columns, we regress abnormal trading volume around bond and equity analysts' reports, respectively, on variables that indicate the recommendation level, the credit rating category, and whether the analyst is affiliated. We control for several bond characteristics. In the last four columns, we estimate regressions using adjusted bond returns as the dependent variable. The sample for these tests is limited to observations with available data to calculate the variables. Columns 1, 3, 4, and 5 employ only bond-analyst report events. Columns 2 and 6 are limited to equity-analyst report events, in which explanatory variables are adjusted and defined as appropriate for the sample of equity analyst reports. Columns 1, 2, 3, and 6 use observations with any analyst recommendation (buy, hold, or sell), while columns 4 and 5 are, respectively, restricted to buy and sell recommendations. We estimate each model as a panel with year fixed effects and cluster the standard errors at the firm level. Coefficient t-statistics are in parentheses.

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively, using two-tailed tests. Variables are defined in appendix A.

for affiliated analysts. We also find that the coefficients on *Highly Traded* and *Time to Maturity* variables are positive and statistically significant. This finding suggests that bond investors react more to bond analysts' reports about more actively traded and younger bonds. The significantly positive coefficient on the *On Watch Neg* variables suggests that the bond volume reaction is stronger when a firm and its bonds are likely to be downgraded. The tests provide no evidence that the bond volume reaction is greater for more complex bonds.

As a benchmark, we estimate the same specification but use the sample of equity analysts' reports (column 2 of table 6). That is, we test for cross-sectional variation in abnormal volume measured around the date of equity analysts' reports. Consistent with the table 5 analysis, the coefficient on *Buy* is negative and statistically significant while the *Sell* coefficient is not significantly different from zero. Of note, there is no evidence of an increased reaction to equity reports for high-yield firms compared with superior-rated firms. This result, combined with the column 1 results, is consistent with bond analysts being particularly important relative to equity analysts for high-yield bond investors. Similar to affiliated bond analysts, there is no evidence of a difference in bond market reaction between affiliated and unaffiliated equity analysts. The effects of bond-issue characteristics are similar to those in column 1.

Next, we present tests similar to those for equation (2), but use adjusted bond returns as the dependent variable instead of abnormal bond volume. Column 3 uses the full sample of bond analysts' recommendations. We exclude all the bond characteristic variables from this test because we have no expectation of a relation between these variables and signed returns. For example, while we expect the returns to be *more* positive (negative) for buys (sells) about low credit quality firms compared to high credit quality firms, we have no signed prediction about the relation between short-window returns and credit quality for the full sample of reports.

The coefficient on *Buy* is 0.003 and is statistically significant. This corresponds to a 30 basis point increase in the price of the bond over the five-day window centered on bond analysts' buys, relative to the price change around their holds. Similarly, bond analysts' sells, relative to holds, are associated with bond prices decreasing by 20 basis points compared with price changes around holds (statistically significant at the 10% level). These results corroborate the higher abnormal volume reaction to bond analysts' buys and sells in column 1. Given that the average bond issue size in our sample is approximately $480 million, the value of a portfolio that includes this issue would increase (decrease) by about $1.44 (0.96) million around a bond analyst's buy (sell) relative to a portfolio that invests in Treasury Bills with the same maturity and paying a similar coupon rate. While these rough calculations ignore bond market transaction costs and illiquidity premiums, the impact on the bond price is, nevertheless, significant.

To provide further tests of H2c and H2d, we present the results of estimating equation (2) (excluding *Buy* and *Sell* variables) in columns 4 and 5, using only the buy and sell reports, respectively. In column 4, the coefficient on *Below BBB Rating* is positive and significantly different from zero. In column 5, the coefficients on *BBB-A Rating* and *Below BBB Rating* are negative and significantly different from zero. This evidence indicates that for low credit quality bonds, bond returns net of Treasury Bills returns around bond analysts' buys (sells) are 80 (70) basis points higher (lower) in comparison to superior-rated bonds. These results are consistent with H2c, that the bond market reaction is stronger for low credit quality bonds. There is no evidence in columns 4 or 5 that the bond return reaction differs between affiliated and unaffiliated bond analysts. Almost all the other coefficients on the explanatory variables are not significantly different from zero.

As a benchmark, column 6 shows the results for the full sample of equity analysts' reports using bond returns as the dependent variable and a specification similar to column 3. The coefficient on *Buy* is positive and significantly different from zero, while the *Sell* coefficient is not. The magnitude of the *Buy* and *Sell* coefficients for the equity analysts' reports is smaller than they are for bond analysts' reports (in column 3). For example, the difference between the bond analysts' *Buy* and *Sell* coefficients is 50 basis points, versus 10 basis points for equity analysts. (An untabulated test indicates that this "difference in difference" is statically significant, with a p-value $= 0.01$.) This result suggests that bond prices are more sensitive to bond analysts' than equity analysts' recommendations, further supporting H2 and H2a. We also estimate but do not tabulate tests using equity analysts' buys-only and sells-only samples (as in columns 4 and 5 for bond analysts). None of the variables in these regressions obtain coefficients that are significantly different from zero.

6. *The Timeliness of Bond Analysts' Reports around Credit Rating Announcements*

Our results above suggest that reports by bond analysts are more relevant and less biased than those of equity analysts, which translates into greater bond market reactions for bond analysts. This section presents some additional analysis that investigates whether bond analysts' reports are timelier than equity analysts' reports with respect to credit rating agency announcements. Differential timeliness could also explain the difference in bond market reactions. To gauge timeliness, we focus on two important credit events: credit rating agency announcements of rating changes and watchlist additions. If bond and equity analysts anticipate, and hence lead, rating agencies, then we expect them to be more likely to issue negative (positive) recommendations before negative (positive) rating agency announcements.

We test for Granger causality by estimating multivariate logistic models that predict rating changes and watchlist additions using lagged values of bond and equity analysts' recommendations and credit rating events as independent variables. These tests allow us to better control for the joint effects of rating changes and watchlist additions on the timeliness of bond and equity analysts' recommendations. These tests are in the spirit of Beaver, Shakespeare, and Soliman [2006], who find that noncertified rating changes lead certified rating changes.

We create a panel data set of calendar months starting from January 2002 to December 2006 for all firms in the sample that have at least one rating change over this period. We construct indicator variables that take the value one if an analyst report or credit-related event occurs during the calendar month, zero otherwise. We create similar indicators for upgrades, negative and positive watchlist additions, as well as for bond and equity analysts' buy and sell recommendations. For a given firm-month observation we could have several analyst recommendations. In this case, we take the median recommendation level for that month to determine whether the monthly analyst recommendation is a buy, hold, or sell. We estimate

$$\begin{aligned}
Event_{i,t} = \alpha &+ \sum_{j=1}^{3} \beta_j Bond\ Analyst\ Buy_{i,t-j} + \sum_{j=1}^{3} \delta_j Bond\ Analyst\ Sell_{i,t-j} \\
&+ \sum_{j=1}^{3} \gamma_j Equity\ Analyst\ Buy_{i,t-j} + \sum_{j=1}^{3} \chi_j Equity\ Analyst\ Sell_{i,t-j} \\
&+ \sum_{j=1}^{3} \lambda_j Upgrade_{i,t-j} + \sum_{j=1}^{3} \theta_j Downgrade_{i,t-j} \\
&+ \sum_{j=1}^{3} \pi_j Pos\ Watchlist_{i,t-j} + \sum_{j=1}^{3} \kappa_j Neg\ Watchlist_{i,t-j} \\
&+ Year\ Effects + \varepsilon_{i,t}. \qquad (3)
\end{aligned}$$

Our logistic prediction model includes three lags of each event indicator. Untabulated analysis indicates: (1) that all inferences remain the same if we use one or five lags, or when we exclude year fixed effects and (2) if we partition the sample into investment-grade and high-yield firms, and reestimate equation (3), the results and inferences are similar between the two groups and to the tabulated analysis.

Table 7, panel A presents the results of estimating four logistic models, each with a different dependent variable, where *Event* is *Upgrade*, *Downgrade*, *Pos Watchlist*, and *Neg Watchlist*, respectively. To ease interpretation, panel B presents the average coefficient for the three lags of each variable, and a *p*-value from a Wald chi-square test of whether the average coefficient is different from zero. Our discussion focuses on the parsimonious panel B results. First, there is evidence of general autocorrelation across all four credit rating events. For example, when predicting downgrades, lagged downgrades, and lagged negative watchlist additions have positive coefficients while lagged upgrades have a negative coefficient. Second, lagged bond analysts' buys are positively related to upgrades and positive watchlist additions. Similarly, lagged bond analysts' sells are positively related to downgrades and negative watchlist additions. Lagged bond analysts' sells are also negatively related to upgrades. These results provide evidence that bond analysts' recommendations lead credit rating announcements for both rating changes and watchlist additions. This finding also corroborates and helps explain why the bond market reacts to bond analysts' reports.

Third (and consistent with Ederington and Goh [1998]), the results for lagged equity analysts' buys and sells show a similar pattern to those of bond analysts, and hence also lead credit rating announcements. Untabulated

TABLE 7

Analysis of Bond Analysts' Recommendation Timeliness vis-à-vis Credit Events

Panel A: Logistic model results

	$Upgrade_t$		$Downgrade_t$		$Pos\ Watchlist_t$		$Neg\ Watchlist_t$	
	Coef.	z-stat.	Coef.	z-stat.	Coef.	z-stat.	Coef.	z-stat.
$Bond\ Analyst\ Buy_{t-1}$	0.069	(0.39)	−0.005	(−0.03)	0.845***	(3.08)	0.200	(1.25)
$Bond\ Analyst\ Buy_{t-2}$	0.164	(0.90)	−0.019	(−0.14)	0.414	(1.29)	−0.013	(−0.08)
$Bond\ Analyst\ Buy_{t-3}$	0.507***	(2.99)	−0.055	(−0.40)	0.118	(0.43)	0.063	(0.36)
$Bond\ Analyst\ Sell_{t-1}$	−1.010**	(−2.24)	0.537***	(3.73)	−0.680	(−0.99)	0.265	(1.41)
$Bond\ Analyst\ Sell_{t-2}$	−0.371	(−1.03)	0.169	(1.07)	−0.247	(−0.42)	0.273	(1.42)
$Bond\ Analyst\ Sell_{t-3}$	−0.735*	(−1.88)	0.113	(0.66)	0.047	(0.09)	0.430**	(2.28)
$Equity\ Analyst\ Buy_{t-1}$	0.480***	(3.91)	−0.495***	(−3.79)	0.023	(0.09)	−0.198	(−1.35)
$Equity\ Analyst\ Buy_{t-2}$	0.336***	(2.65)	−0.351***	(−2.97)	0.310	(1.45)	−0.165	(−1.15)
$Equity\ Analyst\ Buy_{t-3}$	0.201	(1.50)	−0.164	(−1.47)	0.301	(1.28)	−0.078	(−0.56)
$Equity\ Analyst\ Sell_{t-1}$	−0.347	(−1.41)	0.419***	(4.21)	−0.344	(−0.77)	0.521***	(4.01)
$Equity\ Analyst\ Sell_{t-2}$	−0.169	(−0.78)	0.146	(1.41)	−0.455	(−0.94)	0.199	(1.36)
$Equity\ Analyst\ Sell_{t-3}$	−0.113	(−0.56)	0.312***	(3.07)	0.383	(1.19)	0.031	(0.20)
$Pos\ Watchlist_{t-1}$	0.601	(0.40)	0.237	(0.63)	0.826	(1.19)	−1.018*	(−1.95)
$Pos\ Watchlist_{t-2}$	1.181	(1.27)	−0.377	(−1.63)	−0.428	(−0.92)	0.514	(1.07)
$Pos\ Watchlist_{t-3}$	−0.751	(−0.41)	−0.221	(−0.91)	−0.543	(−1.13)	0.107	(0.22)
$Neg\ Watchlist_{t-1}$	−0.289	(−0.95)	1.074***	(5.54)	−0.891	(−1.18)	−1.124***	(−2.75)
$Neg\ Watchlist_{t-2}$	−0.201	(−0.42)	1.640***	(10.20)	−0.366	(−0.36)	−0.637	(−1.50)
$Neg\ Watchlist_{t-3}$	−0.341	(−1.15)	0.538***	(2.65)	−0.786	(−1.03)	−0.578*	(−1.83)
$Upgrade_{t-1}$	−0.772	(−1.33)	−2.160**	(−2.13)	0.125	(0.18)	−0.301	(−0.59)
$Upgrade_{t-2}$	0.510	(1.59)	−0.974*	(−1.74)	−0.517	(−0.52)	−1.040	(−1.46)
$Upgrade_{t-3}$	0.590*	(1.86)	−1.433**	(−2.16)	0.584	(1.00)	−1.032	(−1.47)
$Downgrade_{t-1}$	−0.264	(−0.68)	0.102	(0.64)	−0.749	(−0.73)	0.260	(1.03)
$Downgrade_{t-2}$	−0.324	(−0.83)	0.803***	(5.78)	−0.844	(−0.83)	0.372*	(1.71)
$Downgrade_{t-3}$	0.067	(0.21)	0.965***	(7.04)	−0.948	(−0.93)	0.312	(1.31)
Year effects	Yes		Yes		Yes		Yes	
No. of obs.	32,889		32,889		32,889		32,889	
Pseudo-R^2	3.1%		8.3%		3.3%		1.6%	

(*Continued*)

TABLE 7—*Continued*

Panel B: Summary of logistic model coefficients

	Upgrade$_t$		*Downgrade$_t$*		*Pos Watchlist$_t$*		*Neg Watchlist$_t$*	
	Avg. Coef.	*p*-value	Avg. Coef.	*p*-value	Avg. Coef.	*p*-value	Avg. Coef.	*p*-value
Lag bond analyst buys	0.247	(<0.001)	−0.026	(0.675)	0.459	(<0.001)	0.083	(0.272)
Lag bond analyst sells	−0.705	(<0.001)	0.273	(<0.001)	−0.293	(0.336)	0.323	(<0.001)
Lag equity analyst buys	0.339	(<0.001)	−0.337	(<0.001)	0.211	(0.093)	−0.147	(0.050)
Lag equity analyst sells	−0.210	(0.064)	0.292	(<0.001)	−0.139	(0.489)	0.250	(<0.001)
Lag positive watchlists	0.344	(<0.001)	−0.120	(0.3527)	−0.048	(0.851)	−0.132	(0.360)
Lag negative watchlists	−0.277	(0.210)	1.084	(<0.001)	−0.681	(0.204)	−0.780	(<0.001)
Lag upgrades	0.109	(0.660)	−1.522	(<0.001)	0.064	(0.889)	−0.791	(0.036)
Lag downgrades	−0.174	(0.433)	0.623	(<0.001)	−0.847	(0.141)	0.315	(0.015)

This table examines the lead and lag relation between bond and equity analysts' recommendations and credit events. In panel A, we test for Granger causality by estimating multivariate logistic models that predict rating changes and watchlist additions (as indicated in each column) using lagged values of bond and equity analyst recommendation and credit rating events as independent variables. The sample consists of calendar month observations during 2002 to 2006 for all firms with bond and equity recommendations and at least one rating change. We construct indicator variables that take the value one if a credit-related or analyst report (e.g., rating change, watchlist addition, bond, or equity analyst recommendation) has occurred during the calendar month, zero otherwise. We create similar indicators for an *Upgrade*, negative watchlist addition (*Neg Watchlist*), positive watchlist addition (*Pos Watchlist*) and *Bond* or *Equity Analyst Buy* or *Sell* recommendation. Coefficient *z*-statistics are in parentheses. We estimate each model as a panel with year fixed effects and cluster the standard errors at the firm level. Panel B presents the average coefficient for the three lags of each variable and, in parentheses, a *p*-value from a Wald chi-square test that the average coefficient is different from zero.

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively, using two-tailed tests.

tests indicate the differences between coefficients on lagged bond and lagged equity analysts' recommendations are not generally significant. Hence, the stronger bond market reactions we observe for bond analysts compared with equity analysts is not due to the former's issuing of more timely recommendations. Instead, the differential bond market reaction we observe must be due to the different information contained within bond analysts' reports, supporting our explanation that these reports are considered more relevant for bond investors and less biased than the reports by equity analysts.

7. *Conclusion*

This study uses a large sample of sell-side bond analysts' reports to examine the effect of bond-market features on the recommendations provided by bond analysts and the impact of these recommendations on bond securities. Unique features of the bond market such as a higher level of investor sophistication relative to the equity market, presence of certified rating agencies that provide independent information, and more objectively determined pricing of fixed income bond securities suggest that bond analysts add less strategic bias to their investment recommendations than equity analysts. Moreover, since the payoff function of bond securities limits the upside potential, bond investors have a greater demand for negative information.

We empirically document that the distribution of bond analysts' recommendations is skewed positively, and less so than the distribution of equity analysts' recommendations. The positive skewness in bond analysts' recommendations is greater for low than for high credit quality bonds. While the distribution of affiliated bond analysts' recommendations is more positively skewed than it is for unaffiliated bond analysts, there is practically no affiliation effect on the distribution of equity analysts' recommendations. Consistent with less strategic bond analyst behavior compared with equity analysts and reports that offer debt-specific interpretations of news, we find that bond analysts' reports generate bond market reactions that are greater than responses to equity analysts' reports. The bond market reaction is greater for lower credit quality bonds, consistent with greater bond investor demand for high-yield bond information. Furthermore, we do not find that this difference in the bond market reaction is explained by differential timeliness. Our results contribute to the literature on sell-side bond analysts, which is surprisingly limited given the prevalence of these analysts and the importance of bond markets as a source of capital for U.S. corporations. The analysis also contributes more broadly to the literature on information intermediaries, such as credit agencies and equity analysts.

APPENDIX A

Variable Definitions

Variable	Definition
Abnormal Volume	= Abnormal volume is the average daily firm volume (scaled by the bond issue size) during the five-day event window centered on day 0 less the average daily volume for the nonevent 30-day periods before and after the event window.
Adjusted Return	= Raw return on a bond issue around an event window minus the return on a Treasury Bill with similar maturity and coupon. The estimation is restricted for bonds trading within 10 trading days around the event.
Affiliated	= Indicator variable that equals one if the analyst's recommendation is issued by an affiliated analyst, zero otherwise. Bond analysts are classified as affiliated if the broker employing the analyst is the lead underwriter for a bond or the lead arranger of a syndicated loan, issued by the borrowing firm in the 12 months prior to the report. Underwriter data are from Mergent. Equity analysts are classified as affiliated if the broker employing the analyst is part of the syndicate underwriting the initial public or secondary offering issued by the firm during the sample period. Underwriter data are from Thompson Financial (SDC).
BBB-A Rating	= Indicator variable that equals one if the firm's senior debt rating ranges from BBB to A, zero otherwise.
Below BBB Rating	= Indicator variable that equals one if the firm's senior debt rating is below BBB, zero otherwise.
Bond Report	= Indicator variable that equals one in the five-day period centered on the date of a bond analyst's recommendation, zero otherwise.
Bond and Equity Report	= Interaction term between *Bond Report* and *Equity Report* variables. This variable takes the value of one on the days that are within both the five-day period around bond analysts' reports and the five-day period around equity analysts' reports, zero otherwise.
Bond Equity Disagree	= Indicator variable that equals one if the bond analyst's recommendation disagrees with the most recent equity analyst's recommendation issued for the same firm in the 21-day window before the bond analyst report, zero otherwise. For instance, if the bond analyst's recommendation is a sell while the most recent equity analyst's recommendation is a buy or hold, the indicator variable equals one. If the bond analyst's recommendation is a sell and the most recent equity analyst's recommendation is a sell, the indicator variable equals zero.
Bond Report Buy	= Indicator variable that equals one in the five-day period centered on the date of a bond analyst's buy recommendation, zero otherwise.
Bond Report Sell	= Indicator variable that equals one in the five-day period centered on the date of a bond analyst's sell recommendation, zero otherwise.
Buy	= Indicator variable that equals one if the bond or equity analyst's recommendation is a buy, zero otherwise.
CDS Pos Price Change	= Indicator variable that equals one if the daily change in a firm's five-year CDS spread is positive, zero otherwise.
CDS Neg Price Change	= Indicator variable that equals one if the daily change in a firm's five-year CDS spread is negative, zero otherwise.

(*Continued*)

APPENDIX A— *Continued*

Variable	Definition
Complexity	= Indicator variable that equals one if a firm's complexity index is above the sample's median, zero otherwise. Complexity index is based on the following bond characteristics: callable, convertible, credit enhancement, putable, foreign currency, floating rate coupon, variable rate coupon, combination of floating/fixed coupon, nonstandard payment frequency, nonstandard accrual frequency, pay-in-kind, sinking fund. The complexity index is estimated as the sum of the bond complexity characteristics, where each characteristic is assigned the value of one. The index is based on the average complexity of a firm's bonds. Definitions of the characteristics incorporated in the complexity index are as follows: *Callable* bonds are redeemable by the issuer (in whole, or in part) before the scheduled maturity under specific conditions, at specified times, and at a stated price. *Convertible* bonds may be converted into shares of another security under stated terms. The security is often the issuing company's common stock. *Credit enhancement* occurs when an issuer improves the credit rating of a bond by purchasing the financial guarantee (e.g., insurance, letter of credit) of a large financial intermediary, such as an insurance company or bank. *Putable* bonds give the holder the right to sell, or put, his or her bond to the issuer prior to the bond's maturity date. *Foreign currency* bonds are issues denominated in a foreign currency. *Floating coupon* bonds have a variable coupon, equal to a money market reference rate, like LIBOR or federal funds rate, plus a spread. *Variable rate coupon* bonds have a variable coupon that adjusts according to some schedule or index. *Floating/fixed combination coupon* bonds have a combination of fixed and floating coupons. *Nonstandard payment* frequency bonds pay interest at frequencies other than semi annual. *Nonstandard interest accrual frequency* bonds do not accrue interest on a 30/360 capital-appreciation basis. *Pay-in-kind* bonds allow the issuer the option of paying the bondholder interest either in additional securities or in cash. *Sinking fund* bonds have a sinking fund provision, which requires a bond issuer to retire a certain number of bonds periodically (typically accomplished through purchases in the open market).
Conference Call	= Indicator variable that equals one in the five-day period centered on the date of a conference call, zero otherwise. Data are from Best Calls.
Earnings	= Indicator variable that equals one in the five-day period centered on the date of a firm's earnings announcement, zero otherwise. Data are from Compustat.
Earnings Neg	= Indicator variable that equals one in the five-day period centered on the date of a firm's earnings announcement if earnings before extraordinary items are negative, zero otherwise.
Equity Report	= Indicator variable that equals one in the five-day period centered on the date of an equity analyst's recommendation, zero otherwise. Data are from IBES.
Equity Report Buy	= Indicator variable that equals one in the five-day period centered on the date of an equity analyst's buy recommendation, zero otherwise.
Equity Report Sell	= Indicator variable that equals one in the five-day period centered on the date of an equity analyst's sell recommendation, zero otherwise.
Fed Change	= Indicator variable that equals one in the five-day period centered on the date of the federal funds rate changes, zero otherwise.

(*Continued*)

APPENDIX A — *Continued*

Variable	Definition
Highly Traded	= Indicator variable equal to one if the firm's bonds are traded on average more than the median bond in the sample, zero otherwise.
Interest Coverage	= Ratio of EBITDA to interest expense.
Issue Size	= Logarithm of the average principal of the firm's bonds.
Leverage	= Ratio of long-term debt to total assets.
Management Forecast	= Indicator variable that equals one in the five-day period centered on the date of a management forecast of any type, zero otherwise. Data are from First Call.
Market-to-Book	= Ratio of market value to book value of common equity.
No. of Trades	= Number of bond trades per day, averaged across all of the firm's bond issues.
On Watch Neg	= Indicator variable that equals one if the firm is on a negative or developing S&P Watchlist when the analysts' recommendation is issued, zero otherwise.
On Watch Pos	= Indicator variable that equals one if the firm is on a positive S&P Watchlist when the analysts' recommendation is issued, zero otherwise.
Outlook	= Indicator variable that equals one in the five-day period centered on the date of a firm's change in the S&P Outlook, zero otherwise.
Outlook Neg	= Indicator variable that equals one in the five-day period centered on the date of a firm's addition to the negative S&P Outlook, zero otherwise.
Outlook Pos	= Indicator variable that equals one in the five-day period centered on the date of a firm's addition to the positive S&P Outlook, zero otherwise.
Profitability	= Ratio of EBITDA to total assets.
Rating Change	= Indicator variable that equals one in the five-day period centered on the date of a rating change, zero otherwise. Senior bond ratings are at the firm level from Moody's and S&P historical databases. If missing, the rating is from the bond analyst's report. When the firm has ratings available from both Moody's and S&P, we take the first rating change announced by Moody's or S&P. Rating agencies typically move in tandem, usually with one following soon after the other. If one rating agency changes its rating of a firm and the other agency does so within the next 30 days, we ignore the second rating change.
Rating Change Downgrade	= Indicator variable that equals one in the five-day period centered on the date of a rating change if the rating change is a downgrade, zero otherwise.
Return on TB	= The daily T-bill return from the CRSP database. T-bills are chosen to match bond issues based on remaining time to maturity (in years) at the beginning of the accumulation period and on coupon rate.
Sales Growth	= Average sales growth over the three-year period prior to the year of a bond analyst's report.
Sell	= Indicator variable that equals one if the bond or equity analyst's recommendation is a sell, zero otherwise.

(*Continued*)

APPENDIX A— *Continued*

Variable	Definition
TB Change	= Indicator variable that equals one in the five-day period centered on the price changes of T-bills that are in either the top or bottom 10% of the price change distribution, zero otherwise. T-bills with an eight-year maturity and coupon rates close to 6% are chosen to be consistent with the average maturity and coupon size of the bonds in our sample. T-bill returns are retrieved from the CRSP daily Treasury file.
Time to Maturity	= Logarithm of the time to maturity of a firm's largest bond outstanding. Time to maturity is estimated as the number of years between the analyst's report date and the bond's maturity date.
Total Assets	= Dollar value of a firm's total assets (in millions).
Trade	= Indicator variable that equals one if any of a firm's bonds are traded on a given day, zero otherwise.
Volume	= Dollar volume of principal traded on a given day, scaled by the size of the bond on the issue date, averaged over all the firm's bonds.
Watchlist	= Indicator variable that equals one in the five-day period centered on the date of a firm's addition to the S&P Watchlist, zero otherwise.
Watchlist Neg	= Indicator variable that equals one in the five-day period centered on the date of a firm's addition to the negative or developing S&P Watchlist, zero otherwise. Additions to watchlists that are "developing" are classified as negative. These represent a small number of events and are ex post more likely to be associated with a rating downgrade than with a rating upgrade.

APPENDIX B

Computation of Adjusted Bond Returns

We calculate Treasury-adjusted bond returns over periods around bond reports dates. Our return measurement method is similar in spirit to that of Hand, Holthausen, and Leftwich [1992] and Easton, Monahan, and Vasvari [2009].

We first compute the buy-and-hold raw bond returns (*BR*) as follows:

$$BR_t = (BP_t + C_t - BP_{t-1})/BP_{t-1}. \tag{B1}$$

BP_t is the invoice bond price (flat price plus accrued interest, defined below) of the first transaction that occurs on or after day 3, and must occur on or before day 10, where the day 0 is the event day. BP_{t-1} is defined symmetrically; it is the invoice bond price of the last transaction that occurs on or before day −3, and must occur on or after day −10. C_t is the sum of all coupon payments between the two periods (as a percentage of book value). Given the short accumulation interval over which we compute returns [−10, 10], the coupon payments are infrequent.

Invoice bond prices are computed as the quoted price reported by the database (also called flat price) plus the accrued interest (*AI*) from the last coupon payment. If the combined TRACE-Mergent database reports more than one trade on a given day, we take the average flat price for that day. We compute the accrued interest based on the coupon size, frequency, and initial coupon payment date reported in the terms and conditions database from Mergent. The accrued interest is computed as

$$AI_t = c(t - t_c)/360 \tag{B2}$$

where c is the bond coupon rate and $t - t_c$ is the period in days between the date of the trade and the date when the last coupon payment occurred. The dates of coupon payments are determined based on the coupon frequency and the date of the first coupon payment (both reported by the Mergent FISD terms and the conditions database).

We then adjust the raw bond return by subtracting the daily U.S. Treasury returns to remove the effect of the interest rate environment

$$AdjBR_t = BR_t - TR_t \tag{B3}$$

where TR is the daily Treasury buy and hold return cumulated over the exact time period as the bond returns. We match each bond issue in our sample with the Treasury bond that has the same remaining time to maturity (in years) at the beginning of the accumulation period and has the closest coupon rate. We download these data from the CRSP Daily Treasuries database.

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