# Internet Appendix for Rating-Based Investment Practices and Bond Market Segmentation

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October 24, 2014

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This Internet Appendix presents additional findings and other material relating to Chen, Lookman, Schürhoff, and Seppi (2014) "Rating-Based Investment Practices and Bond Market Segmentation". This includes the following:

- Discussion of test regarding fundamental news and stock prices.
- Discussion of test regarding rating-based segmentation or liquidity improvement.
- Table IA.1 provides a timeline of events.
- Table IA.2 compares bond and firm characteristics of HY-to-IG upgraded bonds to all bonds.
- Table IA.3 compares characteristics of HY-to-IG upgraded bonds and control bonds.
- Table IA.4 provides return decompositions with alternative control bonds.
- Table IA.5 describes bond returns and order flow imbalances.
- Table IA.6 provides a second test of the Fitch reputation hypothesis.
- Table IA.7 documents the impact on liquidity.

**Fundamental news and stock prices?** As a second test of the Fitch reputation hypothesis, we examine how the stock prices of bond issuers in different rating-based portfolios reacted to the Lehman index rating redefinition. In particular, an enhanced Fitch reputation should affect the stock prices of companies with favorable Fitch ratings.[1] Daily equity prices are from CRSP and are adjusted for splits and dividends. The three Fama-French factors—market excess returns ($MKT$), the size factor ($SMB$), and book-to-market factor ($HML$)—are from Kenneth French's website.[2]

Table IA.6 reports results from cross-sectional regressions using equity CARs. The cross-section consists of the 732 companies which issued the 8,767 bonds in our sample. For firms whose bonds have different ratings, we compute the firm's aggregate rating as the average rating of its bond issues. We use the Fama-French three-factor model to compute equity abnormal returns. The key explanatory variables of interest are indicator variables for a firm's weighted-average bond old index rating interacted with the proportion of a firm's bonds with favorable Fitch ratings. As controls for credit risk, we include issuers' average old index rating, dummies for the company's industry segment, and firm size and book-to-market ratios.

Table IA.6 shows little evidence of a significant stock price response to the Lehman announcement. Almost all of the coefficients for Fitch-reputation effects are not statistically significant. In particular, the coefficients for firms with Fitch-favorable BB+ bonds (both HY-to-IG upgraded and nonupgraded) are economically and statistically small. An information-based explanation for the Lehman announcement is, therefore, unlikely since a reduced default risk at companies with bonds highly rated by Fitch should also impact equity values. Instead, the impact of the Lehman announcement appears to be confined to the bond market (consistent with rating-based segmentation) rather than indirectly providing cash flow information to the stock market (as predicted by the Fitch reputation hypothesis).

[1] If increased credibility of a favorable Fitch rating raises the market's estimate of a firm's asset value, this should be good news for stock prices. If instead the lower credit risk implied by a favorable Fitch rating is due to lower firm asset volatility, then this would be bad news for equity which is a call option on firm assets and, therefore, long asset volatility. Previous research in Holthausen and Leftwich (1986), Hand, Holthausen, and Leftwich (1992), and Goh and Ederington (1993) has typically found stock return evidence consistent with the asset value channel.

[2] *http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/.*

**Rating-based segmentation or liquidity improvement?** Another possible explanation for the price response of the 57 HY-to-IG upgraded bonds is that increased turnover improved market liquidity for these bonds which, in turn, was priced. To investigate the *priced liquidity* hypothesis, we use two measures of liquidity. Roll's (1984) measure estimates the effective spread based on the serial covariance between price changes. Following Goyenko *et al.* (2009), we compute the Roll measure as $Roll_t = 2\sqrt{-cov(\Delta P_t, \Delta P_{t-1})}$, if $cov(\Delta P_t, \Delta P_{t-1}) < 0$, and zero otherwise. We compute the Roll measure for each bond separately and report the cross-sectional average, excluding bonds with insufficient data to compute the Roll measure. As a robustness check, we also use the Amihud (2002) measure of price sensitivity to trading volume, $Amihud_t = \frac{|\Delta P_t / P_{t-1}|}{Volume_t}$. Both the Roll and Amihud measures are constructed only using actual daily trade prices. Since imputed prices are not used, the calendar time between prices can be more than one day when there is nontrading.

Table IA.7 gives the average changes in liquidity in the postannouncement and the posteffective windows relative to the pre-announcement window. A formal difference-in-difference test indicates that the changes in liquidity for the HY-to-IG upgraded bonds are not statistically significantly different from the control bonds. This result is consistent for both the Roll and Amihud measures. The absence of abnormal changes in liquidity is evidence against the alternative hypothesis that the positive and persistent abnormal returns on the upgraded bonds were caused by changes in priced liquidity.

# References


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TABLE IA.1: TIMELINE OF EVENTS

| Date | Event | Description |
|---|---|---|
| 01/01/73 | Lehman bond index inception | Lehman Brothers bond indexes are established. The initial rule defines a bond's index rating as the average of its credit ratings from Moody's and S&P. |
| Aug 1988 | Lehman index rule change 1 | Lehman changes a bond's index rating to be its Moody's rating or, if not rated by Moody's, its S&P rating. |
| 07/01/02 | TRACE Phase I | NASD requires all over-the-counter bond transactions to be reported through the TRACE system. The rule affects investment-grade bonds having an original issue size of $1 billion or more (a total of 500 bond issues) as well as 50 high-yield bonds which were carried over from NASD's Fixed Income Pricing System (FIPS). Initially, NASD members were required to report transactions within 75 minutes of the trade's occurrence. |
| 03/03/03 | TRACE Phase II | The TRACE system includes all bonds with an original issue size of at least $100 million and an index rating of A or better. An additional 120 BBB rated bonds with issue sizes less than $1 billion are added as part of Phase II in April 2003. The number of disseminated bonds increases to approximately 4,200 bonds. In addition, the NASD shortens the time required to report a trade's occurrence to 45 minutes. |
| Oct 2003 | Lehman index rule change 2 | Lehman makes another change and defines a bond's index rating as the lower of its ratings from Moody's and S&P in an effort to reduce the dependence on one rating agency and to align its methodology with industry practice. |
| 10/01/04 | TRACE Phase III, Stage One | All "liquid" bond issues (i.e., TRACE-eligible securities transactions that were subject to immediate dissemination under the Phase III rule amendments) become subject to dissemination. As a result, the number of bonds in the TRACE universe jumps to 17,000 bonds. In addition, the required reporting time is reduced to 30 minutes. |
| 01/14/05 | GM rating review | S&P affirms the rating and outlook on General Motors (GM), but announces it will review them within the next six months. |
| 01/24/05 | Lehman index rule change 3 | Lehman Brothers announces that Fitch ratings will be incorporated in computing index ratings. Under this new rule, a bond's index rating is to be the middle of its Moody's, S&P, and Fitch ratings. If rated by only two agencies, a bond's index rating will continue to be the lower of the two. The change is to go into effect on July 1, 2005. |
| 02/07/05 | TRACE Phase III, Stage Two | All TRACE-eligible bond issues become subject to dissemination. NASD begins full dissemination of transaction and price data on the entire universe of corporate bonds, a total of approximately 29,000 issues. The required reporting time is scheduled to reach the final goal of 15 minutes by July 1, 2005. |
| 03/16/05 | GM profit warning | GM issues a profit warning. Fitch downgrades GM and GMAC by one notch to BBB– with negative outlook. S&P changes its GM and GMAC outlook from stable to negative. |
| 04/05/05 | GM downgrade | Moody's downgrades GM and GMAC by one notch to BBB– and BBB, respectively, with negative outlook. |
| 04/20/05 | GM announces $1.1 bn loss | GM posts record $1.1 bn loss. Rating agencies signal they could drop GM's bonds one notch to junk status, and they put rival Ford on notice. |
| 05/05/05 | GM and Ford downgrade | S&P downgrades GM and GMAC to BB with a negative outlook, and it downgrades Ford and FMCC to BB+ with negative outlook. |
| 05/24/05 | GM downgrade | Fitch downgrades GM and GMAC to BB+ with negative outlook. |
| 07/01/05 | Lehman index rule change | The index rating rule change announced by Lehman on January 24, 2005 goes into effect. |

## Table IA.2: Bond and firm characteristics of HY-to-IG upgraded bonds compared to all bonds

This table reports the determinants of bond and firm characteristics $C_i$ based on the following cross-sectional regression:

$$C_i = \alpha + \beta\, \mathbf{I}_i^{\text{HY-to-IG}} + \gamma' X_i + \varepsilon_i,$$

where $\mathbf{I}^{\text{HY-to-IG}}$ is an indicator variable used to identify the bonds upgraded from high-yield (HY) to investment-grade (IG) status, and $X$ is a set of control variables described in Appendix A including the old Lehman index ratings. The regressions are estimated using all bonds in the universe of 8,767 bonds with (where relevant) the necessary COMPUSTAT data to compute the (LHS) dependent variable. Missing values of (RHS) regressors due to missing COMPUSTAT data are imputed with zero and a missing value dummy is included as additional regressor. Two-sided $p$-values (shown in brackets) are computed using standard errors that are robust to heteroscedasticity and issuer clustering.

| | **Yield** | **Maturity** | **Age** | **Coupon** | **Index beta** | **Liquidity** | **Issue size** | **Market-to-book** | **Firm size** | **Profitability** | **Tangibility** | **Leverage** | **Interest coverage** | **Interest-to-debt** | **R&D** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HY-to-IG upgraded | -0.29 | 3.75 | 1.34 | -0.60 | -0.03 | -0.01 | 0.01 | 0.03 | -0.23 | 0.01 | -0.07 | 0.02 | 0.02 | -0.01 | -0.02 |
| | [0.11] | [0.19] | [0.06] | [0.04] | [0.87] | [0.85] | [0.83] | [0.86] | [0.62] | [0.38] | [0.27] | [0.70] | [0.41] | [0.32] | [0.21] |
| AA - A | -0.71 | -2.41 | 0.33 | -0.11 | 0.08 | 0.06 | 0.00 | -0.24 | -0.31 | -0.00 | 0.09 | 0.01 | -0.01 | -0.04 | -0.04 |
| | [0.08] | [0.01] | [0.36] | [0.53] | [0.08] | [0.00] | [0.94] | [0.07] | [0.44] | [0.91] | [0.11] | [0.86] | [0.87] | [0.02] | [0.01] |
| BBB+ - BBB | -0.75 | -3.26 | -0.08 | 0.36 | 0.13 | 0.05 | 0.05 | -0.54 | -1.04 | 0.01 | 0.11 | -0.06 | -0.02 | -0.04 | -0.03 |
| | [0.09] | [0.00] | [0.82] | [0.06] | [0.01] | [0.01] | [0.22] | [0.00] | [0.01] | [0.30] | [0.04] | [0.28] | [0.54] | [0.06] | [0.04] |
| BBB– | -0.86 | -4.35 | -0.35 | 0.63 | 0.10 | 0.03 | 0.05 | -0.54 | -1.13 | 0.01 | 0.06 | -0.04 | -0.02 | -0.03 | -0.02 |
| | [0.09] | [0.00] | [0.39] | [0.00] | [0.06] | [0.09] | [0.24] | [0.00] | [0.01] | [0.26] | [0.22] | [0.57] | [0.56] | [0.14] | [0.21] |
| BB+ | -0.38 | -4.91 | -1.87 | 1.05 | -0.05 | 0.01 | 0.17 | -0.68 | -1.07 | 0.02 | 0.10 | -0.04 | -0.04 | -0.03 | -0.00 |
| | [0.50] | [0.00] | [0.00] | [0.00] | [0.57] | [0.79] | [0.01] | [0.00] | [0.01] | [0.20] | [0.24] | [0.50] | [0.30] | [0.12] | [0.95] |
| BB | -0.60 | -5.22 | -1.80 | 1.41 | -0.21 | 0.07 | 0.06 | -0.57 | -1.11 | 0.01 | 0.09 | -0.02 | -0.03 | -0.03 | -0.03 |
| | [0.34] | [0.00] | [0.01] | [0.00] | [0.00] | [0.07] | [0.16] | [0.00] | [0.02] | [0.51] | [0.20] | [0.71] | [0.41] | [0.13] | [0.05] |
| BB– - B | -0.14 | -5.75 | -2.97 | 2.02 | -0.31 | 0.03 | 0.08 | -0.51 | -1.63 | 0.01 | 0.14 | 0.03 | -0.01 | -0.03 | -0.02 |
| | [0.84] | [0.00] | [0.00] | [0.00] | [0.00] | [0.19] | [0.04] | [0.00] | [0.00] | [0.50] | [0.01] | [0.52] | [0.85] | [0.28] | [0.15] |
| Maturity | 0.05 | – | -0.03 | 0.04 | 0.03 | 0.00 | -0.01 | 0.00 | 0.01 | -0.00 | -0.00 | 0.00 | -0.00 | -0.00 | 0.00 |
| | [0.00] | – | [0.01] | [0.00] | [0.00] | [0.18] | [0.00] | [0.08] | [0.00] | [0.95] | [0.11] | [0.05] | [0.21] | [0.01] | [0.09] |
| Age | -0.11 | -0.19 | – | 0.20 | 0.01 | -0.00 | -0.01 | -0.00 | 0.03 | -0.00 | 0.00 | -0.01 | -0.00 | 0.00 | 0.00 |
| | [0.00] | [0.02] | – | [0.00] | [0.02] | [0.53] | [0.00] | [0.79] | [0.03] | [0.42] | [0.01] | [0.00] | [0.69] | [0.43] | [0.08] |
| Coupon | 0.53 | 1.60 | 1.12 | – | -0.01 | -0.01 | 0.03 | -0.02 | -0.10 | 0.00 | -0.00 | 0.01 | 0.00 | 0.00 | -0.00 |
| | [0.00] | [0.00] | [0.00] | – | [0.04] | [0.25] | [0.00] | [0.05] | [0.00] | [0.14] | [0.93] | [0.00] | [0.85] | [0.01] | [0.50] |
| Index beta | -0.06 | 4.30 | 0.18 | -0.06 | – | 0.00 | 0.11 | -0.03 | -0.08 | 0.00 | 0.02 | -0.01 | 0.00 | -0.00 | 0.00 |
| | [0.30] | [0.00] | [0.03] | [0.03] | – | [0.89] | [0.00] | [0.01] | [0.00] | [0.25] | [0.00] | [0.09] | [0.57] | [0.63] | [0.43] |

*(continued)*

TABLE IA.2: BOND AND FIRM CHARACTERISTICS OF HY-TO-IG UPGRADED BONDS COMPARED TO ALL BONDS—*CONTINUED*

| | **Yield** | **Maturity** | **Age** | **Coupon** | **Index beta** | **Liquidity** | **Issue size** | **Market-to-book** | **Firm size** | **Profitability** | **Tangibility** | **Leverage** | **Interest coverage** | **Interest-to-debt** | **R&D** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Liquidity | 0.20 | 1.10 | -0.17 | -0.20 | 0.00 | – | -0.29 | -0.09 | -0.80 | 0.00 | -0.01 | -0.00 | 0.01 | -0.00 | -0.00 |
| | [0.11] | [0.21] | [0.54] | [0.22] | [0.89] | – | [0.00] | [0.01] | [0.00] | [0.99] | [0.58] | [0.97] | [0.34] | [0.38] | [0.93] |
| Issue size $150-250 MM | -0.26 | -1.88 | 0.67 | 0.30 | 0.37 | -0.09 | – | -0.08 | -0.49 | 0.00 | 0.00 | -0.04 | 0.01 | 0.00 | -0.00 |
| | [0.07] | [0.00] | [0.01] | [0.01] | [0.00] | [0.00] | – | [0.01] | [0.00] | [0.25] | [0.85] | [0.01] | [0.54] | [0.09] | [0.58] |
| Issue size ≥$250 MM | -0.49 | -3.45 | -0.86 | 0.41 | 0.51 | -0.19 | – | -0.00 | 0.04 | -0.00 | 0.01 | -0.05 | 0.00 | 0.00 | -0.00 |
| | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | – | [0.87] | [0.76] | [0.54] | [0.61] | [0.00] | [0.48] | [0.28] | [0.85] |
| Market-to-book | -0.15 | -0.49 | -0.19 | -0.09 | -0.02 | 0.00 | 0.01 | – | -0.99 | 0.06 | -0.06 | -0.04 | 0.05 | -0.02 | 0.01 |
| | [0.22] | [0.31] | [0.31] | [0.24] | [0.48] | [0.67] | [0.74] | – | [0.00] | [0.00] | [0.01] | [0.01] | [0.12] | [0.00] | [0.30] |
| Firm size | -0.09 | 0.14 | 0.01 | -0.04 | 0.00 | -0.01 | 0.01 | -0.15 | – | 0.00 | -0.00 | -0.01 | 0.01 | -0.00 | 0.00 |
| | [0.10] | [0.27] | [0.91] | [0.09] | [0.49] | [0.00] | [0.24] | [0.00] | – | [0.45] | [0.91] | [0.06] | [0.03] | [0.25] | [0.13] |
| Profitability | 1.90 | 2.70 | -5.04 | 1.56 | 0.32 | 0.02 | -0.21 | 8.76 | 2.47 | – | 1.39 | -1.14 | 0.31 | 0.12 | -0.06 |
| | [0.33] | [0.68] | [0.05] | [0.12] | [0.45] | [0.92] | [0.61] | [0.00] | [0.08] | – | [0.00] | [0.00] | [0.19] | [0.00] | [0.34] |
| Tangibility | -0.44 | -0.65 | 0.08 | -0.16 | 0.18 | -0.01 | -0.10 | -0.46 | -0.04 | 0.07 | – | -0.05 | -0.12 | 0.02 | -0.02 |
| | [0.22] | [0.58] | [0.88] | [0.39] | [0.01] | [0.73] | [0.10] | [0.00] | [0.93] | [0.00] | – | [0.45] | [0.00] | [0.07] | [0.05] |
| Leverage | 1.52 | 2.74 | -1.85 | 0.64 | -0.15 | 0.11 | -0.09 | -0.32 | -0.40 | -0.07 | -0.04 | – | -0.13 | 0.00 | -0.04 |
| | [0.05] | [0.10] | [0.00] | [0.00] | [0.08] | [0.00] | [0.29] | [0.02] | [0.32] | [0.00] | [0.54] | – | [0.00] | [0.93] | [0.00] |
| Interest coverage | 0.48 | -2.85 | 0.37 | 0.11 | 0.08 | 0.03 | -0.18 | 0.47 | 2.18 | 0.03 | -0.21 | -0.30 | – | -0.01 | 0.02 |
| | [0.47] | [0.22] | [0.59] | [0.67] | [0.50] | [0.50] | [0.13] | [0.13] | [0.01] | [0.49] | [0.01] | [0.05] | – | [0.58] | [0.31] |
| Interest-to-debt | 16.38 | -34.08 | -1.10 | 8.38 | -0.20 | 0.35 | -0.03 | -4.02 | -3.43 | 0.24 | 0.56 | 0.02 | -0.14 | – | -0.21 |
| | [0.17] | [0.00] | [0.79] | [0.00] | [0.75] | [0.12] | [0.95] | [0.00] | [0.08] | [0.00] | [0.02] | [0.97] | [0.58] | – | [0.01] |
| R&D | 5.34 | 32.76 | 8.19 | -2.10 | 0.62 | -0.19 | 0.60 | 3.71 | 0.09 | -0.28 | -0.85 | -0.50 | 1.02 | -0.08 | – |
| | [0.08] | [0.05] | [0.11] | [0.39] | [0.45] | [0.50] | [0.41] | [0.02] | [0.98] | [0.03] | [0.15] | [0.23] | [0.01] | [0.19] | – |
| Constant | 2.10 | 3.48 | 0.06 | 4.19 | -0.03 | 0.32 | 0.19 | 2.58 | 12.14 | 0.02 | 0.07 | 0.65 | -0.05 | 0.10 | 0.06 |
| | [0.00] | [0.04] | [0.95] | [0.00] | [0.75] | [0.00] | [0.12] | [0.00] | [0.00] | [0.22] | [0.50] | [0.00] | [0.57] | [0.00] | [0.00] |
| Industry F.E. | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| $R^2$ | 0.289 | 0.208 | 0.357 | 0.475 | 0.257 | 0.156 | 0.200 | 0.846 | 0.589 | 0.871 | 0.740 | 0.794 | 0.458 | 0.475 | 0.518 |

TABLE IA.3: CHARACTERISTICS OF HY-TO-IG UPGRADED BONDS AND CONTROL BONDS

This table reports the average characteristics in the sample of HY-to-IG upgraded bonds compared to the control bonds. Two-sided *p*-values (shown in brackets) are computed using standard errors that are robust to heteroscedasticity and issuer clustering.

| | **HY-to-IG upgraded bonds** | **Control bonds (narrow match)** | | **Control bonds (broad match)** | |
|---|---|---|---|---|---|
| | Mean | Mean | Difference | Mean | Difference |
| Yield | 5.56 | 5.99 | -0.43 | 6.23 | -0.67 |
| | [0.00] | [0.00] | [0.13] | [0.00] | [0.06] |
| Maturity | 12.67 | 7.71 | 4.96 | 9.20 | 3.47 |
| | [0.00] | [0.00] | [0.01] | [0.00] | [0.13] |
| Age | 4.84 | 3.62 | 1.22 | 4.10 | 0.75 |
| | [0.00] | [0.00] | [0.07] | [0.00] | [0.46] |
| Coupon | 6.95 | 7.53 | -0.58 | 7.68 | -0.73 |
| | [0.00] | [0.00] | [0.06] | [0.00] | [0.02] |
| Index beta | 0.47 | 0.43 | 0.04 | 0.41 | 0.06 |
| | [0.00] | [0.00] | [0.80] | [0.00] | [0.74] |
| Liquidity | 0.11 | 0.16 | -0.04 | 0.07 | 0.04 |
| | [0.00] | [0.00] | [0.42] | [0.03] | [0.40] |
| Issue size \$150-250 MM | 0.18 | 0.27 | -0.09 | 0.30 | -0.12 |
| | [0.01] | [0.00] | [0.27] | [0.00] | [0.25] |
| Issue size ≥\$250 MM | 0.60 | 0.60 | 0.00 | 0.67 | -0.07 |
| | [0.00] | [0.00] | [1.00] | [0.00] | [0.57] |
| Market-to-book | 1.41 | 1.13 | 0.28 | 1.33 | 0.08 |
| | [0.00] | [0.00] | [0.44] | [0.00] | [0.84] |
| Firm size | 8.79 | 7.81 | 0.98 | 8.23 | 0.56 |
| | [0.00] | [0.00] | [0.02] | [0.00] | [0.16] |
| ROA | 0.13 | 0.12 | 0.01 | 0.14 | -0.01 |
| | [0.00] | [0.00] | [0.73] | [0.00] | [0.68] |
| Tangibility | 0.29 | 0.37 | -0.08 | 0.40 | -0.11 |
| | [0.00] | [0.00] | [0.40] | [0.01] | [0.40] |
| Leverage | 0.36 | 0.30 | 0.06 | 0.21 | 0.14 |
| | [0.00] | [0.00] | [0.44] | [0.00] | [0.07] |
| Interest coverage | 0.08 | 0.05 | 0.03 | 0.08 | 0.00 |
| | [0.08] | [0.00] | [0.49] | [0.00] | [0.96] |
| Interest-to-debt | 0.06 | 0.07 | -0.01 | 0.06 | -0.00 |
| | [0.00] | [0.00] | [0.28] | [0.00] | [0.82] |
| R&D | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 |
| | [0.02] | [0.01] | [0.37] | [0.17] | [0.18] |

TABLE IA.4: RETURN DECOMPOSITION WITH ALTERNATIVE CONTROL BONDS

This table reports the Kalman Filter return decomposition using various alternative control bond matching criteria to compute the upgraded bond CARs. We use specification E in Table 5 in the main text. Two-sided $p$-values (shown in brackets) are computed using Kalman filter standard errors.

| | **Original controls** | | **HY bonds without Fitch rating** | | **HY bonds with same, lower or no Fitch rating** | | **Ex bonds upgraded post-announce** | |
|---|---|---|---|---|---|---|---|---|
| | Narrow match | Broad match | Narrow match | Broad match | Narrow match | Broad match | Narrow match | Broad match |
| $\alpha_{\text{Ann}}$ | 1.62 | 1.57 | 1.71 | 1.60 | 0.76 | 0.73 | 1.68 | 1.42 |
| | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.01] | [0.01] | [0.00] |
| $\alpha_{\text{Eff}}$ | 0.96 | 0.82 | 0.76 | 0.71 | 0.42 | 0.27 | 1.07 | 0.61 |
| | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.20] | [0.00] | [0.03] |
| $\sum_i \beta_i$ | 0.34 | 0.31 | 0.32 | 0.32 | 0.34 | 0.40 | 0.30 | 0.28 |
| | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] |
| $\beta_{-2}$ | 0.05 | 0.05 | 0.04 | 0.04 | 0.05 | 0.07 | 0.03 | 0.03 |
| | [0.15] | [0.12] | [0.27] | [0.20] | [0.11] | [0.05] | [0.49] | [0.43] |
| $\beta_{-1}$ | 0.08 | 0.06 | 0.08 | 0.06 | 0.08 | 0.07 | 0.08 | 0.06 |
| | [0.03] | [0.11] | [0.03] | [0.15] | [0.02] | [0.05] | [0.06] | [0.14] |
| $\beta$ | 0.22 | 0.21 | 0.20 | 0.21 | 0.17 | 0.20 | 0.22 | 0.22 |
| | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] |
| $\beta_1$ | -0.06 | -0.07 | -0.06 | -0.06 | -0.02 | -0.01 | -0.07 | -0.07 |
| | [0.08] | [0.07] | [0.09] | [0.11] | [0.57] | [0.89] | [0.09] | [0.08] |
| $\beta_2$ | 0.05 | 0.06 | 0.06 | 0.07 | 0.06 | 0.07 | 0.04 | 0.04 |
| | [0.09] | [0.08] | [0.05] | [0.06] | [0.08] | [0.05] | [0.25] | [0.26] |
| $\delta_1$ | 0.58 | 0.52 | 0.52 | 0.52 | 0.63 | 0.66 | 0.52 | 0.42 |
| | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] |
| $\delta_2$ | 0.20 | 0.24 | 0.21 | 0.22 | 0.23 | 0.25 | 0.21 | 0.20 |
| | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.08] | [0.01] |
| $\sigma_\eta$ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.04 |
| | [1.00] | [1.00] | [1.00] | [1.00] | [1.00] | [1.00] | [0.92] | [0.15] |
| $\sigma_\epsilon$ | 0.15 | 0.16 | 0.15 | 0.16 | 0.15 | 0.16 | 0.15 | 0.16 |
| | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] |
| Log-likelihood | 128.70 | 104.76 | 129.30 | 106.30 | 127.04 | 110.82 | 122.05 | 85.43 |
| AIC | -237.41 | -189.52 | -238.60 | -192.61 | -234.08 | -201.64 | -222.10 | -148.86 |
| BIC | -201.09 | -153.21 | -202.29 | -156.29 | -197.77 | -165.33 | -182.15 | -108.92 |

Table IA.5: Bond returns and order flow imbalances

This table describes the relation between daily returns and order flow imbalances for bonds upgraded from high-yield (HY) to investment-grade (IG) status. We report results from both pooled OLS regressions and average coefficients from time-series regressions for individual bonds. The dependent variable is the daily return. The regressors of interest measure order flow imbalances in three different ways in order to control of TRACE order censoring: Signed TRACE dollar volume, number of TRACE transactions, and number of TRACE transactions over $1 MM (as a proxy for institutional trades). To compute order flow imbalances (OI), transaction prices on each trade are compared with the closing price on the most recent prior day with trading. If the transaction price is higher, the transaction is classified as a buy, otherwise as a sell. The buy/sell indicators are used to compute the trade direction and then applied to log volume to compute order flow imbalances. Trading volume is included as a control variable, but the results are similar in univariate regressions. We express all explanatory variables in logarithms in order to reduce fat tails. That is, *Order Imbalance* equals $ln(1 + \text{OI})$, if the raw order imbalance measure OI is positive, and $-ln(1 + |\text{OI}|)$ otherwise. Two-sided $p$-values (shown in brackets) are computed using standard errors that are robust to heteroscedasticity and issuer clustering.

| | **Pooled** | **TS** | **Pooled** | **TS** | **Pooled** | **TS** |
|---|---|---|---|---|---|---|
| **Panel A: Postannouncement window (-10,114] – 3,244 observations** | | | | | | |
| Order flow imbalance ($ MM) | 4.89 | 7.55 | | | | |
| | [0.00] | [0.00] | | | | |
| Order flow imbalance (no. trades) | | | 45.35 | 78.81 | | |
| | | | [0.00] | [0.00] | | |
| Order flow imbalance (no. trades ≥ $1 MM) | | | | | 40.41 | 46.82 |
| | | | | | [0.00] | [0.00] |
| Volume | 2.25 | 7.86 | 3.47 | 9.17 | 3.82 | 11.89 |
| | [0.01] | [0.20] | [0.00] | [0.14] | [0.00] | [0.06] |
| $R^2$ | 0.22 | 0.44 | 0.20 | 0.42 | 0.07 | 0.21 |
| **Panel B: Posteffective window (114,245] – 3,240 observations** | | | | | | |
| Order flow imbalance ($ MM) | 4.79 | 8.29 | | | | |
| | [0.00] | [0.00] | | | | |
| Order flow imbalance (no. trades) | | | 50.98 | 90.20 | | |
| | | | [0.00] | [0.00] | | |
| Order flow imbalance (no. trades ≥ $1 MM) | | | | | 39.12 | 59.37 |
| | | | | | [0.00] | [0.00] |
| Volume | 2.06 | -0.25 | 2.55 | -1.14 | 3.09 | 7.68 |
| | [0.04] | [0.92] | [0.03] | [0.71] | [0.00] | [0.09] |
| $R^2$ | 0.20 | 0.45 | 0.20 | 0.43 | 0.05 | 0.18 |

## Table IA.6: Abnormal stock returns and the Lehman announcement

This table reports estimates of the cross-sectional variation in equity CARs around the Lehman announcement for the issuers of the bonds in our universe of 8,767 bonds. Abnormal equity returns are calculated using the Fama-French three-factor model. The regressors of interest are dummy variables indicating the average old Lehman rating category interacted with the proportion of an issuer's bonds with favorable Fitch ratings. As controls for overall credit risk and pricing, the regression includes the old index rating dummy variables by themselves, dummies for the company's industry segment, firm size measured as log value of sales and book-to-market ratio. The number of observations is 732. Two-sided $p$-values (shown in brackets) are computed using standard errors that are robust to heteroscedasticity.

| | **Event window** | | | | | | |
|---|---|---|---|---|---|---|---|
| | (-10,0] | (-10,10] | (-10,30] | (-10,60] | (-10,90] | (-10,114]$^{\dagger}$ | (-10,245] |
| Fitch favorable × AA - A | -0.43 | 0.10 | 0.01 | -0.86 | -2.34 | -1.50 | 1.00 |
| | [0.23] | [0.86] | [0.99] | [0.43] | [0.07] | [0.36] | [0.72] |
| Fitch fav. × BBB+ - BBB | -0.63 | -0.17 | -1.02 | -1.99 | -4.06 | -2.77 | -5.96 |
| | [0.12] | [0.81] | [0.33] | [0.20] | [0.08] | [0.33] | [0.15] |
| Fitch fav. × BBB– | 0.14 | 1.50 | 0.57 | 2.15 | 3.06 | 4.32 | 7.21 |
| | [0.78] | [0.11] | [0.68] | [0.21] | [0.15] | [0.08] | [0.11] |
| Fitch fav. × BB+ | -0.11 | -0.25 | -0.78 | -3.17 | -5.34 | -4.16 | -3.36 |
| | [0.89] | [0.85] | [0.71] | [0.31] | [0.20] | [0.39] | [0.69] |
| Fitch fav. × BB | 1.23 | 1.33 | 1.79 | 0.90 | -0.26 | -0.27 | -0.43 |
| | [0.31] | [0.41] | [0.49] | [0.85] | [0.96] | [0.97] | [0.97] |
| Fitch fav. × BB– - B | 0.24 | -1.45 | -2.74 | -2.89 | -2.53 | -4.03 | -5.83 |
| | [0.74] | [0.18] | [0.06] | [0.20] | [0.37] | [0.26] | [0.30] |
| AAA | -1.23 | -1.92 | -1.78 | -0.77 | -2.74 | -4.46 | -17.31 |
| | [0.05] | [0.12] | [0.35] | [0.82] | [0.44] | [0.27] | [0.06] |
| AA - A | 0.08 | -0.35 | -0.48 | 0.30 | 0.40 | -1.62 | -6.28 |
| | [0.87] | [0.62] | [0.65] | [0.85] | [0.82] | [0.44] | [0.08] |
| BBB+ - BBB | 0.62 | -0.13 | 0.34 | 1.38 | 2.13 | 0.66 | -3.16 |
| | [0.16] | [0.85] | [0.74] | [0.35] | [0.22] | [0.75] | [0.38] |
| BBB– | 0.69 | -0.30 | 0.08 | 0.58 | -0.04 | -1.78 | -9.66 |
| | [0.16] | [0.69] | [0.95] | [0.73] | [0.98] | [0.44] | [0.02] |
| BB+ | -0.25 | -0.39 | -0.60 | 1.67 | 1.59 | -0.03 | -2.97 |
| | [0.67] | [0.70] | [0.68] | [0.45] | [0.57] | [0.99] | [0.65] |
| BB | 0.13 | 0.63 | 0.90 | 1.21 | 4.15 | 4.70 | 1.15 |
| | [0.89] | [0.62] | [0.62] | [0.72] | [0.21] | [0.28] | [0.86] |
| BB– - B | 0.50 | 0.42 | 0.71 | 1.61 | 1.30 | 1.16 | -2.17 |
| | [0.22] | [0.50] | [0.46] | [0.25] | [0.44] | [0.55] | [0.54] |
| Financial | -0.73 | -2.76 | -3.13 | -4.27 | -4.36 | -4.87 | -3.32 |
| | [0.05] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.25] |
| Industrial | -0.15 | -1.03 | 0.44 | -0.59 | -1.34 | -2.81 | -0.40 |
| | [0.69] | [0.07] | [0.61] | [0.62] | [0.35] | [0.10] | [0.89] |
| Firm size | 0.02 | 0.17 | 0.02 | 0.06 | 0.12 | 0.30 | 0.27 |
| | [0.77] | [0.04] | [0.87] | [0.74] | [0.57] | [0.22] | [0.50] |
| Book-to-market | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | -0.03 |
| | [0.47] | [0.00] | [0.00] | [0.01] | [0.16] | [0.10] | [0.12] |
| $R^2$ | 0.04 | 0.05 | 0.07 | 0.05 | 0.04 | 0.03 | 0.04 |

TABLE IA.7: IMPACT ON LIQUIDITY

This table reports statistics on changes in liquidity for the bonds upgraded from HY to IG status. We consider three time periods: the pre-announcement window (-50,-10], the postannouncement window (-10,114], and the posteffective window (114,245]. We compute Roll and Amihud liquidity measures for each bond separately and report the cross-sectional average. The control group comprises all HY bonds that are either not rated by Fitch or have a Fitch rating below Moody's and S&P. Two-sided *p*-values (shown in brackets) are computed using standard errors that are robust to heteroscedasticity and issuer clustering.

| | **Liquidity (*Roll*)** | | **Liquidity (*Amihud*)** | |
|---|---|---|---|---|
| | Post-Pre Difference | Diff-in-Diff | Post-Pre Difference | Diff-in-Diff |
| **Panel A: Postannouncement window (-10,114]** | | | | |
| HY-to-IG bonds | 0.02 | 0.00 | 0.16 | 0.03 |
| | [0.46] | [0.82] | [0.52] | [0.79] |
| Control bonds | 0.02 | – | 0.13 | – |
| | [0.51] | – | [0.05] | – |
| **Panel B: Posteffective window (+114,245]** | | | | |
| HY-to-IG bonds | 0.06 | -0.01 | 0.26 | 0.09 |
| | [0.37] | [0.69] | [0.45] | [0.97] |
| Control bonds | 0.07 | – | 0.17 | – |
| | [0.96] | – | [0.00] | – |