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ABSTRACT

This dissertation is a collection of three essays that investigate the role and importance of intermediaries in corporate finance and financial markets. Chapter 1 investigates whether bond rating agencies convey new information when they announce a rating change by studying the corporate bond market reaction to rating change announcements. Abnormal bond returns over a two-day event window that includes the downgrade (upgrade) are negative (positive) and statistically significant, although the reaction to upgrades is economically small. The bond market response is stronger for rating changes that appear more surprising, rating changes of lower rated firms, and upgrades that move the firm from speculative grade to investment grade. These findings support the hypothesis that both rating upgrades and downgrades convey some new information. Chapter 2 examines the long-standing question of whether firms derive value from investment banking relationships by studying how the bankruptcy of Lehman Brothers affected industrial firms that received underwriting, advisory, analyst, and market-making services from Lehman. Equity underwriting clients experienced an abnormal stock return of around -5%, on average, in the seven days surrounding Lehman's bankruptcy, amounting to $23 billion in aggregate, risk-adjusted losses. Losses were especially severe for companies that had stronger and broader security underwriting relationships with Lehman or were smaller, younger, and more financially constrained. All other client groups were not adversely affected, on average. These results are consistent with the hypothesis that equity underwriting relationships are valuable to client firms and costly to replace. Chapter 3 examines the question of whether firms derive value from lending relationships by studying how the bankruptcy of Lehman Brothers affected corporate borrowers that had syndicated loans from Lehman. Firms with syndicated credit facilities from Lehman experienced abnormal stock returns of -3%, on average, during a seven day period that includes the bankruptcy announcement. These losses were more severe if Lehman was the firm's lead lender or if Lehman recently underwrote the firm's equity securities. Firms with more severe information asymmetry and moral hazard problems, less profitable firms, and firms with less cash and larger undrawn credit lines from Lehman also suffered greater losses. Lehman's borrowers also experienced significant reductions in profitability and investment relative to their industry peers in the year following Lehman' failure. These findings are consistent with the hypothesis that lending relationships developed through syndicated loans are valuable to corporate borrowers and costly to replace.

CHAPTER 1

THE IMPACT OF BOND RATING CHANGES ON CORPORATE BOND PRICES: NEW EVIDENCE FROM THE OVER-THE-COUNTER MARKET

I. Introduction

High profile bankruptcies of highly rated firms in recent years, such as that of Enron in 2001 and Lehman Brothers in 2008,[1] have led many to question the value of bond ratings. Rating agencies claim that their bond ratings partially reflect private information, and hence the information content of bond rating changes is a topic that has received considerable attention in the academic literature. Numerous studies find that the stock market reacts negatively and significantly to bond rating downgrades. With the exception of a few recent studies, most fail to find a significant stock market reaction to upgrades.[2] A handful of studies have focused on the bond market reaction and produced mixed evidence. Consequently, whether and to what extent rating changes bring new information to financial markets, especially bond markets, is a question unresolved by the literature.

Using monthly corporate bond returns, Weinstein (1977) and Wansley and Clauretie (1985) do not find significant reactions to downgrades or upgrades in the month of and month following a rating change. In contrast, Grier and Katz (1976) find that industrial bonds react negatively in the months following a downgrade,

[1] Enron was rated investment grade by both Moody's and S&P four days prior to its bankruptcy filing,

[2] Griffin and Sanvicente (1982), Holthausen and Leftwich (1986), Wansley and Clauretie (1985), Cornell et al. (1989), Hand et al. (1992), Goh and Ederington (1993), Ederington and Goh (1998), Goh and Ederington (1999), Norden and Weber (2004), Li et al. (2006), and Kim and Nabar (2007) find significant stock price reactions to downgrades but not to upgrades. Dichev and Piotroski (2001), Jorion et al. (2005), and Jorion and Zhang (2007) find statistically significant stock price responses to both downgrades and upgrades.

while Hite and Warga (1997), using monthly dealer quotes, find significant bond market responses to both downgrades and upgrades.[3] Using daily bond price data from the NYSE, Hand et al. (1992) find significant reactions to both downgrades and upgrades in their full sample. However, after removing contaminated rating changes that occur contemporaneously with non-rating, firm specific news, they find an insignificant reaction to downgrades and a significant positive reaction to upgrades. The results from their uncontaminated sample are inconsistent with prevailing evidence on daily abnormal stock returns around downgrades.[4]

The mixed evidence in the literature can be attributed to the past quality and availability of bond price data. With the exception of Hite and Warga (1997),[5] the studies mentioned above use data on bond trades from the NYSE, which is a small, odd-lot market characterized by infrequent trading. The corporate bond market is institutional in nature with trading conducted primarily over-the-counter (OTC). Listed securities and trades on the NYSE account for a negligible fraction of overall market size and activity.[6] Until recently, however, there was no system in place to

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[3] Wansley et al. (1992) use weekly bond price estimates ("matrix" prices) from the Merrill Lynch Bond Pricing Service and find a significant response to downgrades. A potential concern in interpreting these results is that matrix prices are predicted, not actual, and ratings are one of the predictors.

[4] While the information content of rating changes is the focus of this paper, in general there is a large literature on bond ratings. Recent papers study issues such as conflicts of interest in the ratings industry (Stopler, 2009), the role of rating outlooks and watch lists (Boot et al., 2006; Altman and Rijken, 2007), unsolicited ratings (Behr and Güttler, 2008), split ratings (Livingston et al., 2008), rating dynamics (Frydman and Schuermann**,** 2008; Kadam and Lenk, 2008) and public vs. private ratings (Mählmann, 2008).

[5] Hite and Warga (1997) use proprietary data on monthly quotes from traders employed by Lehman Brothers.

[6] In 2005, the NYSE reported that only 534 corporate bonds were listed on the NYSE, that transactions in all listed bonds averaged a mere 128 per day, and that the average par volume per trade was $29,600 (NYSE, 2007). Comparatively, the NASD reported that over 27,000 corporate bonds

collect and disseminate comprehensive information on OTC trades. Previous research, therefore, has been largely limited to small samples comprised of thinly traded bonds. Furthermore, most prior studies employ large event windows, typically a month or a week, due to a past lack of widely available daily bond data. The weaker power of tests that use monthly returns relative to daily returns, especially in small samples, is well documented (Brown and Warner, 1985; Bessembinder et al., 2009). On the other hand, non-rating, firm specific news may confound monthly returns because downgrades (upgrades) tend to occur when the firm is performing poorly (well). Since it is infeasible to eliminate observations that are contaminated with non-rating news during a month long window, monthly return estimates may be biased away from zero. With respect to statistical inferences, this contamination problem works in the opposite direction of the power problem associated with using monthly returns and also works to overstate economic significance. The validity of inferences from analyses of monthly returns around bond rating changes is, therefore, unclear regardless of whether the outcome is a rejection or failure to reject the null.

In this paper, I use comprehensive data on OTC corporate bond trades from the Financial Industry Regulatory Authority's (FINRA) Trade Reporting and Compliance Engine (TRACE) to measure daily abnormal bond returns over the day of and day following a bond rating change. In a large sample of rating changes by Moody's, S&P, and Fitch during September 2002 to March 2009, I find statistically

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were traded in the OTC market in 2005, with a daily average of 23,856 trades per day and an average par volume per trade of $785,000 (NASD, 2006).

significant bond market reactions to both downgrades and upgrades not contaminated by non-rating news. The response to downgrades is about three times larger in magnitude than that to upgrades. Although statistically significant, the positive reaction to upgrades is small relative to bond trading costs. These results indicate that the bond market infers some new information from downgrades and, to a much lesser extent, upgrades.

A contribution of this study over existing literature is the use of daily bond data, which provides greater precision and accuracy in the measurement of abnormal bond returns attributable to rating changes. Given that much of the prevailing evidence on the impact of rating changes in bond markets is based on monthly returns, I also document monthly abnormal bond returns around rating changes during my sample period to determine if and how conclusions would change relative to those obtained from daily return analyses. For both downgrades and upgrades, abnormal bond returns in the month of a rating change are statistically significant. The lack of a relative power advantage in using daily data is due to the ability to construct large samples of rating changes with the TRACE data. However, monthly return estimates tend to overstate the magnitude and economic significance of the market reaction relative to daily returns. For downgrades, monthly abnormal returns are more than three times larger in magnitude than two-day abnormal returns. These results suggest that researchers should be wary when using monthly returns in event studies, especially when contaminating news is expected to induce a bias in the abnormal returns.

My finding of a statistically significant bond market reaction to upgrades is at odds with much of the literature on the stock market reaction to rating changes. I therefore examine the stock market reaction to rating changes during the sample period and find that daily abnormal stock returns are negative and statistically significant around downgrades and positive but statistically insignificant around upgrades. These findings are consistent with the numerous studies that find significant stock market reactions to downgrades but not upgrades, but they contrast with the bond market reaction to upgrades, which is small, positive, and statistically significant. I conjecture that the differing statistical inferences regarding the effect of upgrades on bond and stock prices may be due to the small information content of the average upgrade combined with the differing implications that some rating changes may have for stockholders and bondholders (i.e. wealth transfer effects). I find evidence that is consistent with this conjecture.

Finally, I explore the cross-sectional variation in the bond market response to rating changes and find that the reaction to rating changes that appear to be less anticipated is significantly stronger, i.e., downgrades (upgrades) preceded by positive (negative) abnormal bond returns elicit significantly stronger reactions. The reaction is stronger among firms with lower credit quality, which is consistent with larger differences in historical default rates between adjacent rating classes at lower credit qualities (Hamilton and Cantor, 2004). Finally, the response to an upgrade is exceptionally strong if the firm is moved from speculative to investment grade, which may reflect the influence that ratings-based regulations have on financial institutions' demands for speculative grade bonds.

The remainder of paper is organized as follows. Section II provides a brief overview of the bond rating process. Sections III and IV describe the data and methodology. Section V reports event study results. Section VI explores the cross-sectional variation in the bond market response to rating changes. Section VII concludes.

II. The Bond Rating Process

A bond rating is intended to reflect the ability of an issuer to make promised debt payments in a timely fashion. Before issuing debt, corporations can approach a rating agency or agencies to request a rating. Upon receiving the request, the agency assigns a team of credit analysts to assess the firm's creditworthiness and assign a rating. Ratings are based on information from publicly available information and, according to the rating agencies, private information that analysts gather during meetings and conversations with the firm's management.

The process for bond rating changes is similar. After an initial rating is assigned, an agency analyst remains in periodic contact with the firm. As with initial ratings, the agencies claim that this process affords them access to confidential information not publicly available to investors. If the agency perceives a significant change in the firm's credit quality, it will either announce a rating change or place the firm on its "credit watch" list.[7] In the vast majority of cases, the agency will indicate the direction of a possible future rating change when a firm is credit watch listed. After a watch listing, credit analysts will meet with the firm's management and conduct an evaluation of the firm's financial condition, after which the agency will announce either a rating change or confirmation.

Moody's, S&P, and Fitch are the three largest bond rating agencies, and most U.S. corporations with publicly traded debt are rated by at least one of the three. Rated corporations typically carry an issue rating or ratings, which correspond to individual bond issues, as well as an issuer rating. In general, an issue rating is an opinion of the creditworthiness of the issuer with respect to a specific issue, while an issuer rating encompasses an issuer's overall ability to meet its financial obligations (Moody's Investors Service, 2007). Depending on priority, individual bond issues can have ratings that are higher or lower than the issuer rating. As in most previous studies on the information content of rating changes, I use the issue ratings assigned to long-term corporate bonds in my analysis. Moody's rates long-term issues from Aaa to C, with fine modifiers of 1, 2, and 3 for letter classes Aa to Caa, e.g. Aa1, Aa2, Aa3. S&P and Fitch rate long-term bond issues from AAA to D, with modifiers of plus and minus for letter classes AA to CCC, e.g. AA+, AA, AA-. Issues rated BBB- (Baa3) and above are said to be investment grade. Issues rated BB+ (Ba1) and below are said to be speculative grade.

[7] Moody's, S&P, and Fitch maintain "watch" lists which are meant to identify firms whose bond ratings are under review for possible change in the short term, usually within ninety days. S&P's list is called Credit Watch, Moody's is called the Watchlist, and Fitch's is called Rating Watch. For simplicity, I refer to all three as credit watch lists.

III. Data and Sample Selection

I use transaction data from FINRA's TRACE database, which was introduced by the National Association of Securities Dealers (NASD)[8] in 2002 in an effort to improve transparency in the OTC corporate bond market. Although the data begins in July 2002, TRACE's coverage of the OTC market is not virtually comprehensive until 2005. Prior to October 2004, between 470 and 4,600 large investment grade bonds are covered, with coverage increasing with time. Only fifty non-investment grade issues are covered prior to October 2004, after which coverage begins to expand dramatically. By February 2005, 99% of all transactions and 95% (in par value) of all TRACE-eligible bonds,[9] including investment grade, non-investment grade, and convertible bonds are covered. The data is organized by transaction, and relevant fields include trade date, time, par volume, yield, and price.[10]

I use Bloomberg to identify rating changes by Moody's, S&P, and Fitch during September 2002 to March 2009. During the sample period, there are 37,266 bond issues with at least one trade in TRACE. I was able to obtain the ratings history and necessary bond characteristic data (e.g. maturity, coupon rate, etc.) for 36,416 (97.7%) of these issues from Bloomberg. As described in Section IV, I construct

[8] In 2007, FINRA was formed through a consolidation of the NASD and the enforcement arm of the NYSE.

[9] "TRACE-eligible" securities include US$ denominated public bonds that are registered with the SEC. Rule 144A bonds, government bonds, mortgage or asset backed securities, collateralized mortgage obligations, and bonds with maturities at issuance of one year or less are not covered by TRACE.

[10] As in Edwards et al. (2007), I delete cancelled, reversed, and duplicate interdealer trades. As in Bessembinder et al. (2009), I exclude trades if TRACE indicates that special conditions impacted the execution price or if the execution price includes dealer commission.

bond return indices for each rating class using all issues available in TRACE in order to control for market fluctuations in computing abnormal bond returns, which requires a sufficiently large number of bonds in a given rating class with observable returns. For this reason, I exclude rating changes prior to January 2005 if the old or new rating is speculative grade, as TRACE only covers fifty non-investment grade bonds prior to October 2004. Investment grade bonds are included prior to 2005 as long as the bond is covered by TRACE at the time of the rating change.

Like Hand et al. (1992), I include nonconvertible, fixed-rate corporate bonds issued by U.S. firms. Like Bessembinder et al. (2009), I exclude zero coupon and putable bonds. I also require that the bond's maturity date is at least one year from the rating change date. If a firm experiences multiple rating changes within a five-day period, I include only the earliest rating change. I exclude downgrades where the new rating is CC (Ca) or below since they are more likely to be associated with contaminating information, such as defaults or bankruptcy. For consistency, I also exclude upgrades where the old rating is CC (Ca) or below.

At the issue level, the imposition of these screens results in a preliminary sample of 67,583 bond rating changes (48,915 downgrades and 18,668 upgrades). However, at the firm level, many of these constitute duplicate observations because they pertain to multiple bonds from the same firm affected by a rating change on the same day. At the firm level, these represent 4,886 unique rating change events (2,869 downgrades and 2,017 upgrades).[11]

Trading activity around rating changes illustrates the illiquidity of the corporate bond market. 50% of the 67,583 issue level observations mentioned above trade on fewer than fourteen days during the 101 market days centered around Day 0 (Day -50 to +50), where Day 0 is the rating change date. 16% do not trade at all, and only 1.5% trade on every day during this period. To deal with this illiquidity, I impose trading restrictions. For all my analyses of daily returns, I require a bond to trade on at least ten days during Day +31 to +50. This screen is similar to the one employed by Bessembinder et al. (2009), except that they use a pre-event period (Day-20 to -1). I choose a post-event period for this screen because prior literature has found significant abnormal bond and stock returns just prior to rating changes. This screen eliminates 52,604 observations at the issue level (37,305 downgrades and 15,299 upgrades) and 2,390 observations at the firm level (1,299 downgrades and 1,091 upgrades). I use a two-day window (0,+1) to measure the market's reaction rather than a one-day window because the data in Bloomberg only indicate the date of the rating change and not the time of day. Hence, in my baseline analysis, I also require that a bond trade on Day -1 and on Day +1 to ensure that event period returns reflect observable movements of prevailing market prices. This screen eliminates another 6,153 issue level observations (4,690 downgrades and 1,463 upgrades) and 727 firm level observations (411 downgrades and 316 upgrades).

[11] When members of the same corporate family experience a rating change on the same day (e.g. a parent and its subsidiaries), I sample bonds from each entity but treat the entities all as one distinct firm.

After imposing these trading restrictions, the final baseline sample consists of 6,920 downgrades and 1,906 upgrades at the issue level that represent 1,159 firm downgrades and 610 firm upgrades.

Since rating changes may be contaminated by other non-rating disclosures, I use Factiva to search the Wall Street Journal, Business Wire, PR Newswire, Dow Jones News Service, and Reuters News for other non-rating news about the firm in the three-day period, Day -1 to +1. If an article published in this period contains contaminating information, I classify it as contaminated.[12] After removing contaminated observations, the uncontaminated baseline sample consists of 2,210 downgrades and 1,230 upgrades at the issue level that represent 652 downgrades and 441 upgrades at the firm level.

Table I reports summary statistics on trading activity by event day for individual bond issues in the baseline sample. Over the (-20,+10) window, a large percentage of bonds in the sample (no less than 75%) are traded on any given day, with the largest trading volume occurring on Day 0 for both upgrades and downgrades. Downgraded bonds typically trade about two times as frequently as upgraded bonds in the days surrounding the rating change.

**** Insert Table I here ****

Because the contemporaneous returns exhibited by different bond issues from the same firm should be positively correlated, in my event study analyses I use a

[12] Contaminating information includes items such as earnings or earnings guidance, mergers or acquisitions, spinoffs, divestures, dividends, security repurchases, public, private, or government financing, bankruptcy, default, covenant violations or renegotiations, executive appointments or resignations, board elections, antitakeover amendments, lawsuits, and regulatory actions that may affect the firm.

portfolio approach to compute firm abnormal bond returns and treat each firm level rating change as a single observation. Henceforth, references to the number of observations reflect rating changes at the firm level unless otherwise specified.

Table II reports the distribution of the baseline sample by rating agency and by rating change characteristics. The full baseline sample of downgrades, which contains both contaminated and uncontaminated observations, consists of 504 by Moody's, 460 by S&P, and 195 by Fitch. The full baseline sample of upgrades consists of 244 by Moody's, 253 by S&P, and 113 by Fitch. Fewer Fitch rating changes is consistent with Fitch's smaller market share. Regarding sample distribution by calendar year, there are fewer rating changes in the earlier years because TRACE's coverage of the market did not become virtually comprehensive until 2005. A large number of downgrades occurred in 2008, which reflects the recent economic recession and financial crisis. Regarding the size of the rating change (number of fine grades that the rating is changed), the majority of observations constitute changes of only one grade.[13] In addition, 55% of downgrades and 41% of upgrades in the full sample affected investment grade firms (BBB letter class or above), but investment grade firms comprise a smaller portion of the uncontaminated sample (41% of downgrades and 38% of upgrades), which likely reflects the fact that investment grade firms tend to be larger and generate more

[13] 49 downgrades and 17 upgrades in the full sample constitute observations where the firm had different bond issues whose ratings were changed by a different number of grades (e.g., one bond issue was downgraded one grade and another was downgraded two grades). For these firms, Table II reports the change of the highest rated (closest to AAA) issue.

contaminating news. 9% of both downgrades and upgrades in the full sample crossed the investment grade boundary.

**** Insert Table II here ****

While the baseline sample described above is the focus of most of my analyses, I must acknowledge a potential sample selection bias that may be induced by the requirement that bonds trade on Days -1 and +1. If some rating changes are informative while others are not, and if significant new information induces trading when there otherwise would be none, then this requirement will bias the sample toward more informative rating changes. Hence, for robustness, I consider two alternative samples. The first consists of all bonds that traded on at least ten days during Day +31 to Day +50, irrespective of whether the bond traded in the days surrounding the rating change. Unlike the baseline sample, this sample includes some bonds that did not trade at all during the (0,+1) period. As explained in Section IV, for a day on which a bond does not trade, I assume that the bond's price did not change so that the raw return reflects accrued interest. The advantage of this sample is that it should not contain the previously discussed selection bias.[14] A disadvantage is that it may understate the impact of rating changes due to the assumption that bonds not traded around the event did not do so due to a lack of information content rather than illiquidity. At the issue level, this sample consists of 11,610 downgrades and 3,369 upgrades that represent 1,570 firm downgrades and 926 firm upgrades. After removing observations with contaminating news during Day -1 to +1, it consists of 3,848 downgrades and 2,300 upgrades at the issue level that represent 959

[14] I thank an anonymous reviewer for suggesting this sample.

firm downgrades and 689 firm upgrades. As an additional means of addressing concerns of a selection bias, I also consider a sample of liquid bonds that traded on every day during Day +31 to Day +50, irrespective of whether the bond traded around the rating change. This sample is much smaller and consists of 2,395 downgrades and 543 upgrades at the issue level that represent 494 firm downgrades and 203 firm upgrades. After removing contaminated observations, it consists of 606 downgrades and 322 upgrades at the issue level that represent 214 firm downgrades and 137 firm upgrades. Although not all, the large majority (93%) of these bonds traded on both Days -1 and +1. The rationale for considering this sample is that it includes only securities that could be considered liquid in that they are likely to trade on any given day regardless of whether an informative event occurs. In this respect, this sample more closely resembles a sample of common stocks. A disadvantage is that the sample size is much smaller and less representative of the population with respect to liquidity and other characteristics that are correlated with liquidity, such as issue size and rating.

IV. Methodology

I compute daily raw returns on individual bond issues following Bessembinder et al. (2009):

$$\text{Bond Return}_{\text{Raw}} = \frac{P_t - P_{t-1} + AI_t}{P_{t-1}} \tag{1}$$

where P_{t-1} and P_t are the daily prices on Days *t-1* and *t*, respectively, and AI_t is the interest accrued over Day *t*.[15] If the bond is not traded on Day *t*, P_t is set equal to the most recent observed daily price. Hence, the raw return on a day with no trades simply reflects the accrued interest. Rather than using the last price of the day as the daily price, I estimate daily prices using the "trade-weighted price, all trades" method of Bessembinder et al. (2009). This method uses all trades on a given day and estimates the daily price as the volume-weighted average price. Bessembinder et al. (2009) find that statistical tests on daily abnormal returns estimated with this method are better specified and more powerful than those on returns computed with end-of-day prices. The power advantage is due to the fact that returns computed with end-of-day prices are much noisier because the reported prices in TRACE include bid/ask fees, which are negatively related to trade size and considerably large for small trades.[16] The simulation evidence of Bessembinder et al. (2009) shows that the "trade-weighted price, all trades" method mitigates the problem associated with the bid/ask spread because it gives more weight to large trades that should have lower trading costs and that should, therefore, more accurately reflect the prevailing market price. A potential disadvantage is that the daily price will reflect prices throughout the course of the day and not necessarily at market close. However, this problem is mitigated by using a two-day event window that includes Day +1. Alternatively, Bessembinder et al. (2009) find that their "trade-weighted price, trade $\geq$ 100k"

[15] The accrued interest on Day *t* is computed as the annual coupon payment multiplied by *L*, all divided by 360, where *L* is the number of calendar days elapsed between the close of market Day *t-1* and the close of Day *t*.

[16] Edwards et al. (2007) estimate an average half spread of 0.75% for a small retail trade of \$5,000 and 0.04% for a large institutional trade of \$10 million.

method, which employs trade-weighted prices but uses only trades of $100,000 or more, is even more powerful than the "trade-weighted price, all trades" method. However, they note that it has the disadvantage of fewer observations due to the elimination of days with only trades of less than $100,000. I choose the "trade-weighted price, all trades" method to avoid this problem. However, for robustness I also examine whether my main conclusions are affected if the "trade-weighted price, trade ≥ 100k" method is used. I find that they are not and discuss the results in greater detail in Section V.A.

I compute the daily abnormal bond return as the raw return minus the contemporaneous return on an index of matched corporate bonds:

$$ABR_t = R_t - IR_t \tag{2}$$

where, on Day t, ABR_t is the abnormal bond return, R_t is the raw bond return, and IR_t is the return on a value-weighted index of matched corporate bonds that did not experience a rating change in the period Day *t-30* to Day *t+30*. I use the entire TRACE universe to construct the matched corporate bond indices. The matching criteria include 7 letter classifications based on S&P's ratings and, if unrated by S&P, Moody's ratings of the matched corporate bonds. These classifications include AAA, AA, A, BBB, BB, B, and CCC. To control for risk related to maturity, I partition the AAA, AA, A, BBB, and BB classes into long and short maturity bands. For the AAA, BBB, and BB classes, the two maturity bands are below seven years and seven years and above. For the A and B classes, the two bands are below six years and six years and above. For the AA class, the two bands are below five years and five years and above. These cutoffs are chosen so that, within a letter class, there is roughly the same number of matched bonds in each band. The CCC class is not partitioned by maturity due to the much smaller number of traded bonds in this class. Theses indices are restricted to non-convertible, non-putable, fixed-rate corporate bonds with non-zero coupon rates and one or more years to maturity. For each of the thirteen bond indices, I compute the value-weighted daily return for each day in the sample period. As in Bessembinder et al. (2009), to be included in a given index on Day *t*, I require that a bond be traded on Day *t* and Day *t-1*. Sample bonds are matched to the appropriate index based on maturity and rating on Day *t-1*.

For firms in the sample with multiple bonds affected on the same day, I aggregate abnormal bond returns by firm and treat each firm rating change as a single observation. Specifically, suppose firm *j* had *n* different bond issues affected by a rating change on the same day. In this case, I compute the firm's abnormal bond return on Day *t* as the weighted average of the abnormal returns of the different bond issues. Hence, the abnormal bond return for firm *j* on Day *t* is:

$$ABR_{j,t} = \sum_{i=1}^{n} ABR_{i,t} w_{i,t-1} \quad (3)$$

where *n* is the number of bonds issues in the sample for firm *j* and $w_{i,t-1}$ is the ratio of bond *i*'s market value on Day *t-1* to the total market value of firm *j*'s bonds in the sample. For a multiple day window, Days 0 and +1 for example, cumulative abnormal returns (CARs) are computed as the sum of the firm's daily abnormal bond returns over the window.

V. Results

A. The Corporate Bond Market Reaction to Bond Rating Changes

Table III reports mean CARs for the full (contaminated and uncontaminated) and uncontaminated baseline samples of downgrades and upgrades. Mean CARs are also reported by whether the firm's pre-downgrade or pre-upgrade rating is investment grade or speculative grade. For each window, I report a t-statistic based on the cross-sectional standard error of CARs and a Wilcoxon signed-rank test statistic for whether the median CAR differs from zero. Results in Panel B of Table III suggest that downgrades have a significant effect on bond prices. For the 652 downgrades in the uncontaminated sample (Panel B), the mean cumulative abnormal return over Days 0 and +1 ((0,+1) CAR) of -0.64% is significant based on both the t-test and the signed-rank test.[17] As would be expected, the mean (0,+1) CAR for the full sample of downgrades in Panel A of -0.99% is larger in magnitude and highly significant. When the sample of uncontaminated downgrades is split into investment grade and speculative grade firms, the mean (0,+1) CARs are -0.45% and -0.83% respectively and both are significant. As reported in Panel D, uncontaminated upgrades also elicit a statistically significant response. The mean (0,+1) CAR of 0.21% is significant. The mean (0,+1) CAR in the full sample (Panel C) is slightly larger and statistically significant. The positive reaction to upgrades appears to be driven by speculative grade firms. The mean (0,+1) CARs for speculative grade and investment grade firms in the uncontaminated sample are 0.33% and 0.02%

[17] Unless otherwise specified, proclamations of statistical significance refer to the 5% level or better (two-tailed) in both the t-test and signed-rank test.

respectively. The former is statistically significant while the latter is not. In the full sample of upgrades, a similar pattern is observed.

**** Insert Table III here ****

In addition to significant abnormal returns at announcement, Table III also provides evidence of negative abnormal bond returns prior to downgrades. In Panel B, the mean (-15,-1) and (-30,-1) CARs among uncontaminated downgrades are -1.44% and -2.85%, and both are significant. In addition, both investment grade and speculative grade firms earn significantly negative abnormal returns prior to downgrades. Although weaker, there is also some evidence of positive abnormal returns prior to uncontaminated downgrades, as the (-15,-1) CAR of 0.19% is significant based on the t-stat. These findings are consistent with the notion that rating changes are partially anticipated by the corporate bond market, and they complement the findings of Holthausen and Leftwich (1986), Goh and Ederington (1993), and Goh and Ederington (1999), who report significant abnormal stock returns prior to downgrades.

Finally, Table III reports that downgraded firms experience significantly negative abnormal bond returns in the days after a downgrade. The mean (+2,+10) CAR in the uncontaminated (full) sample of downgrades of -0.95% (-0.65%) is highly significant. Goh and Ederington (1993) and Holthausen and Leftwich (1986) document a similar result for the common stock of downgraded firms. This evidence suggests that the information conveyed by a downgrade may not be fully incorporated into bond prices immediately. In contrast, the mean (+2,+10) CARs in all the upgrade samples are insignificant.

Overall, results are consistent with downgrades and upgrades conveying some new information to the bond market in the sense that the (0,+1) CARs are statistically significant. However, the economic value of the information is much smaller for upgrades. In fact, the (0,+1) abnormal returns around upgrades would likely be too small to cover the costs of trading in the corporate bond market. Before conditioning on credit quality, Edwards et al. (2007) estimate a mean round-trip transaction cost of 0.48% for a "representative" institutional trade of $200,000. For speculative grade bonds, their average cost estimate is 0.7%. In addition, they find that costs are much larger for smaller trades and only moderately smaller for much larger trades.[18] Thus, relative to trading costs, the (0,+1) abnormal returns around upgrades are economically small.

B. Robustness checks

In untabulated analyses, I rerun the event study in Table III using the "trade-weighted price, trade ≥ 100k" method of Bessembinder et al. (2009). Although this alternative specification results in the loss of 309 downgrades and 167 upgrades from the full sample due to the elimination of bonds without trades of $100,000 or more on both Day -1 and Day +1, it yields statistically significant mean (0,+1) CARs for both upgrades and downgrades with magnitudes very similar to those reported in Table III.

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[18] For speculative grade bonds, Edwards et al. (2007) estimate average round-trip costs of 1% and 2.5% for trade sizes of $100,000 and $5,000 respectively. For a very large speculative bond trade of $2 million, the cost is 0.25%.

My sample period includes the recent economic recession that, according to the National Bureau of Economic Research (NBER), began in December 2007. As noted by Jorion et al. (2005), downgrades (upgrades) are more (less) frequent during recessions and, therefore, downgrades (upgrades) may be more (less) expected by the market. This would imply weaker (stronger) responses to downgrades (upgrades) during recession. On the other hand, a counter argument could be that investors are more pessimistic and overreact (underreact) to downgrades (upgrades) during recession. To check whether my conclusions are driven by unusual market conditions during the recession, in untabulated analyses I rerun the event study in Table III after eliminating rating changes that took place during or after December 2007.[19] For both uncontaminated upgrades and downgrades, the mean (0,+1) CAR remains highly significant during the non-recessionary period, indicating that my basic conclusions are unaffected by the inclusion of the recent recessionary period. In Section VI, I further explore whether there were significant differences in the market reaction across the two economic regimes in a multivariate context.

As discussed in Section III, a concern with the baseline sample is that it may contain a selection bias due the restriction that bonds trade on Days -1 and +1. The analyses in Table IV examine samples without imposing this requirement. The results reported in Table IV pertain only to uncontaminated observations. In untabulated analyses, I also examine CARs for the full versions of these samples that include contaminated rating changes and, as in the baseline sample, the (0,+1) CARs

[19] As of this version of the paper (June 2010), NBER has not declared if or when the recession ended. Hence, I assume that the economy was still in recession during the last month of the sample period (March 2009).

for the full samples are stronger in magnitude and statistical significance. For brevity these results for the full sample are not reported. Panel A of Table IV reports mean CARs for the uncontaminated sample that includes all downgraded bonds that were traded on at least ten days during Day +31 to +50, irrespective of trading activity in the days surrounding the rating change. As expected, the mean (0,+1) CAR of -0.47% is weaker than that of the baseline sample, although it is highly significant. Furthermore, the mean (0,+1) CARs are negative and significant for both investment grade and speculative grade firms, with more negative abnormal returns for speculative grade firms. Panel C reports mean CARs for uncontaminated upgrades that include all bonds that traded on at least ten days during Day +31 to +50, irrespective of trading activity in the days surrounding the upgrade. Again, the mean (0,+1) CAR of 0.12% is smaller than that of the baseline sample but remains statistically significant at the 1% level. In addition, the pattern of stronger (0,+1) CARs among speculative grade firms persists in this sample.[20]

**** Insert Table IV here ****

In Panels B and D of Table IV, I examine mean CARs for samples that include only liquid bonds that traded on every day during Day +31 to +50, irrespective of trading activity around the rating change. The samples are much smaller but the results are in agreement with those from the baseline sample. In Panel

[20] The samples in Panels A and C of Table IV contain some bonds that traded on either Day 0 or +1 but not on Day -1. For a bond that traded on Day -5 and not again until Day +1, for example, my methodology assumes that the change in price occurred on Day +1.This assumption is questionable and the concern exists that the estimated return on Day +1 for such a bond incorrectly reflects not only the information in the rating change but also information conveyed by non-rating news that may have occurred prior to the rating change. For robustness, in untabulated analyses I rerun the event studies in Panels A and C of Table IV after dropping any bonds that traded on Day 0 or +1 but not on Day -1. Those results are in complete agreement with those reported in Panels A and C of Table IV.

B, the mean (0,+1) CAR for downgrades of -0.45% is statistically significant. In Panel D, the mean (0,+1) CAR for upgrades of 0.21% is significant and identical in magnitude to that of the baseline sample. Furthermore, for both upgrades and downgrades, the (0,+1) CARs for speculative grade firms are stronger in magnitude.

C. Monthly Abnormal Bond Returns

A contribution of this study over previous works that examine the bond market reaction to rating changes is the use of the TRACE data, which enables the examination of daily returns in a more comprehensive sample of bonds. Given that most prior studies have used monthly bond returns to estimate the bond market reaction to rating changes, it is beneficial to examine if and how inferences and conclusions would change if one used monthly returns to infer the information content of rating changes during the sample period. In addition to lower power due to larger standard errors (Bessembinder et al., 2009), another disadvantage of using monthly bond returns is that downgrades (upgrades) tend to occur contemporaneously with other non-rating events and disclosures that should be bad (good) news for bondholders. Removing observations that are contaminated during a window of a few days is feasible, but doing so over a month long window is infeasible because it would almost certainly result in the elimination of most of the sample.[21] If the researcher's objective is to infer the information content of the rating change, and not simply to measure how bond prices change with default risk, then using monthly returns will tend to bias the return estimates away from zero. With

[21] Weinstein (1977), Wansley and Clauretie (1985), Grier and Katz (1976), and Hite and Warga (1997), who examine monthly bond returns around rating changes, do not attempt to remove contaminated observations.

respect to statistical inferences, this problem works in the opposite direction of the power problem associated with monthly returns and also works to overstate economic significance. A priori, if and how conclusions based on monthly returns would differ from those based on daily returns is ambiguous and, therefore, worth examining.[22]

I examine monthly abnormal bond returns around rating changes during my sample period for a sample that includes all bonds that traded in the prior calendar month (Month -1) and month of the rating change (Month 0). For this sample, I do not impose any of the additional trading restrictions that were imposed in the previously discussed analyses of daily returns. In addition, this sample was not checked for contaminated observations to be consistent with previous studies of monthly bond returns around rating changes. The rationale for employing this sample is that a researcher examining only monthly returns would likely impose monthly trading screens, such as trading in Month -1 and Month 0, as opposed to daily trading screens. However, for direct comparison I also examine the monthly abnormal returns earned by firms in the baseline sample from Table III. In all monthly analyses, I sample only the earliest rating change in cases where a firm experienced multiple rating changes over the course of a single calendar month. This results in a small attrition of the baseline sample size.

Panel A of Table V reports monthly abnormal bond returns around downgrades for the sample that includes all bonds that traded in Month 0 and Month -1. The average monthly abnormal return in Month 0 for this sample is -2.29% and it

[22] I thank an anonymous reviewer for helpful comments that motivated this analysis.

is highly significant. Panels B and C report monthly abnormal bond returns for the full and uncontaminated baseline samples of downgrades respectively. I refer to the latter as the uncontaminated baseline sample to be consistent with previously used nomenclature, but it is only uncontaminated in the sense that observations with non-rating news during Days -1 to +1 have been removed. The mean Month 0 abnormal returns for the full and uncontaminated baseline samples are -2.74% and -2.37% respectively, and both are highly significant. Thus, in all three of these samples, the null is rejected and a researcher would conclude that downgrades have a significant impact on bond prices. This result is not completely unexpected given the very large sample sizes. Bessembinder et al. (2009) find that there is virtually no relative power advantage to using daily returns rather than monthly returns in a sample of 500 firms. However, as previously anticipated, the mean Month 0 abnormal return estimates are much larger than the daily abnormal return estimates over Days 0 and +1 for downgrades documented in Table III. With respect to the (0,+1) daily CARs documented for uncontaminated downgrades in Panel B of Table III, the mean Month 0 abnormal returns in Panels A, B, and C of Table V are more than three times as large in magnitude.

**** Insert Table V here ****

Panels D, E, and F of Table V document the monthly abnormal returns for upgrades. In all samples, the Month 0 abnormal return is significant at the 1% level, and the estimates range from 0.30% (the sample that includes all bonds traded in Month -1 and Month 0) to 0.48% (uncontaminated baseline sample). These are larger than the daily (0,+1) CARs for upgrades in Table IV, although they are not as overstated as the monthly returns for downgrades. The largest discrepancy occurs in the uncontaminated baseline sample, where the Month 0 abnormal return of 0.48% (Table V, Panel E) is more than two times as large as the daily (0,+1) CAR of 0.21% (Table III, Panel D) from the same sample of firms. Furthermore, the Month 0 abnormal return for investment grade firms in the sample that includes all bonds traded in Month -1 and Month 0 is 0.20%, and it is statistically significant at the 1% level. This contrasts with the daily evidence from Table III, in which the mean daily (0,+1) CARs for investment grade firms are all very close to zero and insignificant.

Summarily, if one has access to the TRACE data, there appears to be no power advantage in using daily returns to study the bond market reaction to rating changes. This is probably because one can construct very large samples due to the high frequency of rating changes and TRACE's comprehensive coverage of the bond market. However, the monthly returns do appear to overestimate the market reaction to rating changes if one considers uncontaminated daily returns to be more credible.

D. The Stock Market Reaction to Bond Rating Changes

The finding of a statistically significant bond market reaction to upgrades is inconsistent with the findings of Griffin and Sanvicente (1982), Holthausen and Leftwich (1986), Wansley and Clauretie (1985), Cornell et al. (1989), Hand et al. (1992), Goh and Ederington (1993), Ederington and Goh (1998), Goh and Ederington (1999), Norden and Weber (2004), Li et al. (2006), and Kim and Nabar (2007), who all find statistically insignificant abnormal stock returns in response to upgrades. However, they are consistent with findings from a few recent studies. Dichev and Piotroski (2001) find a mean stock market reaction of 0.5% in a large sample of Moody's upgrades during 1970 to 1997, although they do not remove contaminated observations because their focus is long-run returns. In a sample of rating changes by Moody's, S&P, and Fitch during 1998 to 2002, Jorion et al. (2005) find a significantly positive mean stock price reaction of 1.17% for the 127 upgrades in their sample that occurred after October 2000. They find an insignificantly negative market reaction to upgrades prior to October 2000. They attribute the difference to an increase in the relative informational advantage of rating agencies over analysts and other securities professionals that resulted from Regulation Fair Disclosure, which became effective in October 2000. Jorion and Zhang (2007) find a stock market reaction to uncontaminated Moody's upgrades during 1996 to 2003 of 0.31% that is significant at the 10% level. They also find that the reaction grows stronger as credit quality decreases.

Given my evidence of a statistically significant bond market response to upgrades during the recent September 2002 to March 2009 period and the mixed evidence in the literature on the stock market response to upgrades, a question of interest is how did stockholders of firms in my sample respond to upgrades? The results of Jorion et al. (2005) suggest that upgrades may have been more informative during my sample period relative to less recent periods examined in many previous studies. To examine this issue and as a means of benchmarking my sample to prior works on the stock market response to rating changes, I examine the stock price reaction to rating changes for firms in my baseline sample. For comparison, I also examine the stock market reaction to rating changes during the sample period for all CRSP firms, regardless of whether the firm is in TRACE and has actively traded bonds.[23]

As in Jorion et al. (2005), I compute daily abnormal stock returns as the raw return minus the contemporaneous return on the value-weighted CRSP market index. In addition to upgrades, for completeness I also examine the stock price reaction to downgrades in the baseline sample. Panels A and B of Table VI report the results of this analysis for downgrades. Of the 1,159 downgrades in the baseline sample, 775 have stock return data in CRSP on Day 0 and Day +1.[24] As in previous works, the results indicate that stock prices respond negatively to downgrades. The mean (0,+1) CAR for stocks in the full (uncontaminated) baseline sample of -2.36% (-1.54%) is significant. For comparison, there were 2,478 downgrades that affected firms with return data in CRSP during my sample period. The untabulated mean (0,+1) CAR for this sample of all CRSP firms is -2.09%, and it is statistically significant (t = -9.80). After removing observations with contaminating news during Days -1 to +1, this sample reduces to 1,520 uncontaminated downgrades, for which the mean (0,+1) CAR is -1.50% (t = -7.93). These abnormal stock returns are similar in magnitude to those documented in the baseline sample in Panels A and B of Table VI.

[23] I restrict this sample to rating changes of public debt issued by U.S. domiciled firms with non-missing returns in CRSP on Days 0 and +1. I exclude rating changes if the old or new rating is below CC (Ca). For consistency with previous studies on the stock market reaction to rating changes, I do not impose any additional restrictions on bond characteristic (e.g. coupon rates, maturity, putability, etc.).

[24] The attrition of the sample from 1,159 to 775 is due to the absence of privately owned firms and public firms with equity traded exclusively over-the-counter in CRSP. TRACE includes such firms if they have public bonds.

**** Insert Table VI here ****

Panels A and B of Table VII report abnormal stock returns associated with upgrades in the baseline sample. Of the 610 upgrades in the full baseline sample, 364 have stock return data in CRSP on Day 0 and Day +1. In Panel A, the (0,+1) mean CAR for stocks in the full sample is 0.25%. While not significant based on the t-test, it is significant based on the signed-rank test at the 10% level. In the uncontaminated sample (Panel B), the (0,+1) mean CAR for stocks of 0.17% is slightly smaller and statistically insignificant. Furthermore, splitting the uncontaminated sample into investment and speculative grade firms does not yield a significant mean (0,+1) CAR in either group. For comparison, there were 1,585 upgrades that affected CRSP firms during the sample period. The untabulated mean (0,+1) CAR for this sample is 0.20%. This estimate is significant at the 10% level based on a t-stat of 1.95 but not significant at the 10% level based on a signed-rank test. However, after removing contaminated observations, this sample reduces to 1,176 upgrades, among which the mean stock price reaction in the (0,+1) period is 0.07%. As in the uncontaminated baseline sample of upgrades, this estimate is statistically insignificant.

**** Insert Table VII here ****

In order to directly compare the reactions across bonds and stocks of the same firms, I report abnormal bond returns around upgrades for CRSP firms in the baseline sample in Panels C and D of Table VII. The mean (0,+1) CARs for bonds are 0.20% and 0.13% in the full and uncontaminated samples respectively, and both are statistically significant. In addition, only the speculative grade firms have significant abnormal bond returns around upgrades.

As in many previous studies, the evidence reported in this paper indicates that downgrades bring more information to the market than upgrades. However, an interesting result of the previous analysis is that, for upgrades, the bond market response is statistically significant, at least in the case of speculative grade firms, while the stock market response is not. I briefly consider two possible explanations for this differing result across the two markets. The first is that upgrades, on average, bring no new information to the market but, because the bond market is less efficient than the stock market, bond prices fail to fully incorporate the information prior to upgrades. The second is that some upgrades may be indicative of wealth transfer effects which have negative implications for stockholders but positive implications for bondholders.

Downing et al. (2009) find that the bond market is slower in responding to positive news than the stock market. If upgrades tend to be triggered by other public disclosures, then it is possible that the positive mean bond CAR during the (0,+1) window around upgrades is indicative of a delayed reaction to positive news preceding the upgrade. If this is the case, the positive abnormal bond returns around upgrades should not be concentrated in the (0,+1) window. Rather, there should be some indication of positive abnormal bond returns in the days just prior to upgrades. To examine this possibility, I analyze two-day bond CARs during the (-4,-3), (-3,-2), and (-2,-1) periods preceding upgrades. I do so for the uncontaminated baseline sample of only speculative grade firms in Table III and for the uncontaminated baseline sample of speculative grade TRACE firms with CRSP data examined in Table VII, since investment grade bonds do not react to upgrades. In both samples, I find no indication of significantly positive abnormal bond returns in these two-day windows preceding upgrades. For example, for uncontaminated upgrades of speculative grade firms in the baseline sample (from Panel D of Table III), the untabulated mean (-4,-3), (-3,-2), and (-2,-1) bond CARs are 0.08% (t = 1.14), -0.01% (t = -0.13), and -0.04% (t = -0.81). These are all close to zero and small in magnitude relative to the mean (0,+1) bond CAR of 0.33% for this sample. The same conclusion is drawn for the uncontaminated sample of speculative grade TRACE firms with CRSP data mentioned above. Hence, there is no direct evidence that the positive bond market reaction to upgrades is a delayed reaction to positive news just prior to upgrades.

As noted by Holthausen and Leftwich (1986), Goh and Ederington (1993), and Kim and Nabar (2005), some bond rating changes may have different implications for bondholders and stockholders due to wealth transfer effects. A rating change reflects the agency's perception of a change in default risk, which is determined by the firm's capital structure and the mean and variance of the value of its assets. Thus, a rating change may reflect a past or anticipated change in one or any combination of these factors. An anticipated increase in the mean of the firm's asset value should lower default risk and have positive implications for both bondholders and stockholders. On the other hand, an anticipated decrease in leverage should lower default risk, thereby increasing the value of the firm's debt, but it may also transfer wealth from stockholders to bondholders, thereby lowering the value of the firm's equity. Similarly, if one views the value of equity as a call option on firm value (Merton, 1974), a decrease in asset variance should transfer wealth from stockholders to bondholders. My evidence from the bond market suggests that the average upgrade conveys some new information but that, at best, its value is small. Given the small information content, even a small portion of upgrades reflecting situations where bondholders' and stockholders' interest are not aligned could be enough to result in a statistically insignificant stock market reaction to upgrades. One way to assess the validity of this conjecture would be to examine the bond and stock market reaction to upgrades conditional on the reason for the rating change cited by the rating agency. Unfortunately, my ratings data does not contain such information. Another means of addressing this is to examine the bond market reaction to upgrades conditional on the stock market reaction. As argued by Kim and Nabar (2005), a sample that includes only upgrades where the stock market reacts negatively should presumably capture those upgrades where all or a significant portion of the new information, if any, reflects a wealth transfer from stockholders to bondholders. If the average upgrade in such instances contains some new information, then the bond market reaction should be positive, even though the stock market reaction is negative. On the other side, for instances where the stock market reacts positively to an upgrade, the bond market reaction should also be positive if there is some new information in the average upgrade. Hence, I split the sample in Panel D of Table VII into those upgrades where the stock market reaction is negative and those where it is positive. I do so for the sample that includes only speculative grade firms, since investment grade bonds do not react to upgrades. Splitting the observations in this manner results in 70 upgrades where the abnormal stock return over the (0,+1) period is negative and 83 where it is positive. In the former group, the mean stock market reaction over the (0,+1) window is -2.13%, while in the latter group it is 2.14%. For the former group, the mean (0,+1) CAR for bonds is 0.23%, and it is statistically significant (t = 2.13). For the latter group, the mean (0,+1) CAR for bonds is 0.24%, and it is statistically significant at the 10% level (t=1.93). Thus, in both groups the average bond market reaction is small but statistically significant. This result is consistent with the conjecture that upgrades, on average, reflect a small amount of new information that is good for bondholders, even in cases where it is not all good for stockholders. For stocks, though, the average market reaction to upgrades could be statistically indistinguishable from zero because the information content, on average, is very small and because some upgrades may convey information pertaining to situations in which wealth will be transferred from stockholders to bondholders.[25]

VI. Cross-Sectional Analysis of the Bond Market Reaction to Rating Changes

In this section, I aim to identify cross-sectional determinants of the bond market's response to rating changes. The market reaction should be stronger (1) the

[25] Consistent with these results, the mean (0,+1) bond CAR for uncontaminated downgrades is -0.52% (t = -2.36) in cases where the (0,+1) stock CAR is positive.

greater the surprise and (2) if the change carries important implications. My cross-sectional hypotheses are motivated by this line of reasoning.

A. Cross-Sectional Hypotheses

As previously reported, negative abnormal bond returns precede downgrades, indicating that some downgrades are not entirely surprising. In an efficient market, all of the price adjustment associated with a downgrade that is fully anticipated should occur before the downgrade is announced. A downgrade that is largely a surprise to the market, though, should to be associated with zero or positive returns before the downgrade and a large negative response at the announcement of the downgrade. The same line of reasoning can be applied to upgrades. Hence, I hypothesize a stronger response to downgrades (upgrades) that are preceded by zero or positive (zero or negative) abnormal bond returns.

As reported in Table II, many rating changes are preceded by a credit watch listing. Altman & Rijken (2007) note that two thirds of firms placed on Moody's watch list experience a rating change at the end of a watch procedure, implying that a watch listing might increase market expectations of a rating change and result in a weaker reaction. Alternatively, Boot et al. (2006) theorize that a credit watch procedure increases the informativeness of a rating change since it generates more private information for the rating agency, implying a stronger market response to rating changes preceded by a credit watch listing. Given these two competing hypotheses, the expected relationship between the market reaction and the existence of a prior credit watch listing is ambiguous.

Different rating agencies sometimes disagree on the credit quality of a particular issue, leading to what are known as split ratings. This begs the question of whether the informaveness of one agency's rating depends on the ratings assigned by other agencies. For example, consider the case in which a firm that carries the same rating from Moody's, S&P, and Fitch (e.g. BB+ from S&P and Fitch and Ba1 from Moody's) is downgraded by one of the agencies. Contrast this to the case in which one of the agencies has the firm rated lower than the other two, and one of the agencies with the higher rating downgrades the firm. The rating change in the latter case might be less informative, all else equal. Hence, I expect the reaction to a downgrade (upgrade) to be weaker if the rating assigned by one or both of the other agencies at the time of the rating change is lower (higher) than the pre-downgrade (pre-upgrade) rating assigned by the agency making the rating change.

Hamilton and Cantor (2004) document three-year default rates of 0.0%, 0.0%, 0.4%, 1.5%, 4.4%, 17.7%, and 31% for Aaa, Aa, A, Baa, Ba, B, and Caa bonds respectively. These default rates suggest that a move from Aa to A, for example, is much less consequential than a move from B to Caa. I hypothesize, therefore, that lower rated firms respond more strongly to rating changes.

Dating as far back as 1936, U.S. government regulations have prohibited some financial institutions from holding speculative grade bonds.[26] It has also been observed that the investment grade cutoff is used by some fund managers and plan sponsors in portfolio decision making, either as a result of imposed regulation or in

[26] In 1936, the Office of the Comptroller of the Currency (OCC), the federal regulator of banks, prohibited banks from investing in speculative grade bonds, an institution that still exists today (Cantor and Packer, 1997).

response to client demand (Cantor et al., 2007). I hypothesize these institutional rigidities that discourage or prohibit financial institutions from holding speculative grade debt to result in a stronger market reaction to rating changes that cross the investment grade boundary.

The number of grades that the rating is changed should represent the extent of the change in credit quality perceived by the agency. Hence, I hypothesize a negative (positive) relation between the market reaction to downgrades (upgrades) and the absolute value of the number of grades that the rating is changed.

The sample period includes the recent economic recession that began in December 2007. Jorion et al. (2005) find that the stock market reaction to downgrades was significantly less negative during the recession of 2001. Hence, I control for whether the rating change occurred during the economic recession that began in December 2007. Finally, to explore the possibility of differing informativeness or timeliness of rating changes across the three rating agencies, I include a set of indicator variables to capture any mean differences across the three agencies.

B. Cross-Sectional Results

Table VIII reports multivariate results for the baseline sample of uncontaminated downgrades and upgrade separately. I estimate all regressions using OLS with (0,+1) percentage bond CARs as the dependent variable. The results in Table VIII indicate that the bond market reaction to a downgrade is significantly more negative if the firm's (-15,-1) bond CAR is positive or zero. This is consistent with the hypothesis that downgrades preceded by positive or zero abnormal bond returns are more surprising and, therefore, elicit a stronger reaction. In addition, the reaction to a downgrade is significantly and positively related to the firm's pre-downgrade rating, indicating that lower rated firms respond more negatively. Finally, the reaction to downgrades is significantly more negative during the recession that began in December 2007.

**** Insert Table VIII here ****

For upgrades, the bond market reaction is significantly more positive if the firm's (-15,-1) bond CAR is negative or zero, which is consistent with such upgrades being more surprising. There is weak evidence that the reaction is more positive if preceded by a credit watch listing. In specification 7, the dummy that equals one for a credit watch listing prior to the rating change and zero otherwise is positive and significant at the 10% level. It is not significant, however, in specification 10. In addition, there is evidence that S&P and, to a lesser extent, Moody's upgrades result in a more positive reaction than Fitch upgrades. In specification 8, the Moody's dummy is positive and significant at the 10% level but is not in specification 10, which constitutes only weak evidence. The S&P dummy is positive and significant at the 5% level in specifications 8 and 10, indicating that the reaction to an S&P upgrade is significantly stronger than the reaction to a Fitch upgrade. The reaction to S&P and Moody's upgrades are not significantly different on average, as the untabulated difference between the S&P and Moody's dummy coefficients is insignificant in all specifications. Furthermore, the bond market reaction to an upgrade is significantly and negatively related to the firm's pre-upgrade rating, indicating that lower rated firms respond more positively. Finally, the reaction to an upgrade is significantly more positive if the firm is moved into the investment grade category. This result is consistent with the investment grade cutoff holding special significance due to ratings based regulations and guidelines that discourage or prohibit some investors from holding speculative grade securities.

VII. Conclusions

I use daily data on bond transactions from TRACE to study the information content of bond rating changes during a period that spans September 2002 to March 2009. In a sample of 652 downgrades and 441 upgrades not accompanied by other non-rating news, I find that the corporate bond market infers some new information from both downgrades and upgrades. Downgrades elicit an average two-day abnormal bond return of -0.64% that is statistically significant at the 1% level. The mean two-day abnormal return for upgrades of 0.21% is smaller in magnitude but statistically significant at the 1% level. These abnormal returns are largest in magnitude among speculative grade firms, which exhibit significant two-day abnormal returns of -0.88% and 0.33% in response to downgrades and upgrades respectively. While statistically significant, the bond market reaction to upgrades is economically small relative to transaction costs.

To determine if and how conclusions and inferences might change if one used monthly bond returns to study the information content of rating changes, I examine monthly abnormal bond returns around rating changes during my sample period. For both downgrades and upgrades, I find statistically significant abnormal bond returns in the month of the rating change. The relative power advantage that one might expect from using daily data appears to be mitigated by the ability to construct large samples of rating changes with the comprehensive TRACE data. However, a weakness of monthly abnormal bond returns is that they tend to overstate the magnitude and economic significance of the market reaction relative to daily returns. This is likely due to contaminating, non-rating events and disclosures during the month of the rating change.

I examine the stock market reaction to bond rating changes during my sample period and find that stock prices react negatively and significantly to downgrades. The stock market reaction to upgrades, however, is positive but statistically insignificant. This contrasts with the bond market reaction to upgrades, which is, although small in magnitude, positive and statistically significant. I conjecture that the differing statistical inferences regarding the effect of upgrades on bond and stock prices may be due to the small information content of the average upgrade and the wealth transfer effects that may be implied by some upgrades. I find some evidence that is consistent with this conjecture.

Finally, in cross-sectional analyses, I find that corporate bond prices respond more negatively (positively) to a downgrade (upgrade) if abnormal bond returns prior to the announcement are positive (negative), suggesting that downgrades (upgrades) preceded by positive (negative) price-movements are more surprising.

The bond market reaction also varies across credit qualities. For upgrades, the boundary that separates investment grade debt from speculative grade debt holds special significance, as firms moved into the investment grade category respond much more positively, all else equal. In addition, lower rated firms react more strongly than higher rated firms to both upgrades and downgrades.

CHAPTER 2

THE VALUE OF INVESTMENT BANKING RELATIONSHIPS: EVIDENCE FROM THE COLLAPSE OF LEHMAN BROTHERS[27]

I. Introduction

The question of whether firms derive value from investment banking relationships has received considerable attention in the literature, especially since the increasingly competitive market for investment banking services would suggest that firms can switch investment banks costlessly. Extant research has failed to come up with an unambiguous answer, due in part to the difficulty in measuring the value of relationship capital.

The sudden collapse of Lehman Brothers on September 14, 2008 (then the fifth largest investment bank in the world) provides a unique natural experimental setting to measure the value of the relationships that client firms had with Lehman. Whereas large U.S. financial institutions in distress have almost invariably been prevented from declaring bankruptcy by being acquired by other large institutions (often with the intervention of the U.S. government), Lehman was explicitly allowed to fail.[28] This unprecedented collapse was all the more shocking since Barclays Bank had been negotiating an acquisition with Lehman's managers right up to Saturday, September 13, 2008, the day before Lehman announced the largest bankruptcy filing in U.S. history. When stock market trading resumed on Monday, September 15,

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[27] This chapter is based on collaborative work with Chitru S. Fernando and William L. Megginson.

[28] Examples of rescues during the 2008 financial crisis include the J.P. Morgan takeover of Bear Stearns, Bank of America's takeover of Merrill Lynch and the U.S. Government's bailout of American International Group, Fannie Mae and Freddie Mac.

2008, Lehman's stock lost virtually all its value, the U.S. stock market experienced one of its worst single-day losses, and the entire global financial system was pushed to the edge of collapse.

The acquisition by an investment bank of valuable private information about a firm (James (1992), Schenone (2004), and Drucker and Puri (2005)), investment bank monitoring (Hansen and Torregrosa (1992)), investment by banks in institutional investor networks (Benveniste and Spindt (1989), Cornelli and Goldreich (2001), Ritter and Welch (2002) and Ljungqvist, Jenkinson and Wilhelm (2003)), switching costs incurred by firms in moving to a new underwriter (Burch, Nanda, and Warther (2005) and Ellis, Michaely, and O'Hara (2006)) and optimal firm-underwriter matching (Fernando, Gatchev and Spindt (2005)) would all suggest that the relationship is jointly valuable to the firm and its underwriter. However, there is no clear evidence on the extent to which client firms receive a share of any value created from the relationship. Moreover, there is considerable evidence that client firms frequently switch underwriters, especially to those of higher reputation (Krigman, Shaw and Womack (2001) and Fernando, Gatchev and Spindt (2005)), which also raises questions about the extent to which client firms share any value created by the relationship. Additionally, while investment banks provide a variety of services in addition to underwriting equity and debt offerings, the extent to which these services create value to clients from a long-term investment bank relationship is also unknown.

We examine how the Lehman collapse affected industrial firms that received underwriting, advisory, analyst, and market-making services from Lehman by studying how their stock prices reacted on Monday, September 15 and over various short-term windows around that day. We identify more than 800 public industrial companies that received one or more of these five services from Lehman during the 10 years leading up to and including 2008, as well as a comparable number (944) of firms that received equity underwriting services from Lehman's competitors. We address two specific research questions: First, did Lehman's collapse impact its investment banking (IB) clients over and above the impact the firm's collapse had on the equity market in general, and second, did the impact of Lehman's failure vary with the type of IB service received, client characteristics, and/or the strength of the client's relationship with Lehman? These questions are central to understanding how intermediaries create value for their clients. To our knowledge, this is the first study that attempts to isolate the value of the investment bank relationship *to clients* using a broad group of client firms and all major investment banking services.

Companies that had used Lehman as lead underwriter for one or more equity offerings during the 10 years leading up to September 2008 suffered economically and statistically significant negative abnormal returns. Based on Fama-French-Carhart four-factor model adjusted abnormal returns, the 184 equity underwriting clients that we study lost 4.85% of their market value, on average, over a seven-day period spanning the five trading days prior to and the first and second trading days immediately following Lehman's bankruptcy filing, amounting to approximately $23 billion in aggregate, risk-adjusted losses. We arrive at similar value loss estimates and conclusions using alternative return generating models. These losses were significantly larger than those for firms that were equity underwriting clients of other large investment banks, and were especially severe for companies that had stronger and broader underwriting relationships with Lehman, including equity clients that also engaged Lehman for debt and convertible debt underwriting. Losses were also higher for smaller, younger, and more financially constrained firms. No other client groups were significantly adversely affected by Lehman's bankruptcy.

These results show that Lehman's collapse did, in fact, impose material losses on its customers, but for the most part these losses were confined to those companies that employed Lehman for equity underwriting. Furthermore, to the extent that investors partially anticipated Lehman's failure prior to the days surrounding Lehman's bankruptcy announcement, these estimates may actually understate the losses suffered by Lehman's equity underwriting clients. More broadly, these results tell us that underwriting is the principal portion of the overall investment banking relationship that is irreplaceable without significant cost and whose value will be forfeited if the relationship were to be involuntarily ruptured.

The rest of the paper is organized as follows. In Section II we briefly review the existing literature on firm-intermediary relationships in corporate finance and formulate our empirical hypotheses. Section III describes the data and methodology. Section IV presents our findings on the impact of the Lehman collapse. Section V concludes.

II. Background

We organize our discussion by first reviewing the literature on investment banking relationships and then discussing the empirical implications pertaining to the value to clients of investment banking relationships.

A. Firm-Investment Bank Relationships

The extant theoretical and empirical literature has examined ways in which a long-term equity underwriting relationship between an investment bank and a client firm can create value for both parties. The first such channel is economies of scale. James (1992) and Burch, et al. (2005) show that set-up costs in the IPO due diligence process create durable relationship capital that will lower underwriting spreads for firms that are expected to issue equity again, and Kovner (2010) provides evidence of valuable relationship capital being created for IPO clients. Equity underwriters also create significant value for their clients by monitoring (Hansen and Torregrosa (1992)) and by investing in the development and maintenance of institutional investor networks that serve as channels not only for collecting information but also for the distribution of shares through book building, thereby reducing the indirect costs of equity offerings.[29] Finally, the presence of switching costs also suggests that an underwriting relationship will be valuable due to the cost of rupturing it to establish a new equity underwriting relationship (Burch, Nanda, and Warther (2005)

[29] Benveniste and Spindt (1989) present a theoretical rationale for this argument, while Benveniste and Wilhelm (1990), Cornelli and Goldreich (2001), Ritter and Welch (2002), Ljungqvist, et al. (2003), and Gao and Ritter (2010) provide empirical support. Brau and Fawcett (2006) observe that the majority of CFOs in their survey carefully weigh the institutional client base of the underwriter.

and Ellis, Michaely, and O'Hara (2006)). However, these studies do not account for the added benefit that firms may receive by employing a higher quality underwriter. Krigman, Shaw and Womack (2001) and Fernando, Gatchev and Spindt (2005) show that seasoned firms often voluntarily switch from lower to higher-quality underwriters, which suggests that the benefits of establishing a new underwriting relationship may sometimes outweigh the costs of doing so.

Burch, et al. (2005) argue that firms derive less value from a debt underwriting relationship based on their finding that in contrast to repeat equity issuers, which benefit from significantly reduced underwriting fees for subsequent offerings, debt issuers are actually penalized (charged higher underwriting fees) for retaining the previous underwriter for subsequent bond offerings. While several studies, including Rajan (1992), Boot and Thakor (2000), Schenone (2004), Yasuda (2005), and Bharath, et al. (2007) argue that an existing *lending* relationship between a bank and borrowing firm can be mutually beneficial, it is unknown whether these findings carry over to debt underwriting, although some of these studies also document economies of scope between lending and underwriting.[30] Additionally, in contrast to equity offerings, debt ratings by rating agencies make underwriter debt certification and placement less valuable to clients.

Studies that examine the relationship between acquiring firms and the investment banks that advise them generally show that banks do provide valuable

[30] More generally, Gande, et al. (1999), Song (2004), and Narayanan, et al. (2004) all document that the entry of commercial banks into the securities underwriting business (mostly debt underwriting) has benefited issuing firms by reducing average fees charged by all underwriters. However, Shivdasani and Song (2010) argue that these benefits came at the cost of lower screening incentives among bond underwriters and show that industries with higher commercial bank penetration tended to have lower screening standards during 1996-2000.

advisory services to acquirers involved in takeover contests, and that employing more prestigious banks is associated with superior outcomes for clients.[31] However, these studies also generally find that banks advising clients on acquisitions face conflicts of interest between their desire to provide unbiased advice and their desire to consummate deals in order to collect completion payments. Additionally, there is no evidence that client acquirer firms derive persistent value from such a relationship or that any relationship is not transferable to another investment bank without a significant cost to the client. Much of the private information collected during the M&A process pertains to the target firm and this information loses value immediately after a deal is consummated.

The investment banking literature indicates that security analysts employed by prestigious banks can provide valuable services to client firms, as shown by Mikhail, et al. (2004) and Ivković and Jegadeesh (2004). However, it is less clear whether that relationship is firm-specific (between client firm and bank) or person-specific (between client firm and analyst). The available evidence suggests that any value in an existing analyst relationship will simply be transferred costlessly to a new bank that employs the analyst after the original bank's failure (Ljungqvist, et al. (2006) and Clarke, et al. (2007)).

Finally, while several studies examine the value of market making for NYSE listed firms,[32] the value of any market making provided by underwriters appears to

[31] See McLaughlin (1990), Servaes and Zenner (1996), Rau (2000), Kale, et al. (2003), Allen, et al. (2004), and Kisgen, et al. (2009).
[32] See Cao, et al. (1997), Corwin (1999), Coughenour and Deli (2002), Ellis, et al. (2000, 2002) and Corwin, et al. (2004).

be short-lived, helping to stabilize an offering in the immediate aftermath of an IPO but progressively becoming less important over the ensuing months. Ellis, et al. (2000) show that the underwriter is almost always the dominant dealer in the three month period after a Nasdaq IPO and that the underwriter engages in price stabilization during this period. Schultz and Zaman (1994), Aggarwal (2000), and Corwin, Harris and Lipson (2004) also show that the underwriter engages in price stabilization just after the IPO.

B. Empirical Implications

Equity underwriting relationships (especially relationships with high reputation underwriters) appear to be potentially valuable to client firms due to equity clients (i) being able to share the benefit of an underwriter's investment in information generation via reduced fees for subsequent equity offerings; and (ii) having the ability to benefit from underwriter monitoring and the underwriter's investment in a network of institutional investors, who provide information and also subscribe to the underwriter's offerings. If so, the rupture of an existing equity underwriting relationship could potentially be highly damaging for client firms, especially for those relatively small and lesser known companies that rely heavily on their current underwriters to access public stock markets and are unable to easily migrate to other underwriters. Additionally, even if some companies are able to swiftly enlist new underwriters, this will involve significant switching costs and any relationship-specific capital embodied in the prior relationship will be forfeited. However, in an environment where a free market exists for underwriter services and underwriter switching is common, the questions of what value client firms obtain by staying in an underwriting relationship and what the sources of this value are, if any, remain unresolved. The question of how this value might be affected by the emergence of co-led underwriting (Shivdasani and Song (2010)) has also not been examined.

Debt underwriting relationships appear to be less valuable to client firms than equity underwriting relationships. While debt offerings also entail information generation, there is no evidence in the literature to suggest that client firms are able to share in the benefit of an underwriter's investment in information when it comes to subsequent offerings. Additionally, since many debt securities have credit ratings, they are easier to price and place, making underwriter certification and the book building process considerably less valuable to client firms. Therefore, to the extent Lehman debt underwriting relationships are valuable to clients, we expect this value to be less than for equity underwriting relationships.

While M&A advisory relationships involve intense information gathering prior to a deal, there is no evidence to suggest that client acquirer firms derive persistent value from such a relationship or that any relationship is not easily transferable to another investment bank. Much of the private information collected during the M&A process pertains to the target firm and this information largely dissipates after a deal is consummated. Additionally, serial acquirers are invariably larger and would have a relatively easier time in transferring to another investment bank for M&A advisory services.

If analyst coverage relationships are analyst specific rather than bank specific as suggested by Ljungqvist, et al. (2006) and Clarke, et al. (2007), any value that is embedded in the analyst-client relationship will simply be transferred to the analyst's new employers without diminishing the client firm's market value. Finally, the value of any market making provided by underwriters is short-lived, helping to stabilize an offering in the immediate aftermath of an IPO but progressively becoming less important over the ensuing months. Therefore, it seems unlikely that client firms would derive value from a long term market making relationship.

Conditional on a relationship developed through the provision of investment banking services having value, we expect cross-sectional variation in client losses around Lehman's bankruptcy to be related to the strength of the relationship and client characteristics. For equity underwriting, we conjecture that the number of past equity deals with Lehman and Lehman's share of the client's past common stock offerings would be a measure of the strength of the relationship. Additionally, the commonality in information used by investment banks across all underwriting services for the same firm (equity, convertible debt, and straight debt) would suggest the presence of economies of scope. If equity underwriting clients that utilize other underwriting services receive some of this benefit, we would expect to see it reflected in the abnormal return. Furthermore, any client lending facilities that involve Lehman as lead or participant lender would add to the strength of the relationship. Finally, to the extent that Lehman's ownership of the client's shares is an indicator of a stronger relationship (Ljungqvist and Wilhelm (2003) and

Ljungqvist, et al. (2006)) a negative relation is implied between the client's abnormal returns and Lehman's ownership of the client's shares. Aside from this relationship based interpretation, Lehman's failure may have also disproportionately affected clients in which it owned shares due to a supply-side effect. If Lehman's bankruptcy triggered the sale of its clients' shares, either voluntarily or as a result of forced liquidation during the impending bankruptcy process, then a more negative reaction among such firms should be observed.

Regarding client characteristics, we hypothesize that clients with greater immediate need for external capital will be more adversely affected by the loss of an underwriting relationship. Specifically, we expect firms with less financial slack and firms in greater financial distress to have greater need for external capital and therefore we expect such firms to suffer greater losses in response to Lehman's bankruptcy. Finally, since smaller and younger firms generally have less established reputations in financial markets, the information production role of an intermediary is more important to them relative to larger, more established firms (Diamond (1991)), and so they should be more adversely affected by Lehman's collapse.

III. Data and Methodology

A. Equity Underwriting

We use the Securities Data Corporation (SDC) Global New Issues database to identify firms that employed Lehman Brothers as the lead or co-lead underwriter on a public offering of common stock in the U.S. market during the ten years preceding Lehman's bankruptcy (Sep. 14, 1998 to Sep. 14, 2008).[33] We restrict the sample to U.S. firms in CRSP and Compustat with publicly traded common stock (CRSP share codes of 10 or 11) at the time of the bankruptcy announcement. We exclude utilities (two-digit SIC code 49) because their financing decisions are highly regulated. The Lehman bankruptcy also triggered a wave of creditor claims, overwhelmingly from other financial firms and arising largely from debt and OTC derivatives counterparty claims.[34] Thus we also exclude all financial (one digit SIC code 6) firms from our analyses to prevent this purely financial, counter-party exposure from obscuring the impact of Lehman's bankruptcy on its corporate finance clients.

For our event study, we identify September 15, 2008 as Day 0 because it was the first day on which the market could react to the bankruptcy announcement. For the purpose of estimating abnormal stock returns during the event period, we use a 260-day estimation period (Day -290 to Day -31), and we require that firms have non-missing returns on at least 100 days during this estimation period and non-missing returns on all days during the period Day -5 to Day +5. Imposing these restrictions yields an initial sample of 199 industrial (i.e., non-financial, non-utility) firms that employed Lehman as a lead underwriter on at least one common stock offering during the ten years preceding Lehman's bankruptcy.

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[33] Throughout, any references to underwriters or underwriting refer only to lead or co-lead underwriters, not co-managers.

[34] For example, 95% of the largest 1000 claims among the 57,057 claims lodged as of the November 2, 2009 final filing deadline (In re Lehman Brothers Holdings Inc., 08-13555, U.S. Bankruptcy Court, Southern District of New York) were from financial firms.

In addition to excluding financial firms, we also screen the industrial firms in our initial sample for material derivatives and other financial exposure to Lehman. Since the SEC requires a firm to file an 8-K report when an event triggers a material change in the firm's financial condition, we search the SEC's EDGAR system for 8-K reports filed by all our sample firms between September 1, 2008 and December 31, 2009 that describe derivatives counterparty relationships or exposure to securities issued by Lehman. We also search quarterly (10-Q) and annual (10-K) reports filed between September 1, 2008 and December 31, 2009 for disclosure of derivatives counterparty relationships with Lehman. We identify and drop 15 firms from the sample, yielding a final sample of 184 equity underwriting clients. As an added check, we verify that our sample does not contain firms that had material claims against Lehman in the aforementioned bankruptcy case docket. We use this same screening procedure to eliminate firms with material exposure to Lehman in all samples discussed in subsequent portions of the paper. While our results are substantively unchanged whether or not we apply these screens, the results we report pertain to these screened samples. Using SEC filings and LPC's Dealscan database, we also identify 42 firms in our sample to whom Lehman was a lender in one or more of their credit facilities. In addition to verifying the robustness of our findings when these firms are excluded from our analysis, we control for lending relationships with Lehman in all our cross-sectional regressions.

Since Lehman's collapse had an adverse impact on the investment banking industry and may have signaled that it would be relatively more costly to issue equity in the near future, we conjecture that the broader population of equity issuers may also have been abnormally affected by Lehman's collapse. We investigate this possibility by computing abnormal returns earned by clients of similarly positioned investment banks around the time of Lehman's bankruptcy. We identify banks with industry status similar to that of Lehman using the two underwriter reputation metrics commonly employed in the literature – underwriting market share (Megginson and Weiss (1991)) and reputation ranking (Carter and Manaster (1990)).[35] We first identify all banks with an updated (2005-2007) Carter-Manaster ranking that is no more than one point lower or one point higher than that of Lehman. We then pick the ten underwriters from this pool of banks that survive to September 14, 2008 and that are closest (according to difference in percentage points) to Lehman in 2007 U.S. common stock underwriting market share. These ten banks are Merrill Lynch, Goldman Sachs, Morgan Stanley, JP Morgan, Citibank, UBS, Credit Suisse, Deutsche Bank, Bank of America, and Wachovia. We identify firms that employed at least one of these banks but did not employ Lehman as a lead underwriter in a public common stock offering during the ten years preceding Lehman's bankruptcy, yielding an initial sample of 963 firms. After searching these firms' SEC filings following the procedure outlined above, we eliminate 17 firms with material financial exposure to Lehman, leading to a final sample of 946 firms.

[35] Megginson and Weiss (1991) compute underwriting market share as the fraction of prior year equity offerings underwritten by a given bank, while Carter and Manaster (1990) assign numerical scores of 0 to 9 to denote the frequency with which a bank is listed in the bulge bracket or lower rankings of the title pages of prior year equity underwritings. The updated Carter-Manaster rankings are generously provided by Jay Ritter on his webpage.

B. Debt Underwriting, M&A Advising, Market Making, and Analyst Coverage

In addition to equity underwriting, we also examine the effect of Lehman's collapse on firms that received other services from Lehman, including debt underwriting, M&A advising, market making, and analyst coverage. We do so using samples that include all industrial firms that receive the particular service of interest from Lehman, constructed using the same restrictions regarding SIC codes and available CRSP/Compustat data as those used to construct the sample of equity underwriting clients.

We identify an initial sample of 61 industrial firms that employed Lehman as an underwriter in at least one public straight debt offering during the ten-year period prior to Lehman's bankruptcy. Screening for firms with material financial exposure to Lehman eliminates eight companies, yielding a final sample of 53 firms. Next, we construct an initial sample of 10 firms that use Lehman as an underwriter for at least one public convertible debt offering during the sample period. After screening for firms with material financial exposure to Lehman, the final sample of convertible debt underwriting clients consists of seven firms. As with equity underwriting, these samples are restricted to offerings made in the U.S. market.

We use the SDC Mergers and Acquisitions database to identify an initial sample of 94 acquiring firms that employ Lehman as a financial advisor in at least one completed acquisition of a U.S. target during the ten years prior to Lehman's bankruptcy. Removing firms with material financial exposure to Lehman reduces the final sample to 87 firms.

We use the NYSE's Post and Panel File to identify 158 NYSE firms for whom Lehman was the specialist at the time of the bankruptcy. This initial sample is reduced to 151 firms once companies with material exposure to Lehman are removed.

We use the Thomson I/B/E/S Detail History database to identify companies that are covered by an analyst from Lehman Brothers just prior to its bankruptcy.[36] We define a firm as receiving coverage if an analyst from Lehman made at least one earnings forecast in either the firm's current fiscal quarter or last fiscal quarter. The initial sample of 659 firms is reduced to 633 companies after screening for material exposure to Lehman.

C. Measures of Investment Bank-Client Relationship Strength and Client Characteristics

This subsection describes measures of the strength of a client's relationship to Lehman and other client characteristics we use as independent variables in our cross-sectional regressions pertaining to equity underwriting clients. We employ several measures of the strength of Lehman's investment banking relationships with equity underwriting clients. Our first proxy for relationship strength is the total number of common stock offerings underwritten by Lehman during our sample period. Since this variable does not capture the client's reliance on Lehman relative to other banks, we also employ the number of a client's equity offerings underwritten by Lehman divided by the total number of the client's equity offerings over the prior ten years as

[36] Thomson has removed all earnings forecasts made by a Lehman analyst from the August 2009 I/B/E/S data that is available through WRDS. We obtained our I/B/E/S data directly from Thomson, and Thomson generously provided us the data that still contains those observations.

a measure for the client's loyalty to Lehman in common stock deals, which we call Lehman's share of the client's common stock offerings. Because our aim is to capture the client's degree of exclusivity or loyalty to Lehman relative to other banks, this variable is constructed such that, for offerings with *n* lead underwriters, Lehman is credited with 1/*n* share of that offering. This variable ranges between zero and one, with one indicating that the firm dealt exclusively with Lehman in its equity offerings. Additionally, we also employ an underwriting relationship scope index as our third proxy for relationship strength, which would also reflect any economies of scope in underwriting captured by the client. This variable receives one point for each of the three underwriting services that a firm can receive (equity, straight debt, and convertible debt) and will therefore range from one to three for equity underwriting clients.

As noted previously, Ljungqvist and Wilhelm (2003) and Ljungqvist, et al. (2006) conjecture that an investment bank holding an equity stake in the client may serve as a means of "cementing" a relationship. Following Ljungqvist, et al. (2006), we use the CDA/Spectrum database on institutional 13f holdings to identify clients in which Lehman held common shares at the time of the bankruptcy. Since Lehman was a large financial institution with multiple subsidiaries that could potentially own shares, we use Lehman's 10-K filing for fiscal year 2007 to identify subsidiaries of Lehman Brothers Holdings Inc. (the ultimate parent company of all Lehman Brothers entities). We then search the SEC's EDGAR database for 13f filings by Lehman Brothers Holdings Inc (LBHI) and its subsidiaries, and find 13f filings by two Lehman Brothers entities: LBHI and Neuberger Berman LLC, part of Lehman's asset management arm.[37] We construct two variables that measure the proportions of the client firm's outstanding shares owned by LBHI and Neuberger Berman. We regress abnormal returns on these two variables to determine whether clients with larger proportions of shares owned by Lehman Brothers entities are more adversely affected by Lehman's collapse.[38]

Lehman Brothers acted as a lead lender or participant lender in many syndicated credit facilities. We use facility-level data from Loan Pricing Corporation's (LPC) Dealscan database along with SEC filings to identify firms in our sample that have credit facilities from Lehman at the time of the bankruptcy. Among Lehman's equity underwriting clients, 42 firms had active credit facilities where Lehman was a member of the lending syndicate. For 14 of these firms, Lehman was the lead lender (administrative agent) in at least one of the firm's facilities. In our cross-sectional analyses, we use two dummy variables that control for Lehman's role as lender. The first equals one if Lehman was a lead lender in at least one of the firm's facilities and zero otherwise. The second equals one if Lehman was not a lead lender but was a participating lender in at least one of the firm's facilities and zero otherwise.

We expect firms with greater immediate need for external capital to be more adversely affected by the failure of their equity underwriter. Since firms with greater

[37] SEC Rule 13f is set up to have no overlap in the holdings reported by subsidiaries and parents or different subsidiaries of the same parent. Parents may file on behalf of subsidiaries, but if a subsidiary files on its own behalf, the holdings reported by the subsidiary are not reported on the 13f filing of the parent, and *vice versa*.

[38] The data in CDA/Spectrum are based on quarterly SEC filings. We measure these variables over the prior calendar quarter, which ended June 30, 2008.

amounts of financial slack should have smaller immediate needs for external financing, we use net market leverage and cash-to-assets to test this hypothesis. Financially distressed firms should have a greater need for external equity capital and so we use Altman's Z-score. As additional determinants, we include firm size and age. We expect larger and older firms to have more established reputations in financial markets so that the information production role of an underwriter is less important to them.

Finally, we include a dummy variable that takes the value of one if the client shelf registered (Rule 415) an equity offering during the two years preceding Lehman's bankruptcy and did not take any of the registered equity off the shelf before September 14, 2008, and zero otherwise. Our intent in using this variable is to capture firms that were likely to be issuing equity in the near future.

**** Insert Table IX about here ****

D. Estimating Abnormal Returns

We estimate daily abnormal stock returns using the Fama-French-Carhart four-factor model, which includes the Fama and French (1993) factors and the Carhart (1997) momentum factor:

$$R_{i,t} = \alpha_i + \beta_i R_{M,t} + s_i SMB_t + h_i HML_t + u_i UMD_t + \varepsilon_{i,t} \qquad (4)$$

where on Day t, $R_{i,t}$ is the return to firm i, $R_{M,t}$ is the return to the value-weighted CRSP market index, and SMB_t, HML_t, and UMD_t are the returns to the Small-Minus-Big (SMB), High-Minus-Low (HML), and Up-Minus-Down (UMD) portfolios meant to capture size, book-to-market, and return momentum effects, respectively.[39] For each firm in the sample, we estimate the parameters in the four-factor model over a 260-day pre-event period (Day -290 to Day -31). Daily abnormal returns during the event period are calculated in the usual manner by subtracting the expected return implied by the four-factor model from the firm's realized return.

While most short-term event studies typically employ a simpler return generating model, such as the market model, we choose the four-factor model as our primary method due to the unusual nature of the event in our study. Lehman's collapse had a system-wide impact, as evidenced by the fact that the market experienced a one-day return of nearly -5% on September 15. In addition, the SMB portfolio gained 1.4%, indicating that larger firms were more adversely affected than smaller firms, the HML portfolio lost over 2%, indicating that value stocks suffered greater losses than growth stocks, and the UMD portfolio gained nearly 3%, indicating that past losers were more adversely affected than past winners. The aim of our study is to isolate the effect of Lehman's collapse on Lehman clients after filtering out systematic effects. Since many of our samples could be considered non-random, especially with respect to size or book-to-market,[40] we consider the four-factor model more robust than the market model because it attempts to control for systematic risk, size, value, and momentum effects, which were significant during our event period. Therefore, using the four-factor model reduces the likelihood that

[39] The daily factor returns for the SMB, HML, and UMD portfolios are generously provided by Kenneth French on his website.

[40] For example, our sample of Lehman equity underwriting clients is typical of recent stock issuer samples in that the average market capitalization is lower than the CRSP average and the average and median book-to-market ratios are lower than the CRSP average and median, respectively.

our results may be influenced by anomalous factors, such as a small firm effect.[41] Nonetheless, in some of our analyses we also report abnormal returns estimated with the three-factor model of Fama and French (1993), the market model, and two procedures that match each sample firm to a non-sample firm according to (1) size and book-to-market ratio and (2) industry and size. In these matching procedures, the abnormal return is computed as the raw return of the sample firm minus the raw return of the matched non-sample firm. For size and book-to-market matching, matched firms are selected such that the sum of the absolute percentage differences between the sizes (market value of equity) and book-to-market ratios of the sample firm and matched firm is minimized. For industry and size matching, matches are selected such that the matched firm is in the same Fama-French 49 industry, and the difference in market value of equity between the sample firm and matched firm is minimized.

Because all firms in our analysis have the same event period in calendar time, some degree of cross-sectional correlation in abnormal returns across firms is expected and conventional test-statistics will be biased. Hence, we test for statistical significance using the test statistic proposed by Kolari and Pynnönen (2010), which is a modified version of the widely used *t*-statistic of Boehmer, Musumeci, and Poulsen (BMP) (1991). Kolari and Pynnönen modify the BMP *t*-statistic to account for contemporaneous correlation in abnormal returns across sample firms. The

[41] Brav, Geczy, and Gompers (2000) find that equally-weighted portfolios comprised of recent stock issuers (IPOs and SEOs) do not exhibit long-run abnormal underperformance when the Carhart (1997) four-factor model is used to estimate abnormal returns. They conclude that the model sufficiently captures the joint covariation of issuer returns.

modification is a multiplier applied to the standard error that is increasing with the average correlation of abnormal returns across stocks in the sample. If correlations tend to be positive on average (as they are in all our samples), the modification will result in a more conservative (closer to zero) test-statistic. This statistic is particularly applicable in our setting because it is well-specified when the variance of abnormal returns is higher during the event period than in the estimation period and when abnormal returns are cross-sectionally correlated.

IV. Results

A. The Collapse of Lehman Brothers

Table X documents the significant events surrounding the bankruptcy of Lehman Brothers and Lehman's stock price performance. On Sunday evening, September 14, 2008, Lehman announced that it would file for protection in the U.S. bankruptcy court. The following day (Day 0), Lehman's shareholders experienced a raw return of -94%, which came on the heels of significant losses during the week prior to the bankruptcy announcement (September 8 to September 12; Days -5 to -1). During this period, Lehman announced a $3.9 billion loss and a dividend cut, the major rating agencies put Lehman's credit rating on "watch," and a deal involving a potential investment in Lehman by Korea Development Bank reportedly fell through. After Lehman filed for bankruptcy, Barclays announced on September 16 that it had reached an agreement to purchase Lehman's North American investment banking and capital markets businesses, and the following day Lehman was delisted from the NYSE.

**** Insert Table X about here ****

B. The Stock Price Reaction of Lehman's Equity Underwriting Clients to Lehman's Bankruptcy

Table X also reports abnormal returns for Lehman's equity underwriting clients using the Fama-French-Carhart four-factor model. Client firms experienced a statistically significant mean four-factor adjusted abnormal return of -1.48% (equally-weighted) or -1.76% (value-weighted) on Day 0.[42] In addition, Lehman's equity underwriting clients earned a significant negative abnormal return on the day the major rating agencies put Lehman's credit rating on "watch" and a deal involving a potential investment in Lehman by Korea Development Bank reportedly fell through (Day -4). Over the seven-day period (-5,+1) that includes the week prior to the bankruptcy announcement, Panel A of Table XI shows that Lehman's equity underwriting clients experienced a sharp -4.85% cumulative abnormal return (CAR) that is highly significant both economically and statistically. The mean (0,+1) CAR for this sample is also negative and statistically significant. Panel A of Table XI also reports mean CARs for clients of banks with industry status similar to that of Lehman, using the four-factor model. Clients of Lehman's industry peers experienced a smaller (in magnitude) and statistically insignificant mean four-factor adjusted abnormal return of -0.66% on Day 0. The -0.82% difference in mean

[42] Unless otherwise stated, all statements of statistical significance refer to the 5% level or better in two-tailed tests.

abnormal returns on Day 0 between Lehman clients and clients of similar banks is statistically significant, indicating that Lehman's bankruptcy had a relatively more adverse effect on Lehman clients. The same conclusion is drawn when the mean (-5,+1) CARs are compared across the two groups.

**** Insert Table XI about here ****

Panels B and C of Table XI report CARs estimated with the Fama and French (1993) three-factor model and the market model, respectively. The results based on the Fama-French three-factor model (Panel B) are consistent with those from the four-factor model. Regarding the reaction of Lehman clients, results based on the market model (Panel C) are weaker than those from the four-factor and three-factor models. The mean market model adjusted abnormal return on Day 0 for Lehman clients is -0.18%, which is statistically indistinguishable from zero. However, the (-5,+1) mean CAR for Lehman clients of -4.26% is significant both economically and statistically. In addition, the differences in mean market model CARs over the (0,0), (0,+1), and (-5,+1) windows between Lehman clients and clients of similar banks are again significantly negative, indicating that Lehman clients suffered significantly greater losses. In summary, the evidence from the factor models and market model in Table XI indicates strongly that Lehman's equity underwriting clients respond more negatively to the announcement of Lehman's bankruptcy than do clients of Lehman's industry peers.

C. Robustness Checks

A potential concern with the factor and market model abnormal returns is that market betas could have shifted up during the event period, which would render the abnormal returns we document negatively biased. Thus, we carry out multiple tests to address the possibility that our results may be affected by shifting market betas around the period of our study. We first conduct tests of parameter stability as discussed in Binder (1985), Kane and Unal (1988), MacKinlay (1997), and Coutts, et al. (1997) by modifying the market model to allow beta to change during the event window, enabling an event study of whether systematic risk shifted. The framework we use employs a continuous time series of daily returns and allows for beta to differ over three different regimes corresponding to the (-290,-31) period (the estimation period used in our baseline approach of estimating abnormal returns), the (-30,-6) period, and an event period that runs from Day -5 to some post-event day. We try both short and long intervals for the event period, where the ending dates range from two weeks (Day +10) to ten weeks (Day +50) after Lehman's bankruptcy, since it is not clear whether shifts in beta around the bankruptcy would be relatively long-lived or transitory. However, regardless of the period, we find no evidence of a positive and significant shift in the average beta (relative to the (-290,-31) period) for the pre-event period (-30,-6) or any of the event periods that follow. The results are reported in Table XII.

**** Insert Table XII about here ****

As a further robustness check against shifting betas, we compute abnormal returns with procedures that match sample firms to non-sample firms according to characteristics that might be correlated with the time-series evolution in systematic risk. In these analyses, abnormal returns are computed as the raw return of the sample firm minus the raw return of a matched firm. Some obvious starting points for matching criteria are industry, size, book-to-market ratio, estimation period beta, or leverage. These choices are motivated by literature that has shown cross-sectional correlations between these characteristics and market beta (Fama and French (1993) and Fama and French (1997)) and empirical asset pricing literature that has concluded that these factors are important in explaining returns (Fama and French (1992) and Lyon, Barber, and Tsai (1999)). Firms in the same industry with similar size, for example, might be subject to similar shifts in systematic risk around Lehman's bankruptcy. An added advantage of matching on characteristics such as industry and size is that firms similar along these dimensions may also be sensitive to the same unobservable risk factors that may not be captured by the factor models. In Panels D and E of Table XI, we report abnormal returns based on size and book-to-market matching and industry and size matching. With both of these procedures we continue to find significantly negative abnormal returns among Lehman's equity underwriting clients around Lehman's bankruptcy announcement.

An alternative explanation for the negative share price reaction among Lehman's equity underwriting clients could be the loss of a lending relationship. As previously mentioned, 42 of Lehman's equity underwriting clients had active credit facilities where Lehman was a member of the lending syndicate. To assess whether these firms drive our results, we repeat the event study in Table XI after dropping these firms. For the remaining 142 firms, the mean (-5,+1), (0,0), and (0,+1) CARs based on the Fama-French-Carhart four-factor model are -4.47%, -1.48%, and -1.65%, which are all statistically and economically significant. Thus, our conclusions persist even after eliminating firms for which Lehman was a lender.

Another alternative explanation for the negative reaction among sample firms could be implied lower liquidity due to the loss of a primary market maker. Thirteen Lehman equity underwriting clients used Lehman as their NYSE specialist, and Lehman was a registered dealer for all 104 Nasdaq firms in the sample. In order to assess the magnitude of Lehman's market making role for sample Nasdaq firms, we obtain data directly from Nasdaq on the number of shares traded by Lehman as a registered dealer in the months prior to the bankruptcy. This data was publicly available to investors at the time of the bankruptcy. For each stock, we compute Lehman's market making market share as the number of shares traded by Lehman as a dealer during the three months prior to the bankruptcy scaled by the total number of shares traded during the same period (as in Ellis, Michaely, and O'Hara (2002)). For Nasdaq firms, the average Lehman market share as a market maker is 6% and the maximum is only 16.6%. According to Ellis, Michaely, and O'Hara (2002), the dominant market maker typically has a market share in excess of 50%. Thus, Lehman played only a modest role as a Nasdaq market maker for sample firms. Nonetheless, for robustness, we examine how our results are affected if we eliminate all Nasdaq firms and firms for which Lehman was the specialist. The remaining firms are all listed on the NYSE, and investors would have been aware that Lehman was not a key market maker for these firms since the identity of the specialist is in the public domain. For these 68 firms, the mean Fama-French-Carhart CARs over the (-5,+1), (0,0), and (0,+1) periods are -5.7%, -3.8%, and -2.3%, respectively, and all are statistically significant. Thus, our results persist when we focus on firms for whom the market would have known with certainty that Lehman was not a key market maker.[43]

D. Debt Underwriting, M&A Advising, Market Making, and Analyst coverage

Table XIII explores the market reaction of Lehman's other client groups. We report four-factor model adjusted abnormal returns of firms that received debt underwriting services, M&A advising services, NYSE specialist services, and analyst coverage from Lehman. Additionally, we divide each of these groups into two subsamples: firms that did and did not also receive common stock underwriting services from Lehman. We report CARs for both subsamples, but in the interest of space only report results from the Fama-French-Carhart four-factor model; abnormal returns computed using the different methodologies described in Subsections IV.B and C yield the same conclusions. Panel A of Table XIII reports mean CARs for all 53 firms that employed Lehman as a lead underwriter for a public straight debt offering. We do not find statistically significant CARs over the (-5,+1), (0,0), and (0,+1) windows. Twelve of the straight debt clients were also equity underwriting

[43] We also investigate the possibility that abnormal returns of Lehman's equity underwriting clients reflect temporary overreactions by examining mean CARs over the (+2,+30) window. However, all the post-event mean CARs in Table II are negative, which is inconsistent with temporary overreaction. Another concern is that the event period CARs will understate true client losses if Lehman's collapse was highly anticipated prior to the event period. To explore this possibility, we examine abnormal returns over the (-30,-6) period. As reported in Table II, we find no evidence of significantly negative abnormal returns over this pre-event period, indicating that little would be gained by including the (-30,-6) CARs in our value loss estimates.

customers. Consistent with our previous results for equity underwriting, we find some evidence of a negative reaction among this subsample of debt clients, as the mean CARs over the (0,+1), and (-5,+1) windows are -4.08% and -7.29%, respectively, both statistically significant at the 10% level or better. In contrast, the 41 straight debt clients that did not also receive equity underwriting services from Lehman show no evidence of a significant negative reaction to Lehman's collapse. Overall, our event study analysis provides no compelling evidence that the rupture of straight debt underwriting relationships precipitated by Lehman's collapse adversely affects straight debt underwriting clients.

**** Insert Table XIII about here ****

In Panel B of Table XIII, we find no evidence of a significantly negative reaction among convertible debt underwriting clients. While the event period abnormal returns for these seven firms tend to be large in magnitude, none are significantly negative, and it would be difficult to draw strong conclusions in any case, due to the very small number of firms in this sample. Panel C of Table XIII reports the stock price reaction of Lehman's M&A clients. For all 87 firms, there is no evidence of a negative mean stock price reaction, as the mean CARs over the (0,0), (0,+1), and (-5,+1) windows are all (insignificantly) positive. Splitting this sample according to whether the firm also received equity underwriting services does not yield significantly negative abnormal returns for either subsample. Overall, we find no evidence that the M&A advisory relationship has enduring value for Lehman's M&A clients.

Panel D of Table XIII documents the stock price reaction of firms for whom Lehman was the NYSE specialist. For all 151 firms, there is no evidence of significantly negative abnormal returns over the (0,0), (0,+1), and (-5,+1) windows. Splitting this sample according to whether the firm received equity underwriting services does not yield significantly negative abnormal returns for either group. Thus, we conclude that Lehman's collapse had no significant adverse impact on Lehman's NYSE market making clients.

In Panel E of Table XIII, we report CARs for firms that received analyst coverage from Lehman just prior to Lehman's bankruptcy. For all 633 firms, we find no evidence of a negative mean stock price reaction. For the 122 firms that received analyst coverage and equity underwriting services, the mean (0,0) and (-5,+1) CARs of -0.99% and -4.20%, respectively, are significant at the 10% level or better. However, this finding appears to be driven by the equity underwriting relationship since we do not find significant abnormal returns during the same periods for the 511 firms that did not receive equity underwriting services from Lehman.

E. Cross-Sectional Analysis of the Stock Price Reaction of Lehman's Equity Underwriting Clients to Lehman's Bankruptcy

We have reported strong evidence that, on average, Lehman's equity underwriting clients reacted negatively to Lehman's collapse. In this section, we investigate the cross-sectional determinants of this market reaction by regressing two-day CARs on measures of the strength of the client's relationship with Lehman and on various client characteristics.

Table XIV reports the results of our cross-sectional analysis. Since all the firms in the sample have the same event period in calendar time, we use the portfolio weighted least squares (PWLS) approach of Chandra and Balachandran (1992), which produces unbiased estimates of the regression coefficient standard errors when abnormal returns over the event window are heteroskedastic and correlated across firms.[44] We estimate the PWLS regressions over the period Day -290 to Day +10 using the Fama-French-Carhart four-factor model and a two-day event window (Days 0 and +1).

**** Insert Table XIV about here ****

We find evidence that the stock price reaction to Lehman's collapse is negatively related to the number of stock offerings that the client conducted with Lehman. The coefficient estimates on the natural logarithm of one plus the number of offerings underwritten by Lehman are all negative and significant at the 10% level. To the extent that multiple offerings with Lehman indicate a stronger relationship, this finding supports the hypothesis that an issuer with a stronger relationship to its underwriter should lose more value when its underwriter fails. In addition, we find that the client's stock price reaction is negatively related to Lehman's share of the client's common stock offering, although not significantly.[45]

[44] PWLS is the weighted version of the portfolio time-series ordinary least squares (POLS) approach of Sefcik and Thompson (1986). As with weighted least squares (WLS), each observation receives a weight that is inversely proportional to its variance in PWLS, where the variance is estimated using a time-series of residuals from the chosen asset return generating model. We use the time-series of residuals from the four-factor model estimated over the pre-event estimation period (Day -290 to -31) to estimate the variance of each observation.

[45] We employ several alternate ways of measuring the firm's reliance on Lehman relative to other investment banks, including using Lehman's share of the client's common stock proceeds (rather than offerings), using the natural log of the number of lead underwriters that the firm dealt with in its

We find that equity underwriting clients lose more value if Lehman is also the lead lender in one of the firm's syndicated credit facilities. In all specifications, the dummy variable that captures this effect is negative and significant. However, we do not find greater losses associated with Lehman acting merely as a participant lender to the firm, as the dummy variable capturing this effect is statistically insignificant.

We find strong evidence that equity underwriting clients that also use Lehman for underwriting straight debt and convertible debt are especially adversely affected. In all specifications, the underwriting relationship scope index is negative and statistically significant. Regarding ownership stakes in clients, we find that client abnormal returns are not significantly related to the proportion of the client's shares owned by Lehman Brothers Holdings Inc. or the proportion of shares owned by Neuberger Berman LLC, although the coefficient estimates are negative as expected.

The client's stock price reaction is positively related to client size and age. In specifications (1), (2), (3), and (5), the client's two-day CAR is positively related to the natural log of the client's market capitalization of equity at either the 10% level or better. In specifications (2) through (5), the coefficients on the natural log of the client's age are positive and significant at the 10% level or better. These results are consistent with the hypothesis that larger and older clients should be less adversely affected by the failure of their underwriter. On the other hand, the shelf registration dummy is always positive, but also always insignificant.

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equity offerings during the sample period, and using a dummy variable to differentiate clients that dealt exclusively with Lehman. As with Lehman's share of the client's common stock offerings, these alternatives have the predicted sign but are never significant.

Firms with less cash and firms with higher likelihoods of financial distress respond more negatively to Lehman's collapse. Two-day CARs are positively related to the cash/assets ratio at the 5% level in specifications (3) and (5) and positively related to Z-score at the 5% level in specification (4). This evidence is consistent with the hypothesis that firms with greater immediate need for external capital respond more negatively to the failure of their underwriter.

Economically, the factors with the largest effects in Table XIV are the scope of the firm's underwriting relationship with Lehman, whether Lehman also acted as a lead lender, and the firm's cash holdings. The coefficient estimates on the underwriting relationship scope index imply that each additional underwriting service (straight debt or convertible debt) received from Lehman decreases the (0,+1) CAR by about 2.5 percentage points. Lehman acting as the firm's lead lender also reduces the CAR by roughly 2.5 percentage points. Regarding the cash/assets ratio, the estimated coefficients indicate that moving from the sample's 75^{th} percentile (cash/assets = 0.464) to the 25^{th} percentile (cash/assets = 0.036) is associated with a decrease in the (0,+1) CAR of 1.57 percentage points.

In light of these cross-sectional differences, we verify that our event study results in Table XI are not driven by specific sub-samples of Lehman equity underwriting clients (e.g., frequent issuers, newly IPO firms, financially constrained firms, etc.) by repeating our previous tests after excluding such firms. We continue to find negative mean event-period CARs that are statistically significant.

F. Cross-Sectional Analysis of the Stock Price Reaction of Lehman's Debt Underwriting, M&A, NYSE Market Making, and Analyst Coverage Clients

We investigate the cross-section of abnormal returns earned by Lehman's debt underwriting, M&A Advisory, NYSE specialist, and analyst coverage clients. These findings are summarized below.

Since there are so few convertible debt clients, we include them with the straight debt clients and utilize a dummy to differentiate convertible debt underwriting. In Table XV, We find that a debt underwriting client's two-day CAR is significantly and negatively related to the proportion of the client's shares owned by both Neuberger Berman LLC and Lehman Brothers Holdings Inc., and the scope of the firm's underwriting relationship with Lehman. It is positively and significantly related to the firm's cash/assets ratio. Two-day CARs earned by debt underwriting clients are not significantly related to the natural logarithm of one plus the number of debt offerings underwritten by Lehman, Lehman's share of the client's debt offerings, whether or not the firm recently shelf registered a debt offering, firm size, firm age, Z-score, net market leverage, or whether Lehman was a lead lender or participant lender to the firm.

**** Insert Table XV about here ****

In Table XVI, we perform a cross-sectional analysis of Lehman's M&A clients. The findings reveal that a client's stock price reaction is negatively related to the natural logarithm of one plus the number of deals advised by Lehman (at the 10% level) and whether Lehman is the firm's lead lender (at the 5% level). It is also positively and significantly related to the firm's Z-score at the 10% level in two of three specifications. An M&A client's reaction is not significantly related to Lehman's share of the client's M&A deals, whether Lehman is a participant lender to the firm, the proportion of the client's shares owned by Lehman entities, firm size, firm age, or whether the firm had a pending M&A deal with Lehman as the advisor.

**** Insert Table XVI about here ****

In Table XVII, we examine the cross-section of abnormal returns earned by firms for whom Lehman was the specialist on the NYSE. The findings reveal weak evidence that stock market liquidity is a determinant of these firms' responses to the collapse of their specialist. The proportion of shares owned by non-Lehman institutions is significantly and positively related to two-day CARs in one of two specifications. If one considers institutional ownership as a proxy for liquidity, then the interpretation is that firms with less liquid stock respond more negatively. Share turnover, however, is not significantly related to abnormal returns. As with equity underwriting clients and M&A clients, the abnormal returns earned by these firms are also significantly and positively related to the firm's Z-score at the 10% level or better. Two-day CARs are not significantly related to firm size, firm age, whether Lehman was a lead or participant lender, or the proportion of the firm's shares owned by Lehman entities.

**** Insert Table XVII about here ****

In Table XVIII, we report cross-sectional results for for firms that received analyst coverage from Lehman just prior to the bankruptcy. We find no evidence that firms followed by fewer non-Lehman analysts react more negatively to Lehman's collapse, as the natural logarithm of the number of analysts covering the firm that are not employed by Lehman is not a significant determinant of the firm's stock price reaction. Kelly and Ljungqvist (2007) find that, in the quarter after a firm loses analyst coverage from a broker, institutions are abnormally large net buyers of the firm's stock, implying that retail investors are net sellers. They interpret this result as indicative that retail investors are more dependent on sell-side analyst research and that a loss of coverage may reduce their valuation and demand for the stock. Consistent with Kelly and Ljungqvist (2007), we find that the proportion of shares owned by non-Lehman institutions is significantly and positively related to the two-day CAR, indicating that firms with low institutional ownership that receive analyst coverage from Lehman lose more value around the bankruptcy. There is some evidence that younger firms are more adversely affected, as the natural log of firm age is positive and significant at the 10% level, and also that the share price reaction of firms receiving analyst coverage from Lehman is positively and significantly related to the firm's Z-score.

**** Insert Table XVIII about here ****

G. Pooled Cross-Sectional Analysis of the Stock Price Reaction of Lehman's Equity Underwriting, Debt Underwriting, M&A, NYSE Market Making, and Analyst Coverage Clients

Finally, we conduct a pooled cross-sectional analysis of (0,+1) CARs earned by all firms that received equity underwriting, debt underwriting, M&A advising, NYSE market making, or analyst coverage services from Lehman. This analysis is presented in Table XIX. For each client group, we include a dummy variable that takes the value of one if the client received that specific service from Lehman and zero otherwise. We also include as independent variables firm-specific characteristics (size, age, and Z-score), dummies for whether Lehman was a lead or participant lender, and ownership of the firm's shares by Lehman Brothers Holdings Inc and Neuberger Berman LLC. Event study analyses suggest that equity underwriting is the principal source of value for clients in investment banking relationships. Our aim is to re-examine that conclusion in a multivariate analysis that disentangles the marginal effects of each type of client-bank relationship. If our conclusion is robust, we would expect to observe a negative and significant coefficient for equity underwriting, and this is exactly what we find. The coefficient on the dummy variable that equals one if the firm received equity underwriting services from Lehman and zero otherwise is negative and significant at the 1% level in specifications (1) and (2). The interpretation is that clients that received equity underwriting services reacted more negatively than clients that did not receive equity underwriting services, on average. In specifications (5) through (7), we use the natural logarithm of one plus the number of equity offerings underwritten by Lehman in lieu of a dummy and reach the same conclusion. In contrast, the coefficients on the dummies that correspond to receipt of straight debt underwriting and convertible debt underwriting are statistically insignificant in specifications (1) and (2) as are the coefficients on the natural logarithms of one plus the number of straight debt offerings and one plus the number of convertible debt offerings.

**** Insert Table XIX about here ****

The dummy for receipt of NYSE specialist service is also insignificant in all specifications. The analyst coverage dummy is positive and significant at the 10% level or better in two of seven specifications, indicating that firms that received analyst coverage were less adversely affected by the collapse of Lehman than the average client not receiving analyst coverage. The dummy for receipt of M&A advisory services is positive and statistically significant in specifications (1) and (2), as is the natural log of one plus the number of M&A deals advised by Lehman in specifications (5) through (7). While this finding suggests that Lehman M&A clients fared relatively better than the average Lehman client that did not receive M&A advisory services, it should not be construed as evidence of a positive reaction by M&A clients to the Lehman collapse. Indeed, the event study results reported in Panel C of Table XIII show an insignificant reaction by the 87 Lehman M&A clients to the collapse. As in Table XII, we find evidence that clients that used Lehman for multiple underwriting services (equity, debt and convertible debt) were especially adversely affected. The underwriting relationship scope index is negative in all three specifications in which it is included although statistically significant in only two of them. These results buttress our conclusion that equity underwriting is the principal source of value for clients in investment banking relationships.

V. Conclusions

The unexpected collapse of Lehman Brothers provides a unique natural experiment to find answers to two key questions in the corporate finance and banking literatures: (1) Are investment banking relationships valuable for client firms and, if so, (2) what are the value drivers of these relationships? We examine the impact of Lehman Brothers' bankruptcy on different categories of the bank's publicly traded clients by studying how their stock prices reacted to the collapse. We find that companies that used Lehman as lead underwriter for one or more equity offerings during the 10 years leading up to September 2008 suffered economically and statistically significant negative abnormal returns when Lehman Brothers declared bankruptcy. Based on Fama-French-Carhart four-factor model adjusted abnormal returns, the 184 equity underwriting clients that we study lose 4.85% of their market value, on average, over a seven-day period spanning the five trading days prior to and the first and second trading days immediately following Lehman's bankruptcy, amounting to approximately $23 billion in aggregate, risk-adjusted losses. These losses were significantly larger than for firms that were equity underwriting clients of other large investment banks, and were especially severe for companies that were smaller, younger, more financially constrained, and had undertaken a larger number of Lehman-led equity offerings or equity offerings in conjunction with debt offerings. No other client groups were significantly adversely affected by Lehman's collapse. These results show that Lehman's collapse did, in fact, impose material losses on its customers, but for the most part these losses were confined to those companies which employed Lehman for equity underwriting.

Our findings also provide insights into the "too-big-to-fail" (TBTF) rationale for the government rescue of financial institutions. While TBTF has traditionally been used as a justification for the government rescue of commercial banks due to the systemic risk that their failure would pose to the banking system, the TBTF rationale was extended to nonbanks when the U.S. Federal Reserve orchestrated the 1998 rescue of Long-Term Capital Management, whose failure threatened the financial markets. While the significant adverse effect of Lehman's bankruptcy on the financial markets in general and Lehman's financial counterparties in particular may have led the government to change its strategy toward allowing other large nonbank financial institutions (such as AIG) to fail (Financial Crisis Inquiry Commission, 2010), our findings shine the spotlight on another negative consequence of Lehman's collapse that has been ignored hitherto.

CHAPTER 3

INVESTMENT BANK LENDING RELATIONSHIPS AND THE WEALTH EFFECTS OF BANK FAILURE: EVIDENCE FROM THE LEHMAN BROTHERS BANKRUPTCY

I. Introduction

The question of whether firms derive benefits from banking relationships has received considerable attention in the academic literature. Relationship lending is depicted as potentially beneficial to both banks and borrowers in much of the theoretical banking literature (Fama, 1985; Sharpe, 1990; Diamond, 1991; Boot, 2000). The initial screening of a borrower enables a bank to acquire private information, thus affording the bank a comparative monitoring advantage. When private information is both costly to produce and reusable in future dealings, repeat dealings between the borrower and bank will result in scale economies. Thus, theory predicts that an established relationship with a bank will be valuable to the borrower as long as she captures a portion of the cost savings.

Several empirical studies of small, privately held borrowers report evidence supporting the benefits of relationship lending (Petersen and Rajan, 1994; Berger and Udell, 1995; Cole, 1998). For larger, widely-held corporations, the evidence is less unified.[46] Moreover, the idea that lending relationships entail both costs and benefits,

[46] See, for example, Bharath et al. (2009), who show that repeat syndicated loan deals with the same lead bank results in significant reductions in loan spreads and Hale and Santos (2009) and Santos and Winton (2008), who find evidence that banks use their information advantage to extract rents from borrowers. Slovin et al. (1993) find that commercial bank insolvency negatively impacts the share prices of its borrower firms while, in contrast, Ongena et al. (2003) find insignificant share price effects for borrowers of distressed commercial banks. For announcements of new loans and/or loan renewals, James (1987) and Lummer and McConnell (1989) find significantly positive stock price

as theorized by Rajan (1992) and Sharpe (1990), has gained increasing empirical support in recent studies (Hale and Santos, 2009; Santos and Winton, 2008; Schenone, 2010). Thus, whether widely held firms derive significant net value from lending relationships is a question unresolved by the literature. Also unknown are the wealth effects of investment bank lending relationships for borrowers. While numerous authors have studied the entry of commercial banks into traditional investment banking services after the relaxation and repeal of the Glass-Steagall Act (Puri, 1994, 1996; Gande et al., 1997; Gande et al., 1999), few have studied the incursion of investment banks into commercial lending. One exception is Harjoto et al. (2006), who show that the annual volume of syndicated loans arranged by investment banks in the U.S. grew from a meager $2.6 billion in 1996 to nearly $100 billion in 2003. Apart from shedding light on the unresolved questions in the extant literature, better insight into these issues have the potential to help guide future financial policy and regulation.

In this paper, I use the bankruptcy of Lehman Brothers in September 2008 to test whether lending relationships developed through syndicated loans have value for corporate borrowers. On Sunday, September 14, 2008, Lehman Brothers, the world's fifth largest investment bank at the time, announced that it would file for Chapter 11 bankruptcy the following day. Although many large, distressed financial firms had been rescued by other financial firms, sometimes with the aid of the U.S. government, Lehman Brothers was allowed to enter bankruptcy. When the market

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reactions for borrowers, while Fields et al. (2006) and Preece and Mullineaux (1996) find insignificant share price effects associated with bank loan announcements.

opened the following Monday, Lehman's stock lost virtually all of its remaining value and the U.S. stock market lost nearly 5%, indicating that investors were surprised by the news.[47] While Lehman Brothers was best known for its traditional investment banking services, such as securities underwriting, the firm also had a significant presence as a lender in the syndicated loan market.[48] Therefore, Lehman's unexpected collapse provides a natural experiment to address the above research issues. I use the Lehman failure and event study methodology to address the following research questions that are key to understanding if and how bank lending relationships create value for corporate borrowers: First, did Lehman's failure result in abnormal losses for its borrowers, above and beyond those predicted by conventional asset pricing models and second, if so, what were the cross-sectional drivers of these losses?

I identify 115 non-financial, non-utility firms that had active syndicated credit facilities with Lehman acting as either a lead-bank or participant lender at the time of its bankruptcy. I find that these firms suffered abnormal returns of approximately -3%, on average, during the seven-day period that spans the five market days prior to and first and second market days after Lehman's bankruptcy announcement. These losses were significantly larger than those experienced by a group of control firms matched on size, credit rating, and industry that had

[47] The fact that many large, distressed financial institutions had historically been rescued by other financial firms, often with the aid of the U.S. government, may partially account for the market's shock when Lehman was allowed to fail.

[48] According to Reuters Loan Pricing Corporation, in 2007 Lehman Brothers acted as lead arranger for $46 billion of syndicated loans to U.S. firms and had the 8th largest market share among all lead arrangers.

syndicated loans from other banks. In addition, Lehman's borrowers also experienced significant reductions in profitability and investment relative to industry benchmarks in the year following Lehman's failure. I conclude that Lehman's borrowers incurred significant costs as a result of Lehman's collapse, above and beyond those experienced by the market in general and by similar firms relying on syndicated loans from other banks. Cross-sectionally, borrower abnormal returns were more sever if Lehman was the lead lender for one or more of the firm's facilities. The scope of the borrower's relationship with Lehman also had important implications, as borrowers that procured equity underwriting services from Lehman in the five years prior to the bankruptcy experienced greater losses. In addition, more opaque firms, firms with more growth opportunities, and less profitable firms also suffered greater losses. Finally, borrowers that had relatively large, undrawn credit lines from Lehman were also disproportionately harmed, but this effect was attenuated if the firm also held larger amounts of cash. Overall, these results suggest that lending relationships developed through syndicated loans are valuable to corporate borrowers and costly to replace, with the value to the borrower increasing with the strength and scope of the relationship, the extent of the borrower's information and moral hazard problems, and the borrower's reliance on bank credit as a principal source of liquidity.

This paper extends the literature on lending relationships and is most notably related to Slovin et al. (1993) and Ongena et al. (2003). Slovin et al. (1993) find that the insolvency of Continental Illinois Bank in 1984 had a negative effect on the share prices of 53 borrower firms and that the FDIC's subsequent rescue of the bank had a smaller (in magnitude) positive effect. Slovin et al. conclude that durable bank lending relationships are valuable to corporate borrowers. In contrast, Ongena et al. (2003) find that announcements of commercial bank distress during the Norwegian banking crisis of 1988-1991 had little impact on the share prices of Norwegian firms with lending relationships to troubled banks.[49] My study differs in that I focus exclusively on lending relationships developed through syndicated loans – joint loans issued by more than one financial institution. Over the last 30 years, the syndicated loan market has evolved as the primary means through which banks lend to large corporations (Sufi, 2007; Ivashina and Scharfstein, 2010). The borrowers that I study tend to be larger and, by definition, have relationships with multiple lenders. *A priori*, it is unclear whether the failure of any one lender would impose significant costs on these firms. On the one hand, theory predicts smaller benefits of lending relationships since they should face lower costs in replacing a lender or raising capital in the public markets compared to smaller firms that rely on direct loans from sole-lenders (Diamond, 1991). On the other hand, syndicated loan borrowers should also be subject to lower "hold-up" costs, since a lender's ability to extract rents decreases with the borrower's transparency and access to alternative capital sources (Rajan, 1992; Hale and Santos, 2009). My study directly addresses the question of whether lending relationships developed through syndicated loans

[49] Kang and Stulz (2000) examine the effect of adverse shocks to Japanese bank solvency during the early 1990s on Japanse borrower firms. However, because Japan is a bank-based system where banks tend to own large equity stakes and exercise greater corporate control, the results are not directly comparable to those or firms in market-based systems such as the U.S.

add significant net value to corporate borrowers and my findings suggest that they do.

My study also adds to the relatively sparse literature on investment banks as lenders. My findings show that investment bank lending relationships create value for corporate borrowers and that this value is enhanced for borrowers that engage their investment bank for both loan capital and equity underwriting.

Finally, understanding the consequences of a failure like that of Lehman Brothers is important for regulatory policy design. On the day of Lehman's bankruptcy filing, the U.S. stock market experienced one of its worst single-day losses ever. History provides few events of such magnitude for study, and thus scholars have begun to examine how Lehman's collapse affected other firms in order to identify important channels of contagion. Ivashina and Scharfstein (2010) study the impact of Lehman's failure on the banking sector, while Aragon and Strahan (2009) examine the effect on hedge funds that used Lehman as their prime broker. Fernando et al. (2011) examine how Lehman's failure affected firms that dealt with Lehman for traditional investment banking services (e.g. securities underwriting).[50] My study complements this line of research by studying the impact of Lehman's failure on its corporate borrowers, which, to my knowledge, is a question that has not been examined. I identify another channel of contagion, which should help policy makers better assess the costs and benefits of government intervention.

[50] Kovner (2010) uses the failure of Lehman Brothers and near failures of Bear Stearns, Merrill Lynch, and Wachovia to study the impact of underwriter distress on IPO client firms.

The remainder of the paper is organized as follows. Section II reviews relevant literature on banking relationships in corporate finance and the structure of syndicated loans. Section III discusses the bankruptcy of Lehman Brothers. Section IV describes my data and methodology. Section V presents the results and Section VI concludes.

II. Literature and Empirical Predictions

A. Theories of Informed Debt and Lending Relationships

In Myers and Majluf (1984), information asymmetries between investors and firms make it costly for firms to raise external capital, resulting in investment distortions. Diamond (1984) and Boyd and Prescott (1986) argue that banks' comparative advantage over dispersed public ("arms-length") investors in acquiring private information and monitoring the firm reduces the information problem. In Fama (1985), Sharpe (1990), Diamond (1991), and Rajan (1992), this notion is modeled formally, with banks operating as "insiders" with access to private information. Due to their comparative monitoring advantage, banks can offer lower costs of capital to some borrowers relative to public markets, and the bilateral nature of loan contracts facilitates renegotiations and lowers costs of financial distress. These theories suggest that repeat dealings between the same borrower and bank will result in scale economies if information about the borrower is costly to produce, non-transferable to outside investors, and useful in future dealings between the same borrower and bank. Under these assumptions, an existing lending relationship will have value for the borrower since replacing it with an uninformed lender would be costly.

The line of reasoning above relies on the premise that the relationship lender will be willing to pass on a portion of the cost savings to the borrower. However, Rajan (1992) argues that relationship lenders can use their private information advantage to extract rents from the borrower. Since the borrower faces high costs of switching lenders due to prospective lenders' relative information disadvantage, the relationship lender effectively enjoys an information monopoly that can be exploited to the benefit of the lender and at the cost of the borrower. Thus, whether the borrower derives significant value from an existing lending relationship depends critically on whether the borrower is able to capture a share of the benefits.

B. Empirical Evidence on the Benefits and Costs of Lending Relationships

Empirical studies generally find support for the benefits of lending relationships for small, privately held firms. Petersen and Rajan (1994) find that banking relationships increase credit availability for small businesses, while Berger and Udell (1995) report that strong relationships lower interest rates and collateral requirements. Cole (1998) finds that greater relationship scope (procuring multiple financial services from the same bank) increases the probability that the bank provides a loan to the firm.

For larger, public corporations, the evidence is less consensual. Early evidence takes the form of event studies that measure borrower stock returns around bank loan announcements. James (1987) finds that borrower abnormal returns are significantly positive around bank loan announcements. Lummer and McConnell (1989) distinguish between loans with a new lender and loan renewals with an existing lender and find that the market reaction is positive only for loan renewals. In contrast, Fields et al. (2006) find that borrower stock prices do not react to either new loans or loan renewals after the 1980s. Fields et al. (2006) attribute this finding to advances in information technology that erode relationship lenders information advantage over prospective investors. Similarly, Preece and Mullineaux (1996) find that announcements of syndicated loans with more than three lenders do not induce significant share price effects. They attribute their findings to higher renegotiation costs, as a result of multiple lenders, that offset the benefits of bank monitoring. Slovin et al. (1993) find that Continental Illinois Bank's (CIB) borrowers earned negative abnormal returns as a result of CIB's insolvency and impending failure in 1984. Conversely, they find that stock prices of the same borrowers reacted positively to the FDIC's subsequent rescue of the commercial bank. In contrast, Ongena et al. (2003) find that announcements of commercial bank distress during the Norwegian banking crisis of 1988-1991 had little impact on the share prices of Norwegian firms with lending relationships to troubled banks.

More recently, Bharath et al. (2009) show that repeat syndicated loan deals with the same lead lender result in significant reductions in loan spreads and collateral requirements, especially for opaque borrowers. Thus, their study provides evidence for the benefits of relationship lending even for publicly traded firms. However, Hale and Santos (2009) find evidence that banks use their information advantage to extract rents from public firms, as theorized by Rajan (1992). They show that firms are able to take out loans at lower interest rates after their bond IPO and that firms that get their first credit rating at the time of their bond IPO benefit from larger interest rate reductions than those that already had a credit rating. Thus, their findings indicate that banks price their information advantage when it is relatively large (when the firm does not have public bonds or a public credit ratings). Santos and Winton (2008) find that, during recessions, syndicated loan spreads rise more for borrowers without access to public debt markets as compared to borrowers with access to bond markets. In their view, this finding is consistent with banks that have an exploitable information advantage (those that lend to firms which cannot access public bond markets) raising their interest by more than is justified by increased borrower default risk alone.

C. Syndicated Loans

In contrast to the sole-lender transactions envisioned in many classical theories of bank lending, in a syndicated loan, two or more institutions agree jointly to make a loan to a borrower. Lenders are classified broadly into two categories: the lead bank(s) and participants. A firm seeking a syndicated loan will first sign a preliminary loan agreement with a lead bank that specifies covenants, fees, loan amounts, interest rate ranges, etc. The lead bank will then seek out potential participant lenders to fund portions of the loan. This process involves the lead bank providing prospective participants with an "information memorandum" that contains information about the borrower's business and financial condition (Sufi, 2007b).

The lead bank also typically meets with prospective participants to explain and negotiate the terms of the deal and further describe the borrower's business and prospects, often with the aid of presentations by the borrower's management (Dennis and Mullinex, 2000). Once participants commit to funding portions of the loan, a loan agreement is signed by all parties and the deal is "closed." Over the life of the loan, one of the lead banks also acts as the "administrate agent," who is responsible for monitoring and dealing directly with borrower, enforcing covenants, administering drawdowns, and collecting interest, principal, and fee payments on behalf of syndicate members. In addition to interest and commitment fee income, the lead bank receives additional fees for arranging and monitoring the loan (Sufi, 2007b).

D. Empirical Predictions

Existing literature does not provide a clear answer to whether lending relationships developed through syndicated loans add value for corporate borrowers. As discussed in Sufi (2007b) and Bharath et al. (2009), syndicated loan borrowers tend to be larger and more transparent than firms that rely heavily on direct bank loans. Moreover, firms that issue syndicated loans necessarily have relationships with multiple lenders. Thus, the potential benefits of relationship lending may be smaller but hold-up costs may also be lower. I measure the abnormal stock returns earned by firms that had lending relationships with Lehman around the time of Lehman's collapse. If borrowers derived significant value from their lending relationships with Lehman, I predict that they should experience negative abnormal returns in the days surrounding the bankruptcy.

D.1. Strength and Scope of the Relationship

For syndicated loans, the distinction between lead banks and participants provides a natural dividing line to separate strong lending relationships from weaker relationships. As argued by Sufi (2007b), the lead bank serves as an intermediary between the borrower and participants and develops a closer working relationship with the borrower. Some authors have even likened participants to “arm’s-length” lenders in that they typically do not deal directly with the borrower after the deal is closed and the loan is activated. This characterization is an oversimplification, however, since participant lenders would be privy to private information about the borrower that prospective lenders and widely-dispersed public investors would not have. Nonetheless, the lead bank is likely to have a greater information advantage with respect to the borrower, and thus replacing the lead bank in future loans might be more costly to the firm than replacing a participant. Furthermore, if a lead bank is unable to perform its duties as the administrative agent of the firm’s active loan, its duties would necessarily need to be assumed by another lender (most likely a member of the syndicate) for the remainder of the loan’s life, which could impose additional costs on the borrower. These costs may be either indirect, e.g., seeking out, negotiating with, and transferring important information to prospective lead banks, or direct, e.g., additional fees charged by the new lead bank.

The ability to procure investment banking services from a lender may be particularly valuable for borrowers due to economies of scope. The rationale is that information procured by the bank during the provision of loans is also useful in the provision of other services and vice versa. If so, the total cost of producing lending and investment banking services will be lower than if the firm deals with separate banks for the production of each. In addition, dealing with the same bank for both lending and securities underwriting, for example, may strengthen the bank's information advantage and ability to monitor since underwriting also entails the production of information. Drucker and Puri (2005) find empirically that equity issuers that employ their lending investment bank as lead underwriter in equity offerings obtain lower underwriting fees. They find that issuers that employ their lending commercial bank as lead underwriter for equity offerings do not obtain lower underwriting fees but do enjoy lower interest rates on loans. Yasuda (2005) finds that a lending relationship with a commercial bank that has underwriting capabilities significantly increases the likelihood that the bank will be chosen to underwrite the firm's bond offerings and that the bank will do so for a lower underwriting fee. Bharath et al. (2007) find that a lending relationship, whether with a commercial bank that has underwriting capabilities or an investment bank, significantly increases the probability of the bank being selected to underwrite the firm's IPO and public bond offerings. Schenone (2004) shows that IPO issuing firms that have an existing lending relationship with either an investment bank or a commercial bank that could underwrite its securities offerings enjoy significantly lower IPO underpricing.

The evidence cited directly above suggests that the scope of the bank-borrower relationship may be an important determinant of relationship value. The collapse of Lehman Brothers provides a unique opportunity to test this prediction since Lehman was, prior to its collapse, a large, reputable investment bank with a significant presence in securities underwriting markets. My empirical analysis reveals that many of Lehman's borrowers also procured equity and debt underwriting services from Lehman. Equity underwriting involves investment in firm-specific information in order to credibly certify the offer to outside investors and is thus an informationally intensive service. Debt underwriting also entails the production of information but less so than equity due to the fixed-claim nature of public debt and the existence of third-party rating agencies that provide credit ratings for publicly issued bonds. I therefore predict greater losses for borrowers that also used Lehman to underwrite equity offerings. I also predict greater losses for borrowers that employed Lehman as their debt underwriter but expect that the incremental effect of a debt underwriting relationship will be smaller than that of an equity underwriting relationship.

D.2.Information Asymmetry and Moral Hazard

In Diamond (1991), the benefits of bank monitoring begin to decline when the borrower obtains a sufficiently long track record of repaying debt. More transparent borrowers with established reputations are able to access public debt markets more cheaply. Thus, Diamond (1991) predicts that the benefits of a banking relationship will be larger for opaque firms that suffer from higher information problems. To the extent that hold-up costs do not completely negate these benefits, I predict more severe losses for more opaque borrowers.

It is widely accepted that firms with more future growth opportunities face higher agency costs of debt (Myers, 1977; Barclay and Smith, 1996; Krishnaswami et al., 1999). In theory, firms with higher financial leverage should also suffer from greater agency costs of debt (Jensen and Meckling, 1976). These agency costs arise due to perverse incentives of shareholders to either underinvest in safe, profitable projects (underinvestment) or to substitute risky assets for safe assets (asset substitution). The underinvestment and asset substation problems are more severe in firms with more growth options due to greater conflicts between shareholders and bondholders over the exercise of the options (Myers, 1977; Houston and James, 1996; Krishnaswami et al., 1999). Likewise, theory predicts that shareholders incentives for underinvestment and asset substitution increase with financial leverage (Jensen and Meckling, 1976; Myers, 1977). Myers (1977) argues that short-term, monitored debt can mitigate the underinvestment problem, while Houson and James (1996) and Krishnaswami et al. (1999) describe how bank debt can overcome the asset substitution problem with closer monitoring and stricter covenants. This line of thought leads to the prediction that banking relationships will be more valuable for growth firms and firms with higher leverage. Hence, I predict greater losses among highly levered firms and firms with higher growth opportunities.

D.3. Profitability

In Myers and Majluf (1984), highly profitable firms depend less on external sources of funds, such as bank debt, due to their ability to finance investments with cheaper internally generated funds. All else equal, this would imply that the loss of a bank lending relationship will be less consequential for more profitable firms. Cantillo and Wright (2000) examine the choice between bank debt and public debt and establish a theoretical link between profitability and a firm's dependence on bank debt relative to public debt. In their model, lower renegotiation costs in the event of financial distress constitute the primary benefit of bank debt over dispersed public debt. For highly profitable firms, both the cost of accessing public credit markets and the expected benefits of bank financing are low because highly profitable firms are unlikely to encounter financial distress. The theoretical link between profitability and reliance on bank debt relative to public debt is confirmed empirically in Denis and Mihov (2003). Hence, the greater ability of profitable firms to finance projects internally as in Myers and Majluf (1984) or with public debt as in Cantillo and Winton (2000) implies that bank lending relationships will be less valuable to highly profitable firms. Thus, I predict greater losses as a result of Lehman's failure among less profitable firms.

D.4. Liquidity: Undrawn Credit Lines and Cash

Sufi (2007a) examines the factors that determine whether firms use bank lines of credit or cash in liquidity management. He finds that many firms rely on credit lines as a liquidity substitute for cash. Lehman Brothers was a lender in many credit lines as well as some term loans with delayed draw provisions. Unsurprisingly, in my empirical analysis I document that many borrowers reported in their SEC filings that Lehman failed to honor its commitments in funding draw-down requests under such facilities after the bankruptcy. The lost option to draw on a credit line could be particularly damaging to firms that rely heavily on credit lines for liquidity, especially in the wake of a financial crisis and tightening credit supplies. Thus, I predict greater losses for borrowers with large, undrawn credit commitments from Lehman. This effect, however, may be mitigated if the firm had viable alternative sources of liquidity. Larger amounts of cash on hand, for example, may soften the impact of losing the option to draw on a line of credit. Hence, I also predict that the losses suffered by firms with large, undrawn credit commitments from Lehman were attenuated if the firm also held large amounts of cash.

III. The Collapse of Lehman Brothers

Table IX documents the significant events surrounding the bankruptcy of Lehman Brothers and Lehman's stock price performance. On Friday, September 5, 2008, Lehman's stock price closed at $16.94. Over the course of the following market week (September 8 - September 12), Lehman announced a $3.9 billion loss and a dividend cut, the rating agencies put Lehman's credit rating on "watch," and a deal involving a potential investment in Lehman by Korea Development Bank was put on hold. By market close on Friday, September 12, Lehman's stock price had sunk to $3.65. On Saturday, September 13, Timothy Geithner, New York Fed president, called Lehman and two potential acquirers, Bank of America and

Barclays, into a special meeting to broker a sale of Lehman's businesses before the market opened the following Monday. On Sunday, September 15, both Barclays and Bank of America walked away from negotiations Lehman announced that it would file bankruptcy late in the evening. The following day, Monday, September 15, Lehman's stock lost nearly all its remaining value and the U.S. stock market lost nearly 5%.

IV. Data and Methodology

A. Sample Selection

My data on syndicated loans is from Loan Pricing Corporation's (LPC) Dealscan database. Dealscan contains data on large bank loans, almost all of which are syndicated. LPC collects information on loans to large corporations primarily through SEC filings, self-reporting by lenders, and staff reporters. I identify all loans[51] for which Dealscan indicates that Lehman was a lender and with activation dates prior to and maturity dates after September 2008. Dealscan indicates whether a loan is syndicated or directly placed. There were no directly placed loans identified in this first step, and thus my focus is syndicated loans. I match the borrowers in this sample to U.S. firms in CRSP and Compustat with publicly traded common stock (CRSP share codes of 10 or 11). I exclude utilities (two-digit SIC code 49) because their financing decisions are highly regulated. I also exclude financial firms (one-digit SIC code 6) because they are more likely to have had financial exposure to

[51] Loan packages often contain multiple credit facilities. Throughout, my use of the term "loan" refers to an individual credit facility.

Lehman unrelated to borrowings under syndicated loans. These screens resulted in a preliminary sample of 150 firms.

I am interested in studying firms that had active loans from Lehman at the time of Lehman's failure. The previously discussed criteria of requiring loans to have maturity dates after September 2008 does not necessarily ensure that firms in the final sample had active loans with Lehman Brothers at the time of the bankruptcy due to the following reason. Firms occasionally "amend," "restate," or "replace" their syndicated loans prior to maturity. For all practical purposes, such situations constitute the termination and replacement of the original loan with a new loan that typically has different terms and, in some cases, different lenders than the original loan. Dealscan is organized by loan, with the information reflecting original terms, and does not indicate whether a loan was eventually terminated and replaced prior to maturity. Loans that replace prior loans before their maturity are in Dealscan, but the data does not provide sufficient information to determine whether the loan replaced an existing loan or was simply a new loan taken out without terminating an existing loan. Hence, I also search each firm's 8K, 10K, and 10Q filings with the SEC to identify any firms that may have terminated their syndicated loans with Lehman without retaining Lehman as a lender on any replacement loans.[52] Such firms are dropped from the final sample. In addition, I also search sample firms' 10K, 10Q, and 8K filings during the year prior to and year after Lehman's bankruptcy and

[52] Specifically, I track the history of sample firms' loans by reviewing the SEC filings that occurred between loan activation dates and September 2008. If a firm indicates in its filings that a loan with Lehman was terminated prior to September 2008 and replaced with another loan, I use Dealscan to identify the replacement loan and determine whether Lehman was a lender for that loan.

eliminate any firms that disclosed exposure from over-the-counter derivatives contracts with Lehman or securities issued by Lehman.[53] After imposing the above mentioned screens, the final sample consists of 115 firms that had active credit facilities from Lehman at the time of Lehman's failure.[54]

Panel A of Table XX reports descriptive statistics for the sample. Consistent with Bharath et al.'s (2009) observation that Dealcan firms tend to be larger, the sample mean (median) market capitalization of equity is $19 billion ($3.7 billion), which is considerably larger than the CRSP/Compustat industrial mean (median) of $3.7 billion ($400 million). Although the sample is weighted toward larger firms, only 37% of firms have an investment grade credit rating. 50% of firms have a speculative grade credit rating, with the remaining 13% unrated. These observations are in line with Harjoto et al. (2006), who find that, compared to commercial banks, investment banks lend to riskier firms.[55] Panel B of Table XX reports loan summary statistics by the type of loan (credit facility) that firms had with Lehman. The sample consists of 128 revolving credit lines, 84 straight (without delay draw provisions)

[53] Twenty firms disclosed that they dad derivatives contracts with Lehman or that they had exposure to securities issued by Lehman.

[54] In addition to firms with active loans from Lehman, I also attempted to examine firms that had loan deals that were still pending and that had not closed at the time of Lehman's failure. Dealscan contains a data field called "deal status" which indicates whether a loan was eventually closed or cancelled. I attempt to identify firms that had pending loans with Lehman at the time of the bankruptcy by examining Lehman loans that were cancelled either just prior to Lehman's failure or after Lehman's failure. However, there are few such loans in Dealscan, and none of the corresponding borrowers appear in CRSP or Compustat. Hence, I am unable to conduct an analysis of firms that had pending loans with Lehman that had not yet closed at the time of Lehman's bankruptcy.

[55] Consistent with Harjoto et al. (2006), my data indicates that Lehman's borrowers had higher leverage and lower credit ratings, on average, than firms that had syndicated loans from Lehman's four closest (in terms of loan market share) commercial bank industry peers (Wells Fargo, Wachovia, Deutsche Bank, and Credit Suisse) .

term loans, and 14 other types of loans. The latter category includes delay draw term loans and bridge loans.

**** Insert Table XX here ****

B. Control Firms

Lehman's collapse had an adverse impact on the stock market, especially the banking sector, and may have signaled that it would be relatively more difficult to borrow in the near future. Thus, I conjecture that the broader population of bank dependent firms may also have been abnormally affected by Lehman's collapse. This raises the concern that any abnormal effects detected in the sample of Lehman borrowers are not necessarily specific to Lehman borrowers, *per se*, but to the broader population of firms that rely on syndicated bank debt. I address this concern by documenting and comparing the abnormal returns earned by a sample of control firms with active syndicated loans from banks other than Lehman at the time of the bankruptcy. This control sample is constructed by matching each sample firm to a control firm in Dealscan of similar industry classification, credit rating, and size that had active loans from other banks. I also require that control firms did not take out any syndicated loans from Lehman during the five years prior to the bankruptcy. I use credit rating and firm size as matching criteria since these characteristics should be highly correlated with the firm's dependency on private debt.[56] Investment grade firms should be less opaque and should have cheaper access to non-bank sources of capital, such as public debt and commercial paper markets. Large firms should suffer

[56] Denis and Mihov (2003) find that the most important empirical determinant of the choice between bank debt and public debt is a firm's credit rating. They also find that smaller firms are much less likely to choose public debt.

less from the asymmetric information problems and should, therefore, be able to access public markets more easily than small firms.

I use the 17 Fama-French industry classification scheme[57] and three broad credit rating categories based on S&P's long-term issuer ratings: investment grade, speculative grade, and unrated.[58] For each sample firm, I select the control firm that is closest in size (percentage difference in market capitalization of equity), subject to the constraint that the control borrower is in the same Fama-French industry and broad credit rating category as the sample firm. Control firms are selected without replacement to ensure that the same control firm is not matched to more than one sample firm.

C. Empirical Determinants of Borrower Abnormal Returns

I use the data field labeled "Lender Role" in Dealscan to identify firms with Lehman acting as a lead lender in at least one of its syndicated credit facilities. While syndicate members can broadly be placed into two categories, lead bank(s) and participants, in practice there are multiple roles within these categories that can be assigned to the members of a lending syndicate. While some syndicated loans have multiple lead arrangers, only one lead arranger acts as the administrative agent. As in Ivashina (2009), I follow the Standard and Poor's (2009) definitions and identify the administrative agent as the lead lender, since the administrative agent deals directly with the firm throughout the life of the loan and handles all payments. For a small

[57] On his website, Ken French maintains several industry classifications schemes that map SIC codes into groups. These classification schemes are extensions of those used in Fama and French (1997) and range from very broad (5 groups) to much narrower (49 groups). I use the scheme that maps SIC codes into 17 different groups and match sample firms to control firms in the same group.

[58] S&P issuer credit ratings from August 2008 are obtained from Compustat.

number of loans, Dealscan does not identify the administrative agent. In such cases, I follow Ivashina (2009) and identify lenders with the titles book runner, lead arranger, lead bank, lead manager, agent, or arranger as the lead bank. This procedure results in the identification of 24 firms for which Lehman was serving as a lead lender at the time of its bankruptcy. In my empirical analyses, I use a dummy variable that equals one for these firms and zero otherwise.

I use SDC's New Issues database to identify borrowers that used Lehman to underwrite public equity and debt offerings. Specifically, I flag all firms in the sample that employed Lehman as a lead underwriter for a public common stock offering during the five years preceding Lehman's bankruptcy announcement (September 14, 2003 – September 14, 2008). I do the same for firms that employed Lehman as lead underwriter in a public debt offering over the same period. In my empirical analyses, I use dummy variables that correspond to these firms. Table XX reports that 30% (35 firms) of the sample used Lehman to underwrite equity offerings while 24% (28 firms) used Lehman to underwrite debt offerings in the five years prior to Lehman's failure.[59]

I use three variables to capture the extent of the firm's information asymmetry problems. These are firm size, firm age, and credit quality. Larger firms, older firms, or investment grade firms should be less opaque or should have more established reputations in capital markets than their smaller, younger, or non-

[59] In unreported analyses, I tried multiple cutoffs for the time period used to identify firms that employed Lehman as a securities underwriter, including the prior 3 years and the prior 10 years. The results using these alternative specifications are very similar to those reported and conclusions remain unchanged.

investment grade counterparts and should, therefore, have less severe information asymmetry problems. Firm size is measured as the natural logarithm of market capitalization of equity and is obtained from Compustat for the firm's most recent fiscal year. Age is computed with CRSP data and is measured as the natural logarithm of the number of years that the firm has had publicly traded equity. I measure credit quality by grouping firms into two categories: investment grade and non-investment grade. I base these groupings on S&P's long-term issuer credit ratings in August 2008, which are collected from Compustat.

To measure the extent of the firm's growth opportunities, I use the ratio of the market value of assets to the book value of assets. This variable is commonly interpreted in the literature as increasing in the firm's growth opportunities. As a measure of financial leverage, I use the book value of total debt scaled by the book value of assets. For firm profitability, I use return on assets (ROA), defined as earnings before interest, taxes, depreciation, and amortization (EBITDA) scaled by the book value of assets. I measure the firm's cash holdings as cash and equivalents scaled by the book value of assets.

I use Dealscan and sample firms' annual (10K) and quarterly (10Q) filings with the SEC to gather data on undrawn credit lines from Lehman at the time of the bankruptcy. The large majority of firms in the sample had credit facilities with features that enable the firm to draw down portions of the total loan amount over the loan's life rather than requiring the entire amount to be drawn upfront. These are mostly revolving credit lines and a few term loans with delayed draw provisions. I treat these types of loans as credit lines since they provide the borrower the option to draw down portions of the loan over time. For these types of loans, each lender in the syndicate commits to fund a portion of the total loan amount, with draw-downs funded on a pro-rata basis (e.g., a lender with a 10% committed share funds 10% of every draw-down). Where available, I collect information on Lehman's committed share of each borrower's loan(s) from Dealscan but, unfortunately, this information is missing for the majority of loans in Dealscan.[60] For 43 sample firms, Dealscan provides sufficient information to compute Lehman's share of the firm's loans. For these firms, I manually examine the most recent SEC filing (10K or 10Q) prior to Lehman's bankruptcy and collect information on total drawn and undrawn portions of their credit facilities. This information can be found in the "Liquidity and Capital Resources" section of quarterly and annual reports, in which firms are required by the SEC to explicitly discuss their liquidity, including access to bank lines of credit (Sufi, 2007) and any events that may have a "material" effect on the firm's liquidity. I use the reported undrawn amounts along with Lehman's committed share of the loan(s) as reported in Dealscan to compute the undrawn amount committed by Lehman for each firm. For example, if Lehman's share of the facility was 10%, and the firm reported that $100 million remained undrawn under the facility just prior to the bankruptcy, then the undrawn amount committed by Lehman is computed as $10 million (0.1x$100 million). This computation is consistent with the pro rata basis on which draw-downs are funded. Thus, I am able to compute the undrawn

[60] Missing data on lender shares in Dealscan is due to the fact that many firms do not explicitly make public the shares of each syndicate member in their loan facilities.

commitments from Lehman for 43 of the 115 firms in the sample with information that would have been publicly available at the time of the bankruptcy.

For the 72 remaining firms in the sample, I search SEC filings made after the bankruptcy announcement to ascertain whether any disclosed ex post Lehman's committed share of their undrawn credit facilities. 33 of these firms did, and thus I record the amounts. All of these firms also reported that Lehman had either failed to fund its portion of the firm's latest draw-down request or that the firm's management did not expect Lehman to honor its commitments in any future draw-down requests. Panel A of Table XX reports summary statistics on the amount of undrawn credit lines from Lehman scaled by total assets for the 76 firms with available data needed to construct this variable. On average, undrawn credit lines from Lehman equal 0.8% of the firm's total assets. With respect to market expectations during the collapse, this variable is measured with error because it is constructed with ex post information for many firms. To mitigate this problem, in addition to this specification I also separately use a dummy variable in my empirical analyses that equals one if undrawn credit lines from Lehman exceed 1% (roughly the 75th percentile) of the firm's total assets and zero otherwise.[61] Because these variables are defined only for the 76 firms with sufficient information to construct them, the analyses that include these variables are restricted to those firms.

[61] In unreported analyses, I also tried scaling the amount of undrawn credit lines from Lehman by the firm's (i) total drawn and undrawn credit lines from all banks and, alternatively, (ii) total undrawn credit lines committed by all banks. The rationale for these alternative specifications is that larger amounts of credit lines committed by other banks might partially offset any negative effects associated with a lost Lehman credit line. However, I find that neither of these alternative specifications has statistically significant explanatory power over sample firms' abnormal returns, and neither has greater explanatory power than the reported specification.

D. Estimating Abnormal Stock Returns

I estimate daily abnormal stock returns using the Fama-French-Carhart four-factor model that includes the three factors from Fama and French (1993) and the momentum factor from Carhart (1997):

$$R_{i,t} = \alpha_i + \beta_i R_{M,t} + s_i SMB_t + h_i HML_t + u_i UMD_t + \varepsilon_{i,t} \qquad (5)$$

where on Day *t*, $R_{i,t}$ is the return to firm *i*, $R_{M,t}$ is the return to the value-weighted CRSP market index, and SMB_t, HML_t, and UMD_t are the returns to the Small-Minus-Big, High-Minus-Low, and Up-Minus-Down portfolios meant to capture size, book-to-market, and return momentum effects, respectively.[62] For each firm in the sample, I estimate the parameters in the four-factor model over a 260-day pre-event period (Day -290 to Day -31). Lehman announced its intention to file for bankruptcy late in the evening on Sunday, September 14, 2008 and subsequently did so the following day. Thus, I identify Monday, September 15, 2008 as Day 0.

While most short-term event studies typically employ a simpler return generating model, such as the market model, I choose the four-factor model as the primary method due to the unusual nature of the event. The market portfolio lost nearly 5% on September 15, indicating that Lehman's collapse had a system-wide impact. Additionally, the SMB portfolio gained 1.4%, indicating that larger firms were more adversely affected than smaller firms, the HML portfolio lost over 2%, indicating that value stocks suffered greater losses than growth stocks, and the UMD portfolio gained nearly 3%, indicating that past losers were more adversely affected

[62] The daily factor returns for the SMB, HML, and UMD portfolios are generously provided on Ken French's website.

than past winners. I aim to isolate the effect of Lehman's collapse on its borrowers after filtering out systematic effects. Thus, I consider the four-factor model more robust than the market model because it attempts to control for systematic size, value, and momentum effects, which were significant during the event period. However, for robustness, in some of my analyses I also report abnormal returns estimated with the three-factor model of Fama and French (1993) and the market model.

Because all firms in the sample have the same event period in calendar time, abnormal returns are likely to be cross-sectionally, which would bias conventional test-statistics that rely on cross-sectional variance estimates. In addition, tests that rely on time-series variance estimates from the estimation period will be misspecified if variances increased during the event period. Hence, I test for statistical significance of abnormal returns using the t-statistic proposed by Kolari and Pynnönen (2010), which is a modified version of the widely used standardized cross-sectional test of Boehmer, Musumeci, and Poulsen (BMP) (1991). Kolari and Pynnönen modify the BMP t-statistic to account for contemporaneous correlation in abnormal returns across sample firms. The modification is a multiplier applied to the standard error that is increasing with the average correlation[63] of abnormal returns across stocks in the sample. If correlations are positive on average (as they are in my sample), the modification will result in a more conservative (closer to zero) test-statistic. Kolari and Pynnönen (2010) find that this statistic is well-specified when

[63] Correlations of abnormal returns across stocks are computed form the time-series of abnormal returns during the estimation period.

the variance of abnormal returns is higher during the event period than in the estimation period and when abnormal returns are cross-sectionally correlated. Since it tests whether the mean standardized cumulative abnormal return (CAR) differs from zero, it can differ in sign from the mean CAR. For completeness, I also report a z-statistic from a Wilcoxon signed rank test of whether the median CAR differs from zero.

V. Results

A. Borrower Abnormal Returns around Lehman's Bankruptcy

In Table XXI, I report abnormal returns earned by sample firms and control firms. I examine CARs over various windows, including three that include the bankruptcy announcement, (-5,+1), (0,0), and (0,+1), where Day 0 is September 15. The (-5,+1) window has the advantage that it includes the week prior to the bankruptcy announcement (Day -5 to -1), in which many of Lehman's troubles became public and Lehman began aggressively shopping itself to potential bidders. Although the large market movements on September 15 indicate that the bankruptcy announcement was not completely anticipated, Lehman's publicized troubles, coupled with the fact that its stock price declined from $16.20 to $3.65 indicates that including the prior week may be important in estimating the value lost as a result of Lehman's collapse. In addition, Day +1 is also considered in some of the event windows to account for the possibility that the market did not fully capitalize the information conveyed in Lehman's collapse by the close of Day 0, since history provides few comparable failures of very large, complex financial institution from which market participants could learn. In addition to CARs in the days surrounding the bankruptcy, Table XXI also reports CARs over a pre-event window, (-30,-6), and a post-event window (+2,+30). The pre-event window is used to assess whether there was any additional anticipation not captured by the primary event windows. Returns over the post-event window are examined to account for the possibility of temporary overreaction to Lehman's collapse.

**** Insert Table XXI here ****

Table XXI separately reports CARs estimated with the Fama-French-Carhart four-factor model, the Fama-French three-factor model, and the market model. The abnormal returns from all three models provide some evidence of a negative mean reaction among Lehman borrowers. In Panel A, although the Day 0 abnormal return of -1.11% from the four-factor model is insignificant, the (-5,+1) and (0,+1) mean CARs of -3.37% and -2.6%, respectively, are statistically significant at the 10% level or better. The signed-rank statistics for these two windows indicate that the median four-factor model CARs are significant at the 5% level. In contrast, (-5,+1), (0,0) and (0,+1) mean four-factor CARs of control firms are small in magnitude and statistically insignificant. In addition, the mean differences in (-5,+1) and (0,+1) CARs across sample and control firms of -3.15% and -2.5%, respectively, are significant at the 5% level. The two-sample signed rank tests indicate that the median differences over the same two windows are significant at the 10% level or better.

Panels B and C of Table XXI report mean CARs estimated with the Fama and French (1993) three-factor model and the market model, respectively. The results based on the Fama-French three-factor model (Panel B) are consistent with those from the Fama-French-Carhart four-factor model. In Panel C, the market model abnormal returns over the (0,0), (0,+1), and (-5,+1) windows for both Lehman borrowers and control firms are less negative than those for the four-factor and three-factor models. On Day 0, the mean market model abnormal return earned by Lehman borrowers is -0.62%, which is statistically insignificant. However, the (0,+1) mean market model CAR for Lehman borrowers of -1.95% is statistically significant at the 10% level. Comparatively, the mean market model CARs earned by control firms over the (0,0), (0,+1), and (-5,+1) periods are all positive but insignificant. Furthermore, the differences in mean market model CARs between Lehman borrowers and control firms over the same three windows are statistically significant at the 10% level or better. Median differences over the latter two windows are statistically significant at the 5% level. Overall, these event study results provide evidence that Lehman's failure harmed its borrowers and that their losses were significantly greater than those of similar firms with syndicated loans from other banks. Depending on the return model, the results indicate that Lehman's borrowers lost between -3.01% and -3.54%, on average, during a period that spans the week prior to the bankruptcy announcement to the day after the bankruptcy announcement and that these losses were significantly more negative than those of control firms that had syndicated loans from other banks. In addition, there is no evidence of a temporary overreaction, as none of the mean CARs over the (+2,+30) window are positive and significant.[64] Furthermore, the mean (-30,-6) CARs are insignificant according to all return models, indicating that Lehman borrowers did not experience significant losses, on average, during the five weeks prior to September 8.

B. Cross-Sectional Analyses of Borrower Abnormal Returns

B.1. Univariate Tests

Table XXII reports a matrix of simple correlation coefficients, including correlations between (-5,+1) four-factor CARs and predicted determinants of borrower abnormal returns. The correlations indicate that firms that used Lehman as a lead lender and firms that used Lehman as their equity underwriter were harmed more by Lehman's collapse, as both are negative and significant at the 1% level. Additionally, Table XXII shows that the investment grade dummy, firm size (Ln(market cap)), and firms age (Ln(age)) are significantly and positively correlated with borrower abnormal returns at the 5%, 5%, and 10% levels, respectively. This is consistent with greater losses among firms with more severe information asymmetry problems. ROA is positively and significantly correlated with borrower abnormal returns at the 10% level, consistent with less profitable firms experiencing greater losses. Simple correlations between (-5,+1) CARs and all the remaining proposed determinants are not statistically significant at the 10% level or better.

**** Insert Table XXII here ****

[64] I also examined abnormal returns for the (+2,+10) and (+2,+20) windows (unreported for brevity) but did not find any evidence of positive abnormal returns during these periods.

While useful, these univariate tests may be misleading due to correlations between several potentially important determinants. For example, borrowers that used Lehman to underwrite debt offerings tend to be larger, older, investment grade firms as indicated by the correlations in Table XXII, which may help explain why their abnormal return tend to be less negative. On the other hand, borrowers that employed Lehman as their equity underwriter tend to be smaller, younger, non-investment grade firms. Thus, in the next subsection, I turn to a multivariate analysis of borrower abnormal returns.

B.2. Multivariate Analysis of Borrower Abnormal Returns

In Table XXIII, I report results of multivariate regressions with borrower abnormal returns as the dependent variable. Since all the firms in the sample have the same period in calendar time, I use the portfolio weighted least squares (PWLS) approach of Chandra and Balachandran (1992), which produces unbiased standard errors when abnormal returns over the event window are heteroskedastic and correlated across firms.[65] I estimate the PWLS regressions over the period Day -290 to Day +10 using the Fama-French-Carhart four-factor model and a seven-day (-

[65] PWLS is the weighted version of the portfolio time-series ordinary least squares (POLS) approach of Sefcik and Thompson (1986). As with weighted least squares (WLS), each observation receives a weight that is inversely proportional to its variance in PWLS, where the variance is estimated using a time-series of residuals from the chosen asset return generating model. I use the time-series of residuals from the four-factor model estimated over the pre-event estimation period (Day -290 to -31) to estimate the variance of each observation.

5,+1) event window.[66] All regressions include industry fixed effects (coefficients unreported) that correspond to the 12 Fama-French industry classifications.[67]

**** Insert Table XXIII here ****

The regression results in Table XXIII provide consistent evidence that borrower abnormal returns were more negative if Lehman was the firm's lead lender (as opposed to a mere participant) at the time of the bankruptcy. The coefficient estimates for this dummy variable are significant at the 10% level or better in all specifications and indicate that the (-5,+1) CARs was between 2.8 and 3.5 percentage points more negative if Lehman was the firm's lead lender. This result is consistent with borrowers developing closer and more valuable relationships with lead banks than with participants. Additionally, the dummy variable that corresponds to Lehman acting as the firm's equity underwriter is negative and significant at the 5% level or better in all specifications, with the most conservative estimate indicating a reduction in the (-5,+1) CAR of 2.7 percentage points for such firms. Thus, expanding the scope of the relationship through the procurement of equity underwriting services enhances the value of the relationship to the borrower, consistent with equity underwriting entailing significant information production. In contrast, there is no evidence that borrowers that used Lehman as a debt underwriter reacted more negatively, as the coefficient estimates for this dummy variable are statistically insignificant.

[66] I also estimated these regressions using the Fama-French three-factor model and the market model. My conclusions based on those results (unreported for brevity) remain unchanged.

[67] I use the Fama-French classification scheme that maps SIC codes in to 12 groupings here because the 17 Fama-French classification scheme is to narrow to use for fixed effects (i.e., some of the 17 industry groupings contain only one sample firm).

Results in Table XXIII also indicate that less transparent borrowers with more severe information asymmetry problems suffered greater losses. In specifications (1), (2), and (3), the investment grade dummy, firm size, and firm age, respectively, are positive and significant at the 10% level or better when each is included without the other two. In specifications (4) through (7), in which all three variables are included, firm age remains positive and significant at the 10% level and subsumes firm size and the investment grade dummy.

The market-to-book assets ratio is negative and significant at the 10% level or better in 5 of the 8 specifications in Table XXIII. The most conservative coefficient estimate of -2.2 implies that a one standard deviation increase in the market-to-book assets ratio decreases the firm's abnormal return by 1.36 points, consistent with firms with more growth opportunities losing more in response to Lehman's failure. Consistent with greater losses among less profitable firms, ROA is positive and significant at the 5% level in all specifications. The most conservative coefficient estimate of 28 implies that a one standard deviation decrease in ROA is associated with a 1.88 percentage point reduction in the firm's abnormal return. In contrast, leverage is not statistically significant at the 10% level or better in any specification.

In specification (6), the amount of undrawn credit lines from Lehman scaled by assets is negative and significant at the 10% level, while its interaction with the cash/assets ratio is positive and significant. The interpretation is that, at low levels of cash/assets, abnormal returns become more negative as the amount of undrawn credit lines from Lehman scaled by assets increase. As the cash/assets ratio increases, this effect grows weaker (less negative). Economically, the coefficients indicate that a one standard deviation increase in undrawn Lehman credit lines scaled by assets (an increase of about 0.01) decreases the (-5,+1) CAR by about 1.2 percentage points when the cash/assets ratio is at its minimum of zero. This negative effect becomes -0.70 percentage points when the cash/assets ratio increases to its 25th percentile[68] value of 0.01 and is virtually eliminated (very close to zero) when the cash/assets ratio is at its median value of 0.04. Similar conclusions can be drawn from specification (8), which replaces the undrawn Lehman credit line variable with its dummy counterpart. The coefficient estimates indicate that the loss of a relatively large undrawn Lehman credit line (in excess of 1% of total assets) decreases the firm's CAR by 3.31 percentage points when the cash/assets ratio is zero. This negative effect is completely eliminated when the cash/assets ratio increases to its 70th percentile value of 0.077. These results are consistent with greater losses among firms with less cash and larger undrawn credit lines from Lehman.[69]

C. Abnormal Profitability and Investment

I focus on stock returns in the days surrounding Lehman's collapse as the primary outcome variable since it allows me to detect the unanticipated effect of Lehman's collapse on firm value with precision. Short-run stock returns are also

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[68] The percentile figures cited here are for the 76 firms included in specification (5) through (8) in Table IV (those with non-missing data on undrawn Lehman credit lines), so they may differ slightly from those for the full sample reported in Table I.

[69] In unreported tests, I also tried interacting the undrawn Lehman credit line variables with leverage. These test are motivated by the conjecture that very high financial leverage might be associated with a high probability of distress in the near future, and the lost option to draw on a credit line may be particularly damaging for such firms. However, neither leverage or its interactions with the variables that measure undrawn Lehman credit lines are statistically significant in these tests.

immune to the effect of subsequent unexpected firm-specific or market-wide events during the financial crisis unrelated to sample firms' relationships with Lehman. Nonetheless, as a complement to the return-based analysis, in this section I study long-term abnormal operating performance around Lehman's bankruptcy. I conduct event studies on annual measures of profitability and investment, as theory suggests that both might be affected by the involuntary rupture of a banking relationship.[70] For profitability, I use ROA, defined as EBITDA scaled by total assets and, alternatively, cash-flow-ROA, defined as operating cash flow scaled by total assets. Use of the latter measure is motivated by the fact that the former is an accrual-based measure and can be manipulated by managers, as pointed out by Barber and Lyon (1996). Let a firm's fiscal Year 0 be the fiscal year in which Lehman failed and let $P_{i,t}$ equal the chosen profitability measure for sample firm *i* in fiscal Year *t*. I define abnormal profitability for firm *i* in fiscal Year *t* as:

$$AP_{i,t} = P_{i,t} - P_{i,-1} - (PI_{i,t} - PI_{i,-1}) \qquad (6)$$

where $PI_{i,t}$ is the profitability in fiscal Year *t* of a non-sample firm matched to sample firm *i* on the basis of industry and profitability in fiscal Year -1. In this specification, expected profitability is encompassed in the last three terms on the right-hand side and is equated to the sample firm's profitability in fiscal Year -1 (the last completed fiscal year prior to Lehman's bankruptcy) plus the change in profitability from Year -1 to Year *t* of a matched firm. Matching firms are selected such that the absolute value of the difference in profitability measures between the matching firm and

[70] Myers (1977) and Petersen and Rajan (1994) suggest that bank debt can overcome the underinvestment problem. In the context of Myers and Majluf (1984), bank debt (as inside debt) is less subject to information asymmetry than outside funds and, thus, may mitigate underinvestment.

sample firm in Year -1 is minimized, subject to the constraint that the matching firm has the same two-digit SIC code as the sample firm.[71] In addition, I also limit the set of matching firms to those in Dealscan that issued at least one bank loan during the three years prior to Lehman's bankruptcy because Billett et al. (2006) find negative abnormal stock returns and negative abnormal profitability in the years following the issuance of a bank loan.

In addition to profitability, I also examine abnormal investment in the year of and a year following Lehman's bankruptcy. Let a firm's fiscal Year 0 be the fiscal year in which Lehman failed and let $I_{i,t}$ equal sample firm *i*'s investment in fiscal Year *t*, defined as the sum of capital expenditures, increase in investments, and acquisition expenses from Compustat.[72] I define abnormal investment for firm *i* in fiscal Year *t* as:

$$Abnormal\ Investment = \frac{I_{i,t} - I_{i,-1}}{A_{i,-1}} - \frac{II_{i,t} - II_{i,-1}}{AI_{i,-1}} \qquad (7)$$

where $II_{i,t}$ is investment in fiscal Year *t* of a non-sample firm matched to sample firm *i* on the basis of industry and market-to-book ratio of assets in fiscal Year -1. $A_{i,-1}$ is sample firm *i*'s total assets (book value) in Year -1, and $AI_{i,-1}$ is the matching firm's total assets in Year -1. Matching firms are selected such that the absolute value of the percentage difference in market-to-book asset ratios between the sample firm and matching firm is minimized, subject to the constraint that the matching firm has the

[71] Barber and Lyon (1996) advocate matching based on industry and prior profitability because profitability is mean-reverting. They find that statistical tests on abnormal profitability measures that do not incorporate pre-event performance are misspecified.
[72] Capital expenditures, increase in investments, and acquisition expense are obtained from Compustat.

same two-digit SIC code as the sample firm. I use the ratio of market value of assets to book value of assets as a matching criteria because it is commonly used in the literature as a measure of the investment opportunity set.[73]

Table XIV reports abnormal profitability and investment in the year of (Year 0) and year following (Year 1) Lehman's bankruptcy. The smaller number of observations reflects that fact that four firms in the sample delisted prior to the end of their fiscal Year 0 and 12 firms delisted prior to the end of their fiscal Year 1. My primary focus is Year 1, since a substantial portion of fiscal Year 0 occurred prior to Lehman's bankruptcy for many firms in the sample. Panel A reports mean and median profitability, where profitability is measured as ROA (EBITDA scaled by total assets). Panel A provides no evidence of abnormal profitability among Lehman borrowers, as the mean and median abnormal profitability in Years 0 and 1 are statistically insignificant. Panel B reports mean and median abnormal profitability with profitability defined as Cash-flow-ROA (operating cash flow scaled by total assets). Based on this measure, there is some evidence that Lehman borrowers experience significantly negative abnormal profitability in Year 1, as the mean (median) of -1.24% (-1.19%) is statistically significant at the 10% (5%) level. Mean and median abnormal profitability in Year 0 is negative but statistically insignificant. Panel C shows that Lehman borrowers exhibit significantly negative mean and median abnormal investment in Year 1 of -6.09% and -1.41%, respectively. Both estimates are significant at the 5% level. Both the mean mean and median abnormal investment in Year 0 are negative but statistically insignificant. In summary, the

[73] See, for example, Polk and Sapienza (2009) and Barclay, Fu, and Smith (2010).

results in Table XIV indicate that Lehman's borrowers experience significant reductions in profitability, as measured by operating cash flow scaled by assets, and investment relative to their industry peers in the year following Lehman's bankruptcy.

**** Insert Table XIV here ****

VI. Conclusions

I use the bankruptcy of Lehman Brothers in September 2008 as a natural experiment to test whether lending relationships developed through syndicated loans have value for corporate borrowers. Firms with active syndicated credit facilities with Lehman as a lender at the time of Lehman's failure experienced abnormal stock returns of -3%, on average, during a seven day period that includes the bankruptcy announcement. These losses were significantly larger than those earned by a group of control firms of similar credit quality, size, and industry that had syndicated loans from other banks. In addition, Lehman's borrowers also experienced significant reductions in profitability and investment relative to their industry peers in the year following Lehman' failure. I conclude that Lehman's borrowers incurred significant costs as a result of Lehman's failure, above and beyond those experienced by the stock market in general and by similar firms. In the cross-section, I find that borrower abnormal stock returns vary with both the strength and scope of the borrower's relationship with Lehman. Losses were larger if Lehman was the lead lender for one or more of the firm's credit facilities or if the firm recently employed

Lehman as a lead underwriter in a public equity offering. More opaque firms with fewer sources of external capital, as measured by firm size, age, or credit quality, also suffered greater losses, consistent with bank lending relationships having greater value for less transparent borrowers that suffer from more severe information problems. Firms with more growth opportunities suffered greater losses, which is consistent with bank lending relationships having greater value for firms with more severe moral hazard problems that stem from potential conflicts between shareholders and debtholders. Firms with larger, undrawn credit lines from Lehman also suffered greater losses, but this effect was attenuated if the firm also held larger amounts of cash.

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APPENDIX A

Chapter II Variable Definitions

This table provides definitions of all variables in Chapter II and Tables IX through XIX. Numbers in parentheses refer to the annual Compustat item for the firm's most recent fiscal year.

Variable	Definition
# of non-Lehman analysts	# of equity analysts in I/B/E/S not employed by Lehman during the firm's current fiscal quarter or last fiscal quarter (as of September 14, 2008) that made at least one earnings forecast during the same period,
# of common stock offerings with Lehman	# of public common stock offerings by the client lead underwritten by Lehman during September 14, 1998 to September 14, 2008.
# of debt offerings with Lehman	# of public debt (straight and convertible) offerings by the client lead underwritten by Lehman during September 14, 1998 to September 14, 2008.
# of M&A deals with Lehman	# of acquisitions by the firm of U.S. targets announced during September 14, 1998 to September 14, 2008 for which the firm employed Lehman as a financial advisor.
Age	# of years elapsed between when the firm first appears in CRSP and September 14, 2008.
Book-to-market	Book value of common equity (#60) divided by market value of common equity (#25*#199).
Cash / assets	Cash and short-term investments (#1) scaled by the total assets (#6).
Common stock proceeds raised with Lehman	Client's public common stock proceeds (in December 2007 $ millions) underwritten by Lehman during the period Sep 14, 1998 to Sep. 14, 2008. For offerings in which Lehman was one of n lead underwriters, Lehman is credited with 1/n of the proceeds. Proceeds are converted to Dec. 2007 $ using the Producer Price Index.
Debt shelf registration dummy	Dummy variable: = 1 if the firm shelf registered (SEC Rule 415) a public debt (straight or convertible) offering during Sep. 14, 2006 to Sep. 14, 2008 without taking any of the registered debt off the shelf before Sep. 14, 2008 and zero otherwise.
Equity shelf registration dummy	Dummy variable: = 1 if the firm shelf registered (SEC Rule 415) a common stock offering during Sep. 14, 2006 to Sep. 14, 2008 without taking any of the registered equity off the shelf before Sep. 14, 2008 and zero otherwise.
Lehman convertible debt underwriting client	Dummy variable: = 1 if the firm employed Lehman as a lead underwriter in a public convertible debt offering during Sep. 14 1998 to Sep. 2008 and zero otherwise.
Lehman debt underwriting client	Dummy variable: = 1 if the firm employed Lehman as a lead underwriter in a public straight or convertible debt offering during Sep. 14 1998 to Sep. 2008 and zero otherwise.
Lehman is lead lender	Dummy variable: = 1 if Lehman was acting as the lead lender in at least one of the firm's syndicated credit facilities as of Sep. 14, 2008.
Lehman is participant lender	Dummy variable: = 1 if Lehman was a lender in at least one of the firm's active credit facilities but not a lead lender as of Sep. 2008.

APPENDIX A-*Continued*

Variable	Definition
Lehman equity underwriting client	Dummy variable: = 1 if the firm employed Lehman as a lead underwriter in at least one public common stock offering during Sep. 14, 1998 to Sep. 14, 2008.
Lehman M&A client	Dummy variable: = 1 if the firm was an acquirer in a completed acquisition of a U.S. target for which Lehman served as an advisor during Sep. 14, 1998 to Sep. 14, 2008 and zero otherwise.
Lehman's market share as a Nasdaq market maker	For Nasdaq firms only (CRSP exchange code of 3): Equals the total number of shares traded by Lehman as a Nasdaq market maker during the previous three calendar months (Jun., Jul., and Aug. 2008) divided by the total number of shares traded over the same time period.
Lehman NYSE specialist	Dummy: = 1 if Lehman was the NYSE specialist for the firm's stock as of September 14, 2008 and zero otherwise.
Lehman's share of client's common stock offerings	# of client's public common stock offerings credited to Lehman divided by the total # of public common stock offerings by the client during September 14, 1998 to September 14, 2008. For offerings in which Lehman was one of *n* lead underwriters, Lehman is credited with a 1/*n* share of the offering.
Lehman's share of client's common stock proceeds	Client's public common stock proceeds (in December 2007 $ million) underwritten by Lehman during the period Sep 14, 1998 to Sep. 14, 2008 divided by the total amount of public commons stock proceeds raised by the client during the same period (in December 2007 $ millions). For offerings in which Lehman was one of n lead underwriters, Lehman is credited with 1/n share of the proceeds. Proceeds are converted to Dec. 2007 $ using the Producer Price Index.
Lehman's share of client's debt offerings	# of client's public debt (straight and convertible) offerings credited to Lehman divided by the total # of public debt offerings by the client during September 14, 1998 to September 14, 2008. For offerings in which Lehman was one of *n* lead underwriters, Lehman is credited with a 1/*n* share of the offering.
Lehman's share of client's M&A deals	# of client's completed acquisitions of U.S. targets credited to Lehman divided by the total # of completed acquisitions of U.S. targets by the firm during September 14, 1998 to September 14, 2008. For deals in which Lehman was one of *n* financial advisors to the firm, Lehman is credited with a 1/*n* share of the deal.
Lehman straight debt underwriting client	Dummy variable: = 1 if the firm employed Lehman as a lead underwriter in a public straight debt offering during Sep. 14 1998 to Sep. 2008 and zero otherwise.
Leverage	Long term debt (#9) plus short term debt (#34) divided by the market value of assets, where the market value of assets equals total assets (#6) minus the book value of common equity (#60) plus the market value of common equity (#25*#199).
Ln(# of non-Lehman analysts)	Natural logarithm of the number of equity analysts in I/B/E/S that were not employed by Lehman during the firm's current fiscal quarter or last fiscal quarter that made at least one earnings forecast during the same period, where the current fiscal quarter contains Sep. 14, 2008.

APPENDIX A-*Continued*

Variable	Definition
Market cap	Market value of common equity (#25*#199) in $ millions.
Net market leverage	Long term debt (#9) plus short term debt (#34) minus cash and short-term investments (#1) divided by the market value of assets for the latest fiscal year, where the market value of assets equals the book value of assets (#6) minus the book value of common equity (#60) plus the market value of common equity (#25*#199).
Pending M&A deal with Lehman	Dummy variable: = 1 if Lehman advised the firm in an acquisition of a U.S. target that was announced prior to Sep. 14, 2008 and completed after Sep. 14, 2008 and zero otherwise.
Proportion of outstanding shares owned by Lehman Brothers Holdings Inc.	Number of the firm's common shares owned by Lehman Brothers Holdings Inc. (LBHI) divided by the client's total number outstanding shares as of June 30, 2008. From Thomson CDS/Spectrum database on 13f Holdings (available through WRDS).
Proportion of outstanding shares owned by Neuberger Berman LLC.	Number of the firm's common shares owned by Neuberger Berman LLC divided by the client's total number outstanding shares as of June 30, 2008. From Thomson CDS/Spectrum database on 13f Holdings
Proportion of outstanding shares owned by non-Lehman institutions	Number of the firm's common shares owned by institutions required to report holdings under SEC Rule 13f other than Lehman Brothers Holdings Inc. and Neuberger Berman LLC as of June 30, 2008, divided by the client's total outstanding shares. From Thomson CDS/Spectrum database on 13f Holdings.
Recent IPO underwritten by Lehman	Dummy variable: = 1 if the Lehman served as a lead underwriter for the client's IPO and the IPO took place during Sep. 14, 1998 to Sep. 14, 2008
Share turnover	Total number of shares traded during Aug. 2008 divided by the total number of shares outstanding.
Total common stock offerings	Total number of public common stock offerings conducted by the firm during Sep. 14, 1998 to Sep. 14, 2008.
Total common stock proceeds	Total public common stock proceeds (in December 2007 $ millions) raised by the firm during Sep 14, 1998 to Sep. 14, 2008.Proceeds are converted to Dec. 2007 $ using the Producer Price Index.
Underwriting relationship scope index	=0 if the firm did not receive lead underwriting services from Lehman for public common stock, straight debt, or convertible debt during Sep. 14, 1998 to Sep. 14, 2008; =1 if the firm received one of the three aforementioned services from Lehman; =2 if the firm received two of the three aforementioned underwriting services from Lehman; =3 if the firm received all three of the aforementioned services from Lehman.
Z-score	From Altman (1968): = [3.3*EBIT(#178) + 1.0*sales(#12) + 1.4*retained earnings(#36) + 1.2*working capital(#179)]/total assets(#6) + 0.6*market cap(#25*#199)/total liabilities(#181).

APPENDIX B

Chapter III Variable Definitions

This table provides definitions of all variables in Chapter III and Tables XX through XXIV. All Compustat items are for the firm's most recent fiscal year.

Variable	Definition
# of syndicate lenders	The number of lenders in the credit facility.
Age	The number of years elapsed between the time that the firm first appears in CRSP and Sep. 14, 2008.
Assets	The book value of assets for the latest fiscal year.
Cash / assets	Cash and short-term investments scaled by the book value of assets for the latest fiscal year.
Debt underwriter dummy	Dummy variable: = 1 if the firm employed Lehman as a lead underwriter in a public debt offering during Sep. 14, 2003 to Sep. 14, 2008 and zero otherwise.
Equity underwriter dummy	Dummy variable: = 1 if the firm employed Lehman as a lead underwriter in at least one public common stock offering during Sep. 14, 2003 to Sep. 14, 2008.
Investment grade dummy	Dummy variable: = 1 if the firm's long-term issuer credit rating assigned by S&P was investment grade in August 2008.
Large undrawn Lehman credit line dummy	Dummy variable: = 1 if the amount committed by Lehman under the firm's active credit facilities that remained undrawn at the time of Lehman's bankruptcy exceeded 1% of the firm's book value of assets and zero otherwise.
Lead lender dummy	Dummy variable: = 1 if the Lehman was acting as the lead lender in at least one of the firm's syndicated credit facilities as of Sep. 14, 2008.
Leverage	Long term debt plus short term debt, all divided by the book value of assets for the latest fiscal year
Loan amount	Total amount of the credit facility ($ millions).
Loan amount	Total amount of the credit facility scaled by the borrower's book value of assets.
Market cap	Market value of common equity (price per share multiplied by shares outstanding) for the latest fiscal year ($ millions).
Market –to-book assets	The ratio of market value of assets to book value of assets, where the market value of assets is defined as the book value of assets minus the book value of common equity plus the market value of common equity.
Original maturity	The maturity (years) of the credit facility as of the activation date.
ROA	Earnings before interest, taxes, depreciation, and amortization (EBITDA) scaled by the book value of assets.
Speculative grade	Dummy variable: = 1 if the firm's long-term issuer credit rating assigned by S&P was speculative grade in August 2008.
Undrawn Lehman credit line / assets	Defined only for firms with sufficient information in Dealscan and the firm's SEC filings. Equals the amount committed by Lehman under the firm's active credit facilities that remained undrawn at the time of Lehman's bankruptcy scaled by the book value of assets.

Table I. Summary Statistics on Trading Activity

The unit of observation is a rating change at the issue level. The "full" sample consists of 6,920 bond rating downgrades and 1,906 rating upgrades by Moody's, S&P, and Fitch during September 2002 to March 2009 that affected firms with corporate bond data in TRACE. The sample is restricted to bonds that traded on Days -1 and +1 and on at least ten days during Day +31 to +50, where Day 0 is the day of the rating change. The "uncontaminated" sample consists of rating changes not accompanied by contaminating news during Day -1 to +1. "Avg. Par Vol." is the total trading volume in $1,000 averaged across all bonds in the sample for the given event day. "Avg. # of Trades" is the total number of trades averaged across all bonds in the sample for the given event day. "% of Bonds Traded" refers to the % of bonds in the sample that were traded on the given event day.

	Downgraded Bonds						Upgraded Bonds					
	Full Sample (N=6920)			Uncontaminated (N=2210)			Full Sample (N=1906)			Uncontaminated (N=1230)		
Day	Avg. Par Vol.	Avg. # of Trades	% of Bonds Traded	Avg. Par Vol.	Avg. # of Trades	% of Bonds Traded	Avg. Par Vol.	Avg. # of Trades	% of Bonds Traded	Avg. Par Vol.	Avg. # of Trades	% of Bonds Traded
-20	3,979	15	80	4,594	13	77	2,857	7	80	2,736	6	79
-19	4,001	15	79	3,951	13	76	2,476	7	81	2,392	6	81
-18	4,170	15	80	4,106	12	75	2,631	7	78	2,517	6	77
-17	4,038	16	81	3,812	13	77	2,636	7	81	2,732	7	81
-16	4,300	15	81	4,216	12	76	2,959	7	79	2,755	7	79
-15	4,635	15	81	5,000	12	77	2,890	7	81	3,003	6	80
-14	4,365	15	81	5,022	13	79	2,999	7	78	2,837	6	76
-13	4,627	16	80	4,333	13	76	2,918	7	80	2,763	7	79
-12	4,816	17	82	4,547	13	79	2,966	7	80	2,749	6	79
-11	4,446	16	82	4,213	12	78	2,672	7	80	2,567	6	79
-10	4,296	16	82	4,314	12	79	2,525	7	81	2,427	6	80
-9	4,266	16	82	4,183	12	78	3,195	7	81	2,983	6	81
-8	4,133	16	83	4,187	12	82	2,961	7	81	2,788	6	80
-7	3,999	16	84	3,760	12	83	2,851	7	80	2,878	7	80
-6	3,930	16	84	3,810	12	83	2,999	7	81	3,202	7	80
-5	4,099	16	84	3,958	12	83	3,136	7	84	3,279	7	83
-4	4,299	16	83	4,350	14	83	2,936	7	82	2,917	6	81
-3	4,236	16	84	4,464	13	83	2,874	7	81	2,782	7	81
-2	4,161	16	85	3,912	12	83	3,105	7	82	2,771	6	81
-1	4,444	15	100	4,232	12	100	2,792	6	100	2,644	6	100
0	7,495	18	88	6,628	14	86	3,972	8	87	3,771	7	86
+1	5,654	17	100	4,725	11	100	3,530	7	100	3,431	6	100
+2	4,808	17	86	4,371	13	84	3,506	7	84	3,481	7	83
+3	4,534	17	86	4,009	11	85	3,177	7	84	3,272	7	83
+4	4,501	16	84	4,229	13	83	3,038	7	82	3,199	7	80
+5	4,382	16	85	4,810	12	82	3,028	7	83	3,076	7	82
+6	3,998	16	84	3,928	12	83	3,123	7	82	3,061	7	81
+7	4,032	16	84	3,907	12	83	2,872	7	81	2,678	7	80
+8	3,932	16	85	4,037	12	83	3,037	7	80	3,049	7	79
+9	4,049	16	84	4,195	13	82	3,342	7	81	3,259	7	80
+10	4,195	16	83	4,604	13	83	3,140	7	80	2,907	7	81

Table II. Sample Distribution by Rating Agency and Rating Change Characteristics

The unit of observation is a rating change at the firm level. The "full" sample consists of 1,159 bond rating downgrades and 610 rating upgrades by Moody's, S&P, and Fitch during September 2002 to March 2009 that affected firms with corporate bond data in TRACE. The sample is restricted to bonds that traded on Days -1 and +1 and on at least ten days during Day +31 to +50, where Day 0 is the day of the rating change. The "uncontaminated" sample consists of rating changes not accompanied by contaminating news during Day -1 to +1. Panel A reports the sample distribution by calendar year. Panel B reports the sample distribution by size of the rating change (# of fine or modified grades that the rating is changed). Panel C reports the sample distribution by pre-downgrade or pre-upgrade letter rating class. Panel D reports the number of downgrades (upgrades) that moved the firm out of (into) the investment grade category, where investment grade refers to BBB- or Baa3 and above. Panel E reports the number of rating changes that were preceded by a credit watch listing with an indicated direction.

	Downgrades								Upgrades							
	Full Sample				Uncontaminated				Full Sample				Uncontaminated			
	All	Moody's	S&P	Fitch	All	Moody's	S&P	Fitch	All	Moody's	S&P	Fitch	All	Moody's	S&P	Fitch
Panel A: Sample distribution by calendar year																
2002	21	8	10	3	10	7	2	1	2	2	0	0	1	1	0	0
2003	71	25	29	17	43	16	16	11	19	9	7	3	13	5	7	1
2004	45	17	16	12	21	6	9	6	17	6	8	3	11	2	6	3
2005	195	72	103	20	109	48	54	7	110	49	44	17	79	39	30	10
2006	201	96	78	27	126	66	48	12	183	95	62	26	138	77	44	17
2007	186	84	70	32	109	53	36	20	153	58	61	34	109	41	45	23
2008	303	128	118	57	164	76	61	27	113	19	68	26	83	10	53	20
2009	137	74	36	27	70	38	16	16	13	6	3	4	7	2	2	3
Total	1159	504	460	195	652	310	242	100	610	244	253	113	441	177	187	77
Panel B: Sample distribution by size of the rating change																
1 grade	814	348	337	129	461	220	172	69	495	203	205	87	363	151	153	59
2 grades	214	103	77	34	121	60	46	15	86	28	41	17	62	18	31	13
3 grades	75	31	27	17	41	19	14	8	13	6	3	4	8	5	1	2
4 grades	22	7	8	7	14	4	5	5	5	4	0	1	3	2	0	1
5 grades	15	8	5	2	8	5	2	1	5	2	2	1	1	0	0	1
≥6 grades	19	7	6	6	7	2	3	2	6	1	2	3	4	1	2	1
Panel C: Sample distribution by pre-downgrade or pre-upgrade letter rating class																
Aaa, AAA	25	10	9	6	13	7	3	3	0	0	0	0	0	0	0	0
Aa, AA	126	59	50	17	51	29	18	4	24	13	10	1	16	9	7	0
A	230	80	99	51	116	39	53	24	98	35	43	20	67	26	28	13
Baa, BBB	253	93	98	62	142	56	50	36	129	43	43	43	83	25	32	26
Ba, BB	184	84	67	33	112	53	38	21	123	49	50	24	94	36	38	20
B	247	129	97	21	161	95	55	11	161	68	74	19	124	55	56	13
Caa, CCC	94	49	40	5	57	31	25	1	75	36	33	6	57	26	26	5

Table II-*Continued*

Panel D: Number of rating changes that cross the investment grade boundary																
Across inv. grade	105	44	37	24	50	22	16	12	53	19	22	12	39	13	16	10
Panel E: Number of rating changes where the firm was placed on credit watch prior to the rating change																
Placed on credit watch	518	265	200	53	289	153	110	26	178	95	62	21	122	66	43	13

Table III. The Corporate Bond Market Response to Bond Rating Changes

The unit of observation is a rating change at the firm level. The "full" sample consists of 1,159 bond rating downgrades and 610 rating upgrades by Moody's, S&P, and Fitch during September 2002 to March 2009 that affected firms with corporate bond data in TRACE. The sample is restricted to bonds that traded on Days -1 and +1 and on at least ten days during Day +31 to +50, where Day 0 is the day of the rating change. The "uncontaminated" sample consists of rating changes not accompanied by contaminating news during Day -1 to +1. "CAR" is the sum of the firm's daily abnormal bond returns over the event window. Daily abnormal bond returns are computed as the bond's raw return minus the contemporaneous return on an index of corporate bonds matched on rating and maturity. Daily bond prices are computed with the "trade-weighted price, all trades" method of Bessembinder et al. (2009). If a sample bond is not traded on a given day, the bond's daily price for that day is set equal to the most recent observed daily price. If a firm has multiple bonds affected by the same rating announcement, the firm's daily abnormal bond return is the market value-weighted average of abnormal returns on its individual bond issues. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

Event Window (days)	Mean CAR	t-stat	signed-rank	Mean CAR	t-stat	signed-rank	Mean CAR	t-stat	signed-rank
Panel A: Full sample of downgrades									
	All (N=1159)			Investment Grade (N=634)			Speculative Grade (N=525)		
(-30,-1)	-3.19%	-9.92***	-12.53***	-2.09%	-6.59***	-8.93***	-4.52%	-7.62***	-8.94***
(-15,-1)	-1.78%	-6.79***	-10.10***	-1.30%	-4.87***	-7.23***	-2.36%	-4.92***	-7.14***
(0,+1)	-0.99%	-6.46***	-9.57***	-1.09%	-4.60***	-6.39***	-0.88%	-4.80***	-7.01***
(+2,+10)	-0.65%	-3.31***	-5.01***	-0.43%	-1.74*	-4.08***	-0.93%	-2.90***	-3.18***
Panel B: Uncontaminated downgrades									
	All (N=652)			Investment Grade (N=322)			Speculative Grade (N=330)		
(-30,-1)	-2.85%	-7.63***	-8.75***	-1.63%	-4.99***	-5.04***	-4.05%	-6.13***	-7.18***
(-15,-1)	-1.44%	-4.69***	-6.43***	-0.78%	-2.55**	-3.77***	-2.09%	-3.96***	-5.31***
(0,+1)	-0.64%	-5.72***	-5.64***	-0.45%	-3.06***	-2.28**	-0.83%	-4.92***	-5.48***
(+2,+10)	-0.95%	-4.63***	-4.87***	-0.56%	-2.48**	-2.78***	-1.33%	-3.92***	-4.08***
Panel C: Full sample of upgrades									
	All (N=610)			Investment Grade (N=251)			Speculative Grade (N=359)		
(-30,-1)	0.04%	0.32	-0.66	-0.13%	-1.07	-2.44**	0.16%	0.84	0.71
(-15,-1)	0.06%	0.57	0.19	0.00%	-0.01	-0.94	0.09%	0.65	0.72
(0,+1)	0.24%	4.89***	5.47***	0.14%	1.76*	1.44	0.31%	4.97***	5.65***
(+2,+10)	0.01%	0.16	-0.03	0.05%	0.60	-0.28	-0.02%	-0.20	-0.01
Panel D: Uncontaminated upgrades									
	All (N=441)			Investment Grade (N=166)			Speculative Grade (N=275)		
(-30,-1)	0.16%	1.10	0.26	0.08%	0.83	-0.87	0.20%	0.92	0.79
(-15,-1)	0.19%	2.12**	0.73	0.20%	2.31**	0.32	0.18%	1.38	0.56
(0,+1)	0.21%	4.50***	4.91***	0.02%	0.35	0.76	0.33%	4.90***	5.43***
(+2,+10)	-0.01%	-0.22	-0.46	-0.01%	-0.22	-0.62	-0.02%	-0.15	-0.20

Table IV. The Corporate Bond Market Response to Bond Rating Changes: Alternative Samples Based on Trading Activity

The unit of observation is a rating change at the firm level. The sample consists of bond rating downgrades and upgrades by Moody's, S&P, and Fitch during September 2002 to March 2009 that affected firms with corporate bond data in TRACE. The sample is restricted to rating changes not accompanied by contaminating news during Day -1 to +1. In Panels A and C, the samples are constructed using all bonds that traded on at least ten days during Day +31 to +50, irrespective of trading activity during Day -1 to Day +1. In Panels B and D, the samples are constructed using "liquid" bonds that traded on every day during Day +31 to +50, irrespective of trading activity during Day -1 to Day +1. "CAR" is the sum of the firm's daily abnormal bond returns over the event window. Daily abnormal bond returns are computed as the bond's raw return minus the contemporaneous return on a value-weighted index of corporate bonds matched on rating and maturity. Daily bond prices are computed with the "trade-weighted price, all trades" method of Bessembinder et al. (2009). If a sample bond is not traded on a given day, the bond's daily price for that day is set equal to the most recent observed daily price. If a firm has multiple bond issues affected by the same rating announcement, the firm's daily abnormal bond return is the market value-weighted average of abnormal returns on its individual bond issues. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

Event Window (days)	Mean CAR	t-stat	signed-rank	Mean CAR	t-stat	signed-rank	Mean CAR	t-stat	signed-rank
Panel A: Uncontaminated downgrades, all bonds traded on at least ten days during Day +31 to Day +50									
	All (N=959)			Investment Grade (N=438)			Speculative Grade (N=521)		
(-30,-1)	-2.39%	-5.39***	-9.82***	-1.08%	-1.98**	-5.41***	-3.50%	-5.19***	-8.08***
(-15,-1)	-1.59%	-5.94***	-7.36***	-0.89%	-3.88***	-4.78***	-2.17%	-4.82***	-5.69***
(0,+1)	-0.47%	-4.37***	-5.94***	-0.32%	-2.99***	-2.20**	-0.61%	-3.39***	-5.75***
(+2,+10)	-1.55%	-6.02***	-7.88***	-1.11%	-4.83***	-5.05***	-1.91%	-4.44***	-6.00***
Panel B: Uncontaminated downgrades, all bonds traded on every day during Day +31 to Day +50									
	All (N=214)			Investment Grade (N=130)			Speculative Grade (N=84)		
(-30,-1)	-3.43%	-5.15***	-5.11***	-2.09%	-4.00***	-3.81***	-5.51%	-3.75***	-3.55***
(-15,-1)	-1.35%	-3.29***	-3.54***	-0.78%	-2.48**	-2.91***	-2.22%	-2.42**	-2.36**
(0,+1)	-0.45%	-2.57**	-2.47**	-0.24%	-1.28	-1.18	-0.77%	-2.30**	-2.34**
(+2,+10)	-1.42%	-3.49***	-4.07***	-0.49%	-1.66*	-1.38	-2.87%	-3.13***	-4.15***
Panel C: Uncontaminated upgrades, all bonds traded on at least ten days during Day +31 to Day +50									
	All (N=689)			Investment Grade (N=247)			Speculative Grade (N=442)		
(-30,-1)	0.31%	2.72***	1.50	-0.05%	-0.48	-0.85	0.51%	3.02***	2.49**
(-15,-1)	0.22%	2.58***	1.37	-0.08%	-0.68	-0.60	0.38%	3.36***	2.06**
(0,+1)	0.12%	2.75***	2.63***	0.02%	0.34	0.63	0.17%	2.99***	2.80***
(+2,+10)	0.01%	0.18	-0.55	0.03%	0.47	-0.34	-0.00%	-0.03	-0.46
Panel D: Uncontaminated upgrades, all bonds traded on every day during Day +31 to Day +50									
	All (N=137)			Investment Grade (N=77)			Speculative Grade (N=60)		
(-30,-1)	-0.11%	-0.36	-0.44	-0.02%	-0.13	-1.10	-0.24%	-0.34	0.29
(-15,-1)	0.08%	0.54	-0.26	0.00%	-0.03	-0.99	0.19%	0.60	0.41
(0,+1)	0.21%	2.80***	3.52***	0.04%	0.62	1.75*	0.43%	2.91***	3.19***
(+2,+10)	0.12%	1.01	-0.05	0.07%	0.82	-0.21	0.19%	0.74	0.16

Table V. Monthly Abnormal Bond Returns Around Bond Rating Changes

The unit of observation is a rating change at the firm level. The sample consists of bond rating downgrades and upgrades by Moody's, S&P, and Fitch during September 2002 to March 2009 that affected firms with corporate bond data in TRACE. In Panels A and D, the samples includes all bonds that that traded in Month -1 and Month 0, where Month 0 is the calendar month of the rating change. In Panels B and E, the samples includes all bonds that that traded on Days -1 and +1 and on at least ten days during Day +31 to +50, where Day 0 is the day of the rating change. The samples in Panels C and F are the same as those in Panels B and E respectively, except that observations where there was contaminating news about the firm during Day -1 to Day +1 have been removed. Abnormal bond returns are computed as the bond's raw return minus the contemporaneous return on a value-weighted index of corporate bonds matched on rating and maturity. A bond' raw bond return in Month *t* includes accrued interest and is computed using the last transactions prices in Months *t* and *t-1*. If a firm has multiple bond issues affected by the same rating announcement, the firm's monthly abnormal bond return is the market value-weighted average of abnormal returns on its individual bond issues. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

Event Month	Mean CAR	t-stat	signed-rank	Mean CAR	t-stat	signed-rank	Mean CAR	t-stat	signed-rank
Panel A: Downgrades, all bonds traded in Month -1 and Month 0									
	All (N=2405)			Investment Grade (N=1139)			Speculative Grade (N=1161)		
-1	-1.43%	-9.43***	-9.80***	-0.79%	-5.38***	-5.68***	-2.06%	-7.84***	-8.05***
0	-2.29%	-11.42***	-15.06***	-1.66%	-8.16***	-9.60***	-2.90%	-8.46***	-11.60***
+1	0.75%	0.62	-4.90***	0.05%	0.14	-2.64***	1.44%	0.61	-4.21***
Panel B: Downgrades, full sample, bonds traded on Days -1 and +1 and on at least ten days during Day +31 to +50									
	All (N=1098)			Investment Grade (N=598)			Speculative Grade (N=500)		
-1	-1.41%	-6.46***	-7.26***	-0.92%	-3.83***	-4.40***	-1.99%	-5.22***	-5.86***
0	-2.74%	-9.24***	-12.15***	-2.17%	-5.97***	-8.26***	-3.42%	-7.07***	-8.87***
+1	-0.33%	-1.04	-3.17***	-0.02%	-0.06	-1.13	-0.69%	-1.23	-3.28***
Panel C: Downgrades, uncontaminated sample, bonds traded on Days -1 and +1 and on at least ten days during Day +31 to +50									
	All (N=615)			Investment Grade (N=298)			Speculative Grade (N=317)		
-1	-1.28%	-4.99***	-4.77***	-0.64%	-2.38**	-2.18**	-1.89%	-4.41***	-4.46***
0	-2.37%	-7.18***	-8.43***	-1.69%	-4.86***	-4.82***	-3.02%	-5.49***	-6.88***
+1	-0.71%	-1.93*	-2.94***	0.22%	0.46	-0.29	-1.58%	-2.92***	-3.51***
Panel D: Upgrades, all bonds traded in Month -1 and Month 0									
	All (N=1771)			Investment Grade (N=644)			Speculative Grade (N=1127)		
-1	0.18%	2.95***	2.46**	0.12%	1.43	0.42	0.21%	2.58***	2.81***
0	0.30%	5.44***	7.73***	0.20%	3.16***	4.21***	0.36%	4.53***	6.56***
+1	0.09%	1.71*	1.51	0.00%	0.03	0.23	0.15%	1.94*	1.68*
Panel E: Upgrades, full sample, bonds traded on Days -1 and +1 and on at least ten days during Day +31 to +50									
	All (N=589)			Investment Grade (N=243)			Speculative Grade (N=346)		
-1	0.07%	0.65	0.86	0.10%	1.03	0.89	0.05%	0.30	0.56
0	0.36%	3.70***	4.42***	0.17%	1.65	1.75*	0.49%	3.32***	4.12***
+1	0.01%	0.17	1.29	0.03%	0.30	0.65	0.00%	0.03	1.06
Panel F: Upgrades, uncontaminated sample, bonds traded on Days -1 and +1 and on at least ten days during Day +31 to +50									
	All (N=425)			Investment Grade (N=160)			Speculative Grade (N=265)		
-1	0.11%	0.79	1.71*	0.26%	2.21**	1.72*	0.02%	0.09	0.96
0	0.48%	4.71***	4.50***	0.13%	1.38	1.51	0.69%	4.56***	4.43***
+1	0.01%	0.07	0.40	0.01%	0.15	-0.20	0.00%	0.01	0.49

Table VI. Stock and Bond Price Reactions to Downgrades

The unit of observation is a rating change at the firm level. The sample consists of bond rating downgrades by Moody's, S&P, and Fitch during September 2002 to March 2009 that affected firms with corporate bond data in TRACE and common stock data in CRSP. All samples are restricted to firms with non-missing stock returns in CRSP on Days 0 and +1 and corporate bonds that trade on Days -1 and +1 and on at least ten days during Day +31 to +50, where Day 0 is the day of the rating change. The "uncontaminated" sample consists of rating changes not accompanied by contaminating news during Day -1 to +1. In Panels A and B (C and D), "CAR" is the sum of the firm's daily abnormal stock (bond) returns over the event window. In Panels A and B, daily abnormal stock returns are computed as the raw stock return minus the contemporaneous return on the CRSP value-weighted index. Daily abnormal bond returns are computed as the bond's raw return minus the contemporaneous return on an index of corporate bonds matched on rating and maturity. Daily bond prices are computed with the "trade-weighted price, all trades" method of Bessembinder et al. (2009). If a sample bond is not traded on a given day, the bond's daily price for that day is set equal to the most recent observed daily price. If a firm has multiple bonds affected by the same rating announcement, the firm's daily abnormal bond return is the market value-weighted average of abnormal returns on its individual bond issues. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

Event Window (days)	Mean CAR	t-stat	signed-rank	Mean CAR	t-stat	signed-rank	Mean CAR	t-stat	signed-rank
Panel A: Abnormal stock returns, full sample of downgrades									
	All (N=775)			Investment Grade (N=485)			Speculative Grade (N=290)		
(-30,-1)	-8.76%	-9.33***	-8.86***	-7.35%	-6.73***	-6.71***	-11.10%	-6.49***	-5.86***
(-15,-1)	-4.60%	-6.49***	-6.67***	-3.71%	-4.25***	-4.78***	-6.09%	-5.06***	-4.75***
(0,+1)	-2.45%	-5.59***	-7.72***	-2.28%	-3.80***	-5.58***	-2.74%	-4.51***	-5.31***
(+2,+10)	-0.26%	-0.46	-1.70*	-0.22%	-0.34	-0.94	-0.34%	-0.31	-1.54
Panel B: Abnormal stock returns, uncontaminated downgrades									
	All (N=401)			Investment Grade (N=239)			Speculative Grade (N=162)		
(-30,-1)	-7.40%	-6.23***	-5.39***	-5.94%	-4.79***	-4.04***	-9.55%	-4.16***	-3.63***
(-15,-1)	-3.48%	-3.57***	-3.88***	-2.49%	-2.10**	-2.67***	-4.95%	-2.98***	-2.97***
(0,+1)	-1.68%	-4.29***	-5.97***	-1.16%	-2.40**	-4.26***	-2.44%	-3.76***	-4.14***
(+2,+10)	-1.01%	-1.31	-1.67*	-0.87%	-1.15	-1.18	-1.23%	-0.79	-1.22
Panel C: Abnormal bond returns, full sample of downgrades									
	All (N=775)			Investment Grade (N=485)			Speculative Grade (N=290)		
(-30,-1)	-3.02%	-8.02***	-10.49***	-2.40%	-6.80***	-8.81***	-4.05%	-5.00***	-5.94***
(-15,-1)	-1.63%	-5.29***	-7.99***	-1.45%	-4.51***	-6.84***	-1.94%	-3.10***	-4.57***
(0,+1)	-1.19%	-5.95***	-8.59***	-1.26%	-4.32***	-6.39***	-1.06%	-4.95***	-5.70***
(+2,+10)	-0.64%	-2.51**	-3.90***	-0.37%	-1.25	-3.45***	-1.10%	-2.32**	-2.15**
Panel D: Abnormal bond returns, uncontaminated downgrades									
	All (N=401)			Investment Grade (N=239)			Speculative Grade (N=162)		
(-30,-1)	-2.60%	-5.21***	-5.83***	-1.74%	-4.39***	-4.51***	-3.88%	-3.58***	-3.68***
(-15,-1)	-1.19%	-3.20***	-4.03***	-0.73%	-1.90*	-3.07***	-1.86%	-2.58**	-2.85***
(0,+1)	-0.63%	-4.84***	-4.65***	-0.51%	-3.10***	-2.82***	-0.81%	-3.80***	-3.82***
(+2,+10)	-0.96%	-3.34***	-3.77***	-0.50%	-1.81*	-2.22**	-1.63%	-2.82***	-3.17***

Table VII. Stock and Bond Price Reactions to Upgrades

The unit of observation is a rating change at the firm level. The sample consists of bond rating upgrades by Moody's, S&P, and Fitch during September 2002 to March 2009 that affected firms with corporate bond data in TRACE and common stock data in CRSP. All samples are restricted to firms with non-missing stock returns in CRSP on Days 0 and +1 and corporate bonds that traded on Days -1 and +1 and on at least ten days during Day +31 to +50, where Day 0 is the day of the rating change. The "uncontaminated" sample consists of rating changes not accompanied by contaminating news during Day -1 to Day +1. In Panels A and B (C and D), "CAR" is the sum of the firm's daily abnormal stock (bond) returns over the window. Daily abnormal stock returns are computed as the raw return minus the return on the CRSP value-weighted index. Daily abnormal bond returns are computed as the bond's raw return minus the contemporaneous return on a value-weighted index of bonds matched on rating and maturity. Daily bond prices are computed with the "trade-weighted price, all trades" method of Bessembinder et al. (2009). If a sample bond is not traded on a given day, the bond's daily price for that day is set equal to the most recent observed daily price. If a firm has multiple bond issues affected by the same rating announcement, the firm's daily abnormal bond return is the market value-weighted average of abnormal returns on its individual bond issues. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

Event Window (days)	Mean CAR	t-stat	signed-rank	Mean CAR	t-stat	signed-rank	Mean CAR	t-stat	signed-rank
Panel A: Abnormal stock returns, full sample of upgrades									
	All (N=364)			Investment Grade (N=158)			Speculative Grade (N=206)		
(-30,-1)	1.38%	2.26**	2.67***	0.30%	0.54	0.60	2.22%	2.23**	2.86***
(-15,-1)	0.48%	1.23	1.57	0.08%	0.22	0.45	0.78%	1.26	1.59
(0,+1)	0.25%	1.65	1.69*	0.16%	0.93	0.88	0.32%	1.36	1.46
(+2,+10)	0.24%	0.87	0.45	0.02%	0.06	-0.38	0.41%	0.98	0.85
Panel B: Abnormal stock returns, uncontaminated upgrades									
	All (N=263)			Investment Grade (N=110)			Speculative Grade (N=153)		
(-30,-1)	1.01%	1.36	2.20**	0.89%	1.44	1.15	1.09%	0.91	1.81*
(-15,-1)	0.24%	0.51	1.27	0.29%	0.59	0.89	0.20%	0.28	0.91
(0,+1)	0.17%	1.13	1.47	0.16%	0.85	0.31	0.19%	0.81	1.46
(+2,+10)	0.15%	0.46	0.21	0.00%	-0.00	-0.40	0.25%	0.52	0.54
Panel C: Abnormal bond returns, full sample of upgrades									
	All (N=364)			Investment Grade (N=158)			Speculative Grade (N=206)		
(-30,-1)	-0.07%	-0.42	-1.61	-0.15%	-1.39	-3.31***	-0.01%	-0.03	0.08
(-15,-1)	0.12%	1.14	-0.08	0.02%	0.29	-1.50	0.20%	1.11	0.84
(0,+1)	0.20%	3.73***	3.92***	0.10%	1.74*	1.31	0.27%	3.31***	3.89***
(+2,+10)	-0.05%	-0.64	-0.64	-0.01%	-0.13	-0.90	-0.07%	-0.65	-0.30
Panel D: Abnormal bond returns, uncontaminated upgrades									
	All (N=263)			Investment Grade (N=110)			Speculative Grade (N=153)		
(-30,-1)	-0.05%	-0.25	-1.23	-0.06%	-0.51	-2.37**	-0.04%	-0.12	-0.06
(-15,-1)	0.18%	1.69*	0.21	0.13%	1.29	-0.58	0.22%	1.30	0.61
(0,+1)	0.13%	2.36**	2.80***	-0.02%	-0.35	0.12	0.24%	2.82***	3.44***
(+2,+10)	0.01%	0.16	-0.37	0.08%	0.96	-0.29	-0.03%	-0.29	-0.30

Table VIII. Tests of Determinants of the Corporate Bond Market Response to Bond Rating Changes

The unit of observation is a rating change at the firm level. The sample consists of bond rating changes by Moody's, S&P, and Fitch during September 2002 to March 2009 that affected firms with corporate bond data in TRACE. The sample consists only of rating changes not accompanied by contaminating news during Day -1 to +1.The sample is restricted to bonds that traded on Days -1 and +1 and on at least ten days during Day +31 to +50. The dependent variable is the firm's cumulative abnormal bond return over Days 0 and +1. "CAR(-15,-1) ≥ 0" ("CAR(-15,-1) ≤ 0") is a dummy variable equal to one if the firm's cumulative abnormal bond return over Day -15 to Day -1 is greater than or equal to (less than or equal to) zero and zero otherwise. "Credit Watch" is a dummy variable equal to one if the firm was placed on credit watch with the indicated direction prior to the rating change and zero otherwise. For downgrades (upgrades), "Second Mover" is a dummy variable that equals one if the rating assigned by one or both of the other agencies at the time of the rating change is lower (higher) than the pre-downgrade (pre-upgrade) rating assigned by the agency making the rating change and zero otherwise. "Moody's" ("S&P) is a dummy variable equal to one if the rating change is a Moody's (S&P) rating change and zero otherwise. "Old Rating" is a rating scale integer assigned to the pre-upgrade or pre-downgrade rating (CCC- = 1, CCC = 2, CCC+ = 3, … , AAA = 19). "Across Inv. Grade" is a dummy variable equal to one if the downgrade (upgrade) moved the firm out of (into) investment grade and zero otherwise. "# of Grades" is the absolute value of the number of grades that the rating is decreased (increased) by the downgrade (upgrade). "Recession" is a dummy variable equal to one if the rating change occurred during or after December 2007 and zero otherwise. All regressions are estimated with OLS. T-stats based on robust standard errors adjusted for heteroskedasticity are reported in parentheses below estimated coefficients. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

	Uncontaminated Downgrades					Uncontaminated Upgrades				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
CAR(-15,-1) ≥ 0	-0.51				-0.49					
	(-2.30)**				(-2.24)**					
CAR(-15,-1) ≤ 0						0.26				0.28
						(2.74)**				(2.91)***
Credit Watch		0.04			0.14		0.17			0.17
		(0.16)			(0.57)		(1.72)*			(1.64)
Moody's			-0.52		-0.51			0.21		0.17
			(-1.57)		(-1.46)			(1.93)*		(1.44)
S&P			-0.31		-0.31			0.30		0.30
			(-0.97)		(-0.94)			(2.31)**		(2.30)**
Second Mover				0.16	0.10				0.00	0.01
				(0.69)	(0.40)				(0.01)	(0.13)
Old Rating	0.07	0.07	0.06	0.07	0.06	-0.03	-0.03	-0.03	-0.03	-0.03
	(2.66)***	(2.47)**	(2.36)**	(2.42)**	(2.09)**	(-2.36)**	(-2.38)**	(-2.03)**	(-2.21)**	(-2.34)**
Across Inv. Grade	0.14	0.07	0.04	0.07	0.10	0.57	0.57	0.59	0.58	0.57
	(0.37)	(0.18)	(0.12)	(0.20)	(0.26)	(3.18)***	(3.19)***	(3.28)***	(3.22)***	(3.13)***
# of Grades	-0.09	-0.08	-0.08	-0.09	-0.11	0.01	0.00	0.02	0.01	0.00
	(-0.74)	(-0.65)	(-0.66)	(-0.73)	(-0.89)	(0.07)	(-0.05)	(0.19)	(0.07)	(0.05)
Recession	-0.89	-0.90	-0.90	-0.90	-0.88	0.01	-0.00	-0.02	-0.02	0.02
	(-3.29)***	(-3.33)***	(-3.38)***	(-3.32)***	(-3.24)***	(0.10)	(-0.03)	(-0.16)	(-0.17)	(0.17)
Intercept	-0.71	-0.90	-0.46	-0.96	-0.33	0.29	0.41	0.17	0.42	0.04
	(-2.11)**	(-2.78)**	(-1.01)	(-3.04)***	(-0.67)	(1.70)*	(2.39)**	(0.85)	(2.29)**	(0.17)
Adj. R^2	0.03	0.02	0.03	0.02	0.03	0.05	0.03	0.04	0.03	0.06
Observations	652	652	652	652	652	441	441	441	441	441

Table IX. Events Surrounding Lehman's Bankruptcy and Abnormal Returns

This table reports news and stock returns associated with events surrounding Lehman's bankruptcy. The sample of "Lehman Equity Underwriting Clients" consists of 184 industrial (non-financial, non-utility) firms that used Lehman Brothers as a lead underwriter for at least one public common stock offering during the September 14, 1998 to September 14, 2008 period. Daily abnormal returns (ARs) calculated with the Fama-French-Carhart four-factor model and a 260-day estimation period (Day -290 to Day -31). Statistical significance levels of the mean abnormal return are based on the standardized cross-sectional t-statistic of Boehmer, et al. (1991) adjusted for cross-sectional correlation following Kolari and Pynnönen (2010). The *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

		Lehman Brothers		Lehman Equity Underwriting Clients (N=184)		
Date	Event Day	Closing Stock Price	Daily Raw Return	Mean Daily AR	Value-Weighted Daily AR	News
Aug. 29	-10	$16.09	1.4%	0.14%	0.09%	
Sep.2	-9	$16.13	0.3%	-0.42%	-0.69%	Korea Development Bank (KDB) CEO, Min Euoo-Sung, confirmed rumors that KDB was considering a potential investment in Lehman.
Sep 3	-8	$16.94	5.0%	0.01%	-0.93%	
Sep. 4	-7	$15.17	-10.5%	-0.35%	-0.15%	
Sep. 5	-6	$16.2	6.8%	0.02%	0.01%	
Sep. 8	-5	$14.15	-12.7%	-0.62%	-1.11%**	
Sep. 9	-4	$7.79	-45.0%	-1.31%***	-1.90%***	Dow Jones Newswire reported that KDB put talks with Lehman on hold. (2) S&P put Lehman's credit rating on negative "watch."
Sep. 10	-3	$7.25	-6.9%	-0.17%	-0.08%	(1) Lehman announced an expected $3.9 billion loss and plans to sell a majority stake in its investment management division, spin off real estate assets, and cut its dividend. (2) Moody's put Lehman's credit rating on "watch", saying it would be downgraded unless Lehman could negotiate "a strategic transaction with a stronger financial partner."
Sep. 11	-2	$4.22	-41.8%	-0.70%*	-0.19%	The Wall Street Journal reported that Lehman spent the day shopping itself to potential buyers, including Bank of America.
Sep. 12	-1	$3.65	-13.5%	0.02%	0.22%	
Sep. 13	--	--	--	--	--	(1) Timothy Geithner, president of the New York Fed, called a special meeting to discuss Lehman's future and a possible emergency asset liquidation. (2) Lehman reported that it had been talking with Bank of America and Barclays for the company's possible sale.
Sep. 14	--	--	--	--	--	Lehman announced that the company would file for Chapter 11 bankruptcy protection.
Sep. 15	0	$0.21	-94.3%	-1.48%***	-1.76%***	First day of trading after Lehman bankruptcy announcement.
Sep. 16	+1	$0.3	42.9%	-0.58%	-0.04%	Barclays announced that it had agreed to purchase, subject to regulatory approval, Lehman's New York headquarters and North American investment banking and capital markets businesses.
Sep. 17	+2	$0.13	-56.7%	-1.09%	-0.52%	Lehman's stock delisted from the NYSE at market close.

Table X. Summary Statistics for Lehman's Equity Underwriting Clients
The sample consists of 184 industrial (non-financial, non-utility) firms that used Lehman Brothers as a lead underwriter for at least one public common stock offering during September 14, 1998 to September 14, 2008. This table provides descriptive statistics for the sample. Variable definitions are in Appendix A.

Variable	Mean	Std. Dev	25th Percentile	Median	75th Percentile	N
# of common stock offerings with Lehman	1.516	0.947	1.000	1.000	2.000	184
Total common stock offerings	2.190	1.551	1.000	2.000	3.000	184
Common stock proceeds raised with Lehman	189	253	56	105	207	184
Total common stock proceeds	483	665	134	265	569	184
Lehman's share of client's common stock offerings	0.508	0.274	0.313	0.500	0.633	184
Lehman's share of client's common stock proceeds	0.499	0.280	0.273	0.500	0.537	184
Exclusive Lehman equity underwriting client	0.179	0.385	0.000	0.000	0.000	184
Lehman is lead lender	0.076	0.266	0.000	0.000	0.000	184
Lehman is participant lender	0.152	0.360	0.000	0.000	0.000	184
Lehman straight debt underwriting client	0.065	0.248	0.000	0.000	0.000	184
Lehman convertible debt underwriting client	0.027	0.163	0.000	0.000	0.000	184
Lehman M&A client	0.130	0.338	0.000	0.000	0.000	184
Lehman analyst coverage	0.663	0.474	0.000	1.000	1.000	184
Lehman NYSE specialist	0.071	0.257	0.000	0.000	0.000	184
Lehman's market share as a Nasdaq market maker	0.060	0.027	0.044	0.061	0.076	104
Recent IPO underwritten by Lehman	0.484	0.501	0.000	0.000	1.000	184
Proportion of outstanding shares owned by Lehman Brothers Holdings, Inc.	0.004	0.020	0.000	0.001	0.002	184
Proportion of outstanding shares owned by Neuberger Berman, LLC	0.006	0.020	0.000	0.000	0.001	184
Equity shelf registration dummy	0.087	0.283	0.000	0.000	0.000	184
Age	12.217	12.791	4.000	9.000	15.000	184
Z-score	4.820	9.732	1.094	2.338	4.657	184
Market cap	2603	6402	362	1066	2220	184
Book-to-market	0.427	0.281	0.217	0.381	0.559	168
Net Market Leverage	0.065	0.255	-0.116	0.081	0.254	184
Cash / Assets	0.270	0.291	0.036	0.133	0.464	184

Table XI. The Stock Price Reaction of Lehman's Equity Underwriting Clients to Lehman's Bankruptcy

"Lehman Clients" are 184 non-financial, non-utility firms that employed Lehman as lead underwriter in a public common stock offering during Sep. 14, 1998 to Sep. 14, 2008. "Clients of IBs with Similar Industry Status" are 946 non-financial, non-utility firms that didn't employ Lehman but did employ one of the following banks in a public common stock offering during the same period: Merrill Lynch, Goldman Sachs, Morgan Stanley, JP Morgan, Citi, UBS, Credit Suisse, Deutsche Bank, Bank of America, and Wachovia. In Panels A, B, and C, model parameters are estimated over Day -290 to -31, where Day 0 is September 15, 2008. In Panels D and E, abnormal returns equal the sample firm's raw return minus the raw return of a matched, non-sample firm. In Panel D, matched firms are selected such that the sum of the absolute percentage differences between the market values of equity and book-to-market ratios of the sample firm and matched firm is minimized. In Panel E, each sample firm is matched to the non-sample firm in the same Fama-French 49 industry that is closest in market value of equity. For mean CARs, t-statistics are computed with the standardized cross-sectional method of Boehmer, et al. (1991) and adjusted for cross-sectional correlation following Kolari and Pynnönen (2010). The t-statistics for the difference in means is computed with the cross-sectional variances of CARs and assumes unequal variances across the two samples. The *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

	Lehman Clients (N=184)		Clients of IBs with Similar Industry Status (N=946)		Difference in Means	
Event Window	(1) Mean CAR	t-stat	(2) Mean CAR	t-stat	(1) - (2)	t-stat
Panel A: Fama-French-Carhart Four-Factor Model Adjusted Abnormal Returns						
(-30,-6)	0.18%	0.25	-0.21%	-0.31	0.39%	0.22
(-5,+1)	-4.85%***	-3.19	-1.91%	-1.59	-2.94%***	-2.84
(0,0)	-1.48%***	-2.78	-0.66%	-1.38	-0.82%**	-1.98
(0,+1)	-2.07%**	-2.30	-0.93%*	-1.81	-1.14%*	-1.84
(+2,+30)	-7.07%**	-2.41	-4.42%***	-2.87	-2.65%	-1.11
(-30,+30)	-11.7%**	-2.54	-6.54%***	-2.84	-5.20%	-1.45
Panel B: Fama-French Three-Factor Model Adjusted Abnormal Returns						
(-30,-6)	0.25%	0.25	-0.12%	-0.23	0.37%	0.21
(-5,+1)	-5.09%***	-3.43	-2.21%*	-1.81	-2.88%***	-2.93
(0,0)	-1.46%***	-2.74	-0.64%	-1.26	-0.83%*	-1.97
(0,+1)	-2.17%**	-2.35	-1.05%**	-2.02	-1.11%*	-1.86
(+2,+30)	-6.72%**	-2.35	-3.90%**	-2.55	-2.82%	-1.13
(-30,+30)	-11.56%**	-2.49	-6.23%***	-2.63	-5.33%	-1.45
Panel C: Market Model Adjusted Abnormal Returns						
(-30,-6)	2.42%	0.76	2.92%	1.07	-0.50%	-0.27
(-5,+1)	-4.26%**	-2.14	-1.23%	-0.47	-3.04%***	-3.05
(0,0)	-0.18%	-0.46	0.68%	0.61	-0.87%**	-2.10
(0,+1)	-0.84%	-0.69	0.46%	0.51	-1.29%**	-2.10
(+2,+30)	-11.4%***	-2.74	-9.42%***	-2.68	-1.94%	-0.81
(-30,+30)	-13.2%**	-2.11	-7.73%	-1.64	-5.48%	-1.49
Panel D: Size-Book-to-Market Matched Abnormal Returns						
(-30,-6)	-2.09%	-0.55	-1.54%	-0.94	-0.55%	-0.27
(-5,+1)	-4.77%***	-3.00	-1.29%*	-1.67	-3.48%***	-2.72
(0,0)	-1.25%**	-2.17	0.20%	0.25	-1.45%***	-2.83
(0,+1)	-1.95%**	-1.97	-0.16%	-0.47	-1.79%**	-2.26
(+2,+30)	-10.9%**	-2.56	-9.47%***	-3.56	-1.39%	-0.43
(-30,+30)	-17.7%***	-2.90	-12.3%***	-3.59	-5.41%	-1.17
Panel E: Industry-Size Matched Abnormal Returns						
(-30,-6)	-1.37%	-0.55	-0.94%	-0.78	-0.43%	-0.24
(-5,+1)	-4.03%***	-3.19	-1.44%**	-2.25	-2.59%**	-2.34
(0,0)	-1.23%***	-2.65	0.02%	-0.24	-1.24%***	-2.69
(0,+1)	-1.36%*	-1.87	-0.04%	-0.25	-1.33%*	-1.89
(+2,+30)	-8.15%**	-2.53	-5.13%**	-2.36	-3.02%	-1.04
(-30,+30)	-13.6%***	-3.06	-7.51%***	-2.84	-6.04%	-1.52

Table XII. Tests of Market Beta Stability around Lehman's Bankruptcy

The sample consists of 184 industrial (non-financial, non-utility) firms that employed Lehman as a lead underwriter for at least one public common stock offering during September 14, 1998 to September 14, 2008.The table reports average beta estimates for different time periods, where Day 0 is September 15, 2008. Average betas are estimated by forming an equally weighted portfolio consisting of sample firms and regressing portfolio returns on the CRSP value weighted index. The alternative hypothesis in the Chow Test is that the sample average beta for the given period differs from the sample average beta during the estimation period (-290,-31). The *, **, and *** indicate statistical significance in the Chow test (two-tailed) at the 10%, 5%, and 1% levels respectively.

Time Interval	Average Market Beta	Chow Test of Beta Stability (relative to the (-290,-31) period)
Estimation Period		
(-290, -31)	1.071	--
Pre-Event Period		
(-30,-6)	1.072	0.01
Event Periods		
(-5,+10)	0.959	-1.01
(-5,+20)	1.036	-0.50
(-5,+30)	1.044	-0.47
(-5,+40)	1.008	-0.88
(-5,+50)	1.064	-0.11

Table XIII. The Stock Price Reaction of Firms that Received Debt Underwriting, M&A Advisory, NYSE Specialist, and Analyst Coverage Services from Lehman

In Panel A, the sample consists of 53 industrial (non-financial, non-utility) firms that used Lehman as a lead underwriter for at least one public straight debt offering during September 14, 1998 to September 14, 2008. In Panel B, the sample consists of 7 industrial firms that used Lehman as a lead underwriter for at least one public convertible debt offering during the same period. In Panel C, the sample consists of 87 industrial firms that used Lehman as a financial advisor on a completed acquisition announced during the same time period. In Panel D, the sample consists of 151 industrial firms listed on the NYSE for which Lehman was the NYSE specialist at the time of Lehman's bankruptcy. In Panel E, the sample consists of 633 industrial firms for which an analyst from Lehman made at least one earnings forecast during the firm's current fiscal quarter or last fiscal quarter. The "Equity Underwriting" samples consist of firms that also received equity underwriting services from Lehman. Day 0 is September 15, 2008. Abnormal returns are estimated using the Fama-French-Carhart four-factor model and a 260-day estimation period (-290,-31). All t-statistics are computed with the standardized cross-sectional method of Boehmer, Musumeci, and Poulsen (1991) and adjusted for cross-sectional correlation following Kolari and Pynnönen (2010). The t-statistic for the difference in means is computed with the cross-sectional variances of CARs and assumes unequal variances across the two samples. The *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively in two-tailed t-tests.

Event Window	Mean CAR	t-stat	Mean CAR	t-stat	Mean CAR	t-stat
Panel A: Lehman Public Straight Debt Underwriting Clients						
	All (N=53)		Equity Underwriting (N=12)		No Equity Underwriting (N=41)	
(-30,-6)	2.55%*	1.85	-1.20%	-0.89	3.65%**	2.13
(-5,+1)	-0.37%	-0.01	-7.29%*	-2.27	1.66%	1.66
(0,0)	0.25%	0.63	-2.08%	-1.74	0.93%**	2.13
(0,+1)	-0.88%	-0.98	-4.08%**	-2.31	0.06%	0.44
(+2,+30)	-7.72%**	-2.10	-20.62%*	-2.09	-3.95%	-1.24
(-30,+30)	-5.54%	-0.82	-29.11%**	-2.96	1.36%	0.49
Panel B: Lehman Public Convertible Debt Underwriting Clients						
	All (N=7)		Equity Underwriting (N=5)		No Equity Underwriting (N=2)	
(-30,-6)	2.96%	1.03	3.75%	1.02	0.99%	0.21
(-5,+1)	-5.25%	-1.24	-7.17%	-1.33	-0.46%	0.04
(0,0)	-2.98%	-1.57	-2.28%	-1.09	-4.74%	-3.13
(0,+1)	-1.18%	-0.68	-0.69%	-0.47	-2.43%	-1.32
(+2,+30)	-12.27%	-1.31	-9.34%	-0.7	-19.58%	-4.87
(-30,+30)	-14.56%	-1.09	-12.76%	-0.75	-19.05%	-1.39
Panel C: Lehman M&A Clients						
	All (N=87)		Equity Underwriting (N=24)		No Equity Underwriting (N=63)	
(-30,-6)	3.02%*	1.68	5.56%*	1.84	2.05%	1.14
(-5,+1)	1.30%	1.06	0.43%	0.14	1.63%	1.21
(0,0)	0.47%	0.42	-0.86%	-0.90	0.97%	0.64
(0,+1)	0.49%	0.36	-0.37%	-0.09	0.82%	0.43
(+2,+30)	-8.54%**	-2.17	-8.86%**	-2.20	-8.42%*	-1.70
(-30,+30)	-4.22%	-0.68	-2.87%	-0.55	-4.74%	-0.56

Table XIII-*Continued*

Panel D: Lehman is the NYSE Specialist						
	All (N=151)		Equity Underwriting (N=13)		No Equity Underwriting (N=138)	
(-30,-6)	0.65%	0.37	4.31%	1.66	0.31%	0.16
(-5,+1)	0.03%	0.27	-1.47%	-0.17	0.17%	0.32
(0,0)	-0.07%	0.08	1.92%	1.45	-0.26%	-0.14
(0,+1)	-0.70%	-0.93	1.91%*	2.13	-0.95%	-1.20
(+2,+30)	-7.84%**	-2.54	-16.63%**	-2.25	-7.01%**	-2.23
(-30,+30)	-7.16%*	-1.68	-13.80%	-1.15	-6.54%	-1.53

Panel E: Firms Receiving Analyst Coverage from Lehman						
	All (N=633)		Equity Underwriting (N=122)		No Equity Underwriting (N=511)	
(-30,-6)	1.40%	1.32	1.81%	0.54	1.30%	1.36
(-5,+1)	-0.38%	-0.02	-4.20%**	-2.55	0.54%	0.93
(0,0)	-0.11%	0.07	-0.99%*	-1.92	0.10%	0.66
(0,+1)	-0.16%	-0.39	-0.55%	-1.08	-0.06%	-0.08
(+2,+30)	-5.33%**	-2.83	-5.84%*	-1.93	-5.21%***	-2.60
(-30,+30)	-4.31%*	-1.76	-8.23%*	-1.82	-3.37%	-1.39

Table XIV. Cross- Sectional Analysis of Lehman's Equity Underwriting Clients' Stock Price Reaction to Lehman's Bankruptcy

The sample consists of 184 industrial (non-financial, non-utility) firms that used Lehman Brothers as a lead underwriter for at least one public common stock offering during September 14, 1998 to September 14, 2008. All regressions are estimated using the portfolio weighted least squares (PWLS) approach of Chandra and Balachandran (1992) over Day -290 to Day +10 using a two-day event period (Day 0 and Day +1) and the Fama-French-Carhart four-factor model. Day 0 is September 15, 2008. The reported coefficients represent the marginal effect of the independent variable on the client's two-day percentage CAR. All variable definitions are in Appendix A. All t-statistics are reported in parentheses below estimated coefficients. The *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

	(1)	(2)	(3)	(4)	(5)
Ln(1 + # of common stock offerings with Lehman)	-1.51* (-1.88)		-1.54* (-1.92)	-1.434* (-1.80)	-1.444* (-1.72)
Lehman's share of client's common stock offerings		-0.934 (-0.92)			-0.652 (-0.62)
Lehman is lead lender	-2.548** (-2.25)	-2.834** (-2.52)	-2.392** (-2.17)	-2.622** (-2.37)	-2.440** (-2.22)
Lehman is participant lender	-0.34 (-0.46)	-0.53 (-0.73)	-0.18 (-0.25)	-0.378 (-0.52)	-0.214 (-0.29)
Proportion of outstanding shares owned by Lehman Brothers Holdings Inc	-18.652 (-1.14)	-19.66 (-1.20)	-18.576 (-1.14)	-18.328 (-1.12)	-19.378 (-1.18)
Proportion of outstanding shares owned by Neuberger Berman LLC	-13.632 (-0.81)	-14.454 (-0.84)	-7.668 (-0.46)	-12.27 (-0.73)	-6.254 (-0.37)
Equity shelf registration dummy	1.782 (1.42)	1.848 (1.48)	1.896 (1.51)	1.824 (1.45)	1.874 (1.50)
Ln(age)	0.582 (1.56)	0.702* (1.88)	0.684* (1.86)	0.772** (2.08)	0.712* (1.94)
Ln(market cap)	0.508* (1.90)	0.452* (1.67)	0.606** (2.24)	0.356 (1.37)	0.578** (2.11)
Net Market Leverage	-1.896 (-1.14)	-2.074 (-1.22)			
Cash / Assets			3.68** (2.06)		3.728** (2.07)
Z-score				0.08** (2.09)	
Underwriting relationship scope index	-2.438** (-2.05)	-2.798** (-2.34)	-2.458** (-2.07)	-2.432** (-2.05)	-2.472** (-2.09)
Intercept	-2.296 (-1.11)	-2.562 (-1.21)	-4.218* (-1.95)	-2.254 (-1.09)	-3.820* (-1.74)
# Firms	184	184	184	184	184

Table XV. Cross-Sectional Analysis of Lehman Debt Underwriting Clients' Stock Price Reaction to Lehman's Bankruptcy

The sample consists of 56 industrial (non-financial, non-utility) firms that used Lehman Brothers as a lead underwriter for at least one public debt (straight or convertible) offering during September 14, 1998 to September 14, 2008. All regressions are estimated using the portfolio weighted least squares (PWLS) approach of Chandra and Balachandran (1992) over Day -290 to Day +10 using a two-day event period (Day 0 and Day +1) and the Fama-French-Carhart four-factor model. Day 0 is September 15, 2008. The reported coefficients represent the marginal effect of the independent variable on the client's two-day percentage CAR. All variable definitions are in Appendix A. All t-stats are reported in parentheses below estimated coefficients. The *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

	(1)	(2)	(3)	(4)	(5)
Ln(1+ # of debt offerings with Lehman)	0.886 (1.27)		0.664 (0.96)	0.976 (1.41)	0.554 (0.77)
Lehman's share of client's debt offerings		2.448 (1.12)			0.878 (0.40)
Lehman convertible debt underwriting client	1.366 (0.63)	1.534 (0.71)	-1.506 (-0.62)	2.096 (0.88)	-0.632 (-0.25)
Lehman is lead lender	-2.14* (-1.69)	-1.882 (-1.50)	-1.634 (-1.32)	-1.874 (-1.45)	-1.868 (-1.42)
Lehman is participant lender	1.07 (1.15)	1.718* (1.71)	1.404 (1.53)	1.188 (1.24)	1.366 (1.28)
Proportion of outstanding shares owned by Lehman Brothers Holdings Inc	-40.82** (-1.98)	-45.278** (-2.14)	-46.028** (-2.26)	-38.632* (-1.89)	-45.432** (-2.15)
Proportion of outstanding shares owned by Neuberger Berman LLC	-46.75** (-2.14)	-47.492** (-2.18)	-50.298** (-2.32)	-48.85** (-2.26)	-44.058** (-2.06)
Debt shelf registration dummy	0.116 (0.07)	-0.724 (-0.45)	0.252 (0.16)	0.912 (0.57)	-0.316 (-0.19)
Ln(age)	0.706 (1.49)	0.686 (1.45)	0.666 (1.49)	0.776 (1.57)	0.368 (0.76)
Ln(market cap)	-0.26 (-0.81)	0 (-0.00)	-0.18 (-0.57)	-0.306 (-0.97)	-0.01 (-0.03)
Net Market Leverage	-4.584 (-1.44)	-4.052 (-1.23)			2.632 (0.53)
Cash / Assets			12.442*** (2.81)		15.386** (2.43)
Z-score				0.114 (0.36)	0.436 (1.10)
Underwriting relationship scope index	-3.452** (-2.04)	-3.584** (-2.07)	-3.656** (-2.38)	-3.86** (-2.36)	-3.404** (-2.00)
Intercept	3.116 (0.85)	0.806 (0.21)	1.414 (0.39)	2.506 (0.66)	-1.428 (-0.36)
# Firms	56	56	56	56	56

Table XVI. Cross-Sectional Analysis of Lehman M&A Clients' Stock Price Reaction to Lehman's Bankruptcy

The sample consists of 87 industrial (non-financial, non-utility) firms that employed Lehman as a financial advisor in a completed acquisition of a U.S. target announced during September 14, 1998 to September 14, 2008..All regressions are estimated using the portfolio weighted least squares (PWLS) approach of Chandra and Balachandran (1992) over Day -290 to Day +10 using a two-day event period (Day 0 and Day +1) and the Fama-French-Carhart four-factor model. Day 0 is September 15, 2008. The reported coefficients represent the marginal effect of the independent variable on the client's two-day percentage CAR. All variable definitions are in Appendix A. All t-stats are reported in parentheses below estimated coefficients. The *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

	(1)	(2)	(3)
Ln(1+ # of M&A deals with Lehman)	-1.262*		-1.508*
	(-1.75)		(-1.80)
Lehman's share of client's M&A deals		-0.158	0.668
		(-0.15)	(0.56)
Lehman is lead lender	-3.514**	-3.418**	-3.576**
	(-2.24)	(-2.19)	(-2.29)
Lehman is participant lender	0.100	0.004	0.086
	(0.13)	(0.00)	(0.11)
Proportion of outstanding shares owned by Lehman Brothers Holdings Inc	78.574	49.104	78.196
	(0.61)	(0.39)	(0.61)
Proportion of outstanding shares owned by Neuberger Berman LLC	-77.404	-87.666	-67.684
	(-1.39)	(-1.50)	(-1.10)
Pending M&A deal with Lehman	2.658	2.552	2.816
	(1.27)	(1.24)	(1.36)
Ln(age)	0.272	0.334	0.314
	(0.57)	(0.69)	(0.65)
Ln(market cap)	-0.212	-0.292	-0.18
	(-0.93)	(-1.27)	(-0.76)
Z-score	0.200*	0.220*	0.182
	(1.80)	(1.91)	(1.53)
Intercept	2.090	1.62	1.55
	(1.17)	(0.76)	(0.72)
# Firms	87	87	87

Table XVII. Cross-Sectional Analysis of Lehman NYSE Market Making Clients' Stock Price Reaction to Lehman's Bankruptcy

The sample consists of 150 industrial (non-financial, non-utility) firms listed on the NYSE for which Lehman was the NYSE specialist at the time of Lehman's bankruptcy announcement. All regressions are estimated using the portfolio weighted least squares (PWLS) approach of Chandra and Balachandran (1992) over Day -290 to Day +10 using a two-day event period (Day 0 and Day +1) and the Fama-French-Carhart four-factor model. Day 0 is September 15, 2008. The reported coefficients represent the marginal effect of the independent variable on the client's two-day percentage CAR. All variable definitions are in Appendix A. All t-stats are reported in parentheses below estimated coefficients. The *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

	(1)	(2)	(3)
Share turnover	-1.596		-3.088
	(-0.62)		(-1.12)
Proportion of outstanding shares owned by non-Lehman institutions		1.516	2.828*
		(0.97)	(1.87)
Lehman is lead lender	-4.454	-4.126	-4.094
	(-1.64)	(-1.52)	(-1.51)
Lehman is participant lender	0.394	0.348	0.178
	(0.47)	(0.41)	(0.21)
Proportion of outstanding shares owned by Lehman Brothers Holdings Inc	-9.292	-18.338	-22.642
	(-0.13)	(-0.26)	(-0.32)
Proportion of outstanding shares owned by Neuberger Berman LLC	16.502	15.832	15.278
	(1.51)	(1.44)	(1.39)
Ln(age)	0.028	0.062	0.036
	(0.08)	(0.19)	(0.11)
Ln(market cap)	0.226	0.244	0.224
	(1.10)	(1.17)	(1.09)
Z-score	0.224*	0.236**	0.268**
	(1.96)	(2.00)	(2.22)
Intercept	-3.014*	-4.82**	-4.958**
	(-1.74)	(-2.28)	(-2.35)
# Firms	150	150	150

Table XVIII. Cross-Sectional Analysis of Firms' Receiving Analysts Coverage Stock Price Reaction to Lehman's Bankruptcy

The sample consists of 633 industrial (non-financial, non-utility) firms for which an analyst from Lehman made at least one earnings forecast during the firm's current fiscal quarter or last fiscal quarter. All regressions are estimated using the portfolio weighted least squares (PWLS) approach of Chandra and Balachandran (1992) over Day -290 to Day +10 using a two-day event period (Day 0 and Day +1) and the Fama-French-Carhart four-factor model. Day 0 is September 15, 2008. The reported coefficients represent the marginal effect of the independent variable on the client's two-day percentage CAR. All variable definitions are in Appendix A. All t-stats are reported in parentheses below estimated coefficients. The *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

	(1)	(2)	(3)	(4)
Ln(# of non-Lehman analysts)	0.172	-0.088		-0.106
	(0.64)	(-0.31)		(-0.29)
Proportion of outstanding shares owned by non-Lehman institutions		1.664**	1.644**	1.69**
		(2.06)	(2.05)	(2.20)
Lehman is lead lender		-1.682**	-1.676**	-1.682**
		(-2.13)	(-2.12)	(-2.13)
Lehman is participant lender		0.042	0.034	0.038
		(0.13)	(0.10)	(0.11)
Proportion of outstanding shares owned by Lehman Brothers Holdings Inc		54.662	54.804	55.012
		(1.52)	(1.52)	(1.53)
Proportion of outstanding shares owned by Neuberger Berman LLC		-26.658**	-26.688**	-26.614**
		(-2.44)	(-2.44)	(-2.45)
Ln(age)		0.426*	0.424*	0.416*
		(1.86)	(1.90)	(1.91)
Ln(market cap)			-0.01	0.014
			(-0.08)	(0.09)
Z-score		0.12***	0.118***	0.118***
		(3.94)	(3.85)	(3.94)
Intercept	-0.592	-2.928**	-3.05**	-2.994**
	(-0.74)	(-2.40)	(-2.12)	(-2.08)
# Firms	633	631	631	631

Table XIX. Pooled Cross-Sectional Analysis of Lehman Clients' Stock Price Reaction to Lehman's Bankruptcy

The sample consists of 807 industrial (non-financial, non-utility) firms that received at least one of the following services from Lehman Brothers: underwriting of a public common stock, public straight debt, or public convertible debt offering during September 14, 1998 to September 14, 2008; financial advisory service in a completed acquisition of a U.S. target announced during September 14, 1998 to September 14, 2008; market making service as the NYSE specialist at the time of Lehman's bankruptcy; coverage (at least one earnings forecast) by an equity analyst from Lehman during the firm's current fiscal quarter or last fiscal quarter, where the current fiscal quarter contains September 15, 2008. All regressions are estimated using the portfolio weighted least squares (PWLS) approach of Chandra and Balachandran (1992) over Day-290 to Day +10 using a two-day event period (Day 0 and Day +1) and the Fama-French-Carhart four-factor model. Day 0 is September 15, 2008. The reported coefficients represent the marginal effect of the independent variable on the client's two-day percentage CAR. All variable definitions are in Appendix A. All t-statistics are reported in parentheses below estimated coefficients. The *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lehman equity underwriting client	-1.71*** (-3.25)	-1.27*** (-2.70)					
Ln(1+ # of common stock offerings with Lehman)					- 2.815*** (-4.77)	-2.36*** (-4.45)	-2.20*** (-4.26)
Lehman straight debt underwriting client	-0.477 (-1.42)	-0.034 (-0.09)					
Ln(1+ # of straight debt offerings with Lehman)					0.417 (1.03)	0.560 (1.48)	0.639 (1.46)
Lehman convertible debt underwriting client	-0.292 (-0.14)	0.079 (0.04)					
Ln(1+ # of convertible debt offerings with Lehman)					-1.753 (-0.26)	-1.496 (-0.22)	-1.259 (-0.19)
Lehman M&A client	0.911*** (2.74)	1.021*** (3.07)	0.991*** (2.95)	1.034*** (3.11)			
Ln(1+ # of M&A deals with Lehman)					0.871** (1.97)	1.15*** (2.64)	1.19*** (2.81)
Lehman NYSE specialist	-0.091 (-0.26)	-0.002 (-0.01)	-0.069 (-0.20)	0.027 (0.08)	-0.196 (-0.56)	-0.134 (-0.39)	-0.145 (-0.42)
Lehman analyst coverage	0.692* (1.69)	0.703 (1.60)	0.802** (1.99)	0.693 (1.58)	0.451 (1.10)	0.517 (1.19)	0.520 (1.20)
Underwriting relationship scope index			-1.16*** (-3.48)	-0.75** (-2.17)			-0.190 (-0.50)
Lehman is lead lender		-2.89*** (-3.76)		-2.81*** (-3.65)		-3.167*** (-4.06)	-3.05*** (-3.96)
Lehman is participant lender		-0.151 (-0.46)		0.02 (0.06)		-0.084 (-0.27)	-0.014 (-0.04)
Proportion of outstanding shares owned by Lehman Brothers Holdings Inc		-19.216 (-1.26)		-18.733 (-1.22)		-15.698 (-1.02)	-14.879 (-0.96)
Proportion of outstanding shares owned by Neuberger Berman LLC		-8.435 (-0.96)		-9.358 (-1.06)		-8.264 (-0.93)	-8.076 (-0.92)
Ln(age)		0.468** (2.34)		0.507** (2.49)		0.463** (2.29)	0.46** (2.29)
Ln(market cap)		-0.121 (-1.02)		-0.073 (-0.63)		-0.139 (-1.21)	-0.141 (-1.23)
Z-score		0.118*** (4.05)		0.114*** (3.95)		0.112*** (3.90)	0.11*** (3.90)
Intercept	-0.645 (-1.21)	-1.500 (-1.36)	-0.759 (-1.48)	-2.048* (-1.91)	-0.472 (-0.90)	-1.114 (-1.04)	-1.072 (-1.00)
# Firms	807	804	807	804	807	804	804

Table XX. Summary Statistics for Lehman's Borrowers

In Panel A, the unit of observation is a sample firm. Summary statistics are reported for a sample of 115 industrial (non-financial, non-utility) firms in Dealscan, CRSP, and Compustat that had active syndicated loans from Lehman Brothers at the time of Lehman's bankruptcy. In Panel B, the unit of observation is a sample firm's loan (credit facility). Summary statistics are reported for the active loans that sample firms had with Lehman as a lender at the time of Lehman's bankruptcy. "Term Loans" include straight term loans without delay draw provisions. "Other Loans" include delay draw term loans and bridge loans. All variable definitions are in Appendix B.

Variable	Mean	Std. Dev	25th Percentile	Median	75th Percentile	N
Panel A: Summary Statistics on Sample Firms						
Lead lender dummy	0.21	0.41	0.00	0.00	0.00	115
Equity underwriter dummy	0.30	0.46	0.00	0.00	1.00	115
Debt underwriter dummy	0.24	0.43	0.00	0.00	0.00	115
Investment grade dummy	0.37	0.48	0.00	0.00	1.00	115
Speculative grade dummy	0.50	0.50	0.00	0.00	1.00	115
Market cap	19,175	37,869	1,086	3,693	16,831	115
Assets	18,422	35,368	1,723	4,731	15,366	115
Age	22.16	22.35	6.25	13.50	35.83	115
Market-to-book assets	1.66	0.62	1.24	1.47	1.99	115
Leverage	0.38	0.23	0.23	0.35	0.49	115
ROA	0.14	0.07	0.10	0.13	0.17	115
Cash/assets	0.07	0.11	0.01	0.04	0.09	115
Undrawn Lehman credit line/assets	0.008	0.010	0.002	0.005	0.01	76
Panel B: Summary Statistics on Sample Firms' Loans						
Revolving Credit Lines						
Loan amount	1,014	1,621	100	400	1,200	128
Loan amount / assets	0.106	0.120	0.039	0.071	0.115	128
Original maturity	4.976	0.907	5.000	5.000	5.000	128
# of syndicate lenders	14.898	12.458	7.000	12.000	20.000	128
Term Loans						
Loan amount	521	740	173	323	575	84
Loan amount / assets	0.202	0.242	0.050	0.109	0.265	84
Original maturity	5.899	1.422	5.000	6.000	7.000	84
# of syndicate lenders	10.583	9.860	5.000	7.000	12.500	84
Other Loans						
Loan amount	1,200	1,847	100	225	1,400	14
Loan amount / assets	0.072	0.057	0.044	0.051	0.106	14
Original maturity	5.232	3.360	2.000	5.500	7.000	14
# of syndicate lenders	9.286	4.445	7.000	8.000	15.000	14

Table XXI. The Stock Price Reaction of Lehman's Borrowers to Lehman's Bankruptcy

The "Lehman Borrowers" sample consists of 115 industrial (non-financial, non-utility) firms in Dealscan, CRSP, and Compustat that had active syndicated loans with Lehman Brothers acting as a lender at the time of Lehman's bankruptcy. The "Control Borrowers of Other Banks" sample consists of industrial firms in Dealscan, Compustat, and CRSP with active syndicated loans from other banks at the time of Lehman's bankruptcy that did not take out any loans from Lehman during Sep. 2003 to Sep. 2008 and is constructed by matching each "Lehman Borrower" to the non-Lehman borrower that is closest in size (percentage difference in market capitalization of equity), subject to the constraint that the control firm is in the same Fama-French industry (17 industry classifications) and the same broad credit rating category (investment grade, speculative grade, or unrated) as the "Lehman Borrower." Daily abnormal returns are estimated separately with the Fama-French-Carhart four-factor model, the Fama-French three-factor model, and the market model. Day 0 is Sep. 15, 2008. Model parameters are estimated over the (-290,-31) period. "CAR" is the cumulative daily abnormal return over the event window. For "Lehman Borrowers" and "Control Borrowers of other Banks," the t-statistic (signed rank statistic) tests whether the mean standardized CAR (median CAR) differs from zero. For "Differences" the t-statistic tests whether the mean standardized paired difference in CARs differs from zero and the signed rank statistic tests whether the median paired difference in CARs differs from zero. All t-statistics are computed with the standardized cross-sectional method of Boehmer et al. (1991) and are adjusted for cross-sectional correlation following Kolari and Pynnönen (2010). *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

	Lehman Borrowers (N=115)			Control Borrowers of other Banks (N=115)			Difference		
Event Window	(1) Mean CAR	t-stat	signed-rank	(2) Mean CAR	t-stat	signed-rank	(1)-(2)	t-stat	signed-rank
Panel A: Fama-French-Carhart Four-Factor Model Adjusted Abnormal Returns									
(-30,-6)	-1.33%	-0.07	-0.24	1.46%	0.92	0.47	-2.79%	-0.58	-0.37
(-5,+1)	-3.37%	-1.82*	-2.01**	-0.22%	0.20	0.39	-3.15%	-2.16**	-1.92*
(0,0)	-1.11%	-1.20	-1.15	0.01%	0.17	0.00	-1.12%	-1.57	-0.95
(0,+1)	-2.60%	-2.50**	-3.35***	-0.10%	-0.14	-0.86	-2.50%	-2.58**	-2.19**
(+2,+30)	-9.9%	-3.4***	-4.33***	-10.4%	-3.3***	-3.9***	0.44%	0.02	-0.40
Panel B: Fama-French Three-Factor Model Adjusted Abnormal Returns									
(-30,-6)	-1.30%	-0.06	-0.15	1.50%	0.98	0.53	-2.80%	-0.60	-0.40
(-5,+1)	-3.54%	-2.10**	-2.70***	-0.32%	0.39	0.28	-3.22%	-2.38**	-2.44**
(0,0)	-1.12%	-1.18	-1.06	0.02%	0.32	-0.01	-1.14%	-1.59	-0.90
(0,+1)	-2.68%	-2.7***	-3.75***	-0.14%	-0.08	-0.78	-2.54%	-2.70***	-2.40**
(+2,+30)	-9.87%	-3.2***	-3.99***	-10.2%	-3.3***	-3.8***	0.31%	0.06	-0.28
Panel C: Market Model Adjusted Abnormal Returns									
(-30,-6)	0.79%	0.63	1.47	4.16%	1.56	2.31**	-3.37%	-0.72	-0.57
(-5,+1)	-3.01%	-1.63	-1.94*	0.30%	0.74	1.04	-3.31%	-2.47**	-2.33**
(0,0)	-0.62%	-0.69	0.11	0.50%	1.20	1.26	-1.12%	-1.93*	-1.21
(0,+1)	-1.95%	-1.92*	-2.03**	0.68%	0.92	0.45	-2.63%	-2.87***	-2.49**
(+2,+30)	-12.4%	-3.5***	-4.91***	-13.3%	-3.6***	-4.8***	0.88%	0.25	-0.19

Table XXII. Correlation Matrix

The sample consists of 115 industrial (non-financial, non-utility) firms in Dealscan, CRSP, and Compustat that had active syndicated loans with Lehman Brothers acting as a lender at the time of Lehman's bankruptcy. "CAR(-5,+1)" is the cumulative abnormal return over Day-5 to +1 estimated with the Fama-French-Carhart four-factor model. All other variable definitions are in Appendix B. P-values are reported in parentheses below correlation coefficients. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

	CAR (-5,+1)	Lead lender dummy	Equity under-writer dummy	Debt under-writer dummy	Invest-ment grade dummy	Ln(mark et cap)	Ln(age)	Market-to-book assets	Leverage	ROA	Cash/ assets
Lead lender dummy	-0.30***	--									
	(0.00)										
Equity underwriter dummy	-0.23***	0.26***	--								
	(0.01)	(0.00)									
Debt underwriter dummy	0.11	-0.04	-0.08	--							
	(0.22)	(0.68)	(0.38)								
Investment grade dummy	0.21**	-0.23***	-0.39***	0.33***	--						
	(0.01)	(0.01)	(0.00)	(0.00)							
Ln(market cap)	0.21**	-0.26***	-0.31***	0.37***	0.69***	--					
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)						
Ln(age)	0.15*	-0.16*	-0.36***	0.19**	0.49***	0.48***	--				
	(0.07)	(0.06)	(0.00)	(0.02)	(0.00)	(0.00)					
Market-to-book assets	0.00	0.00	-0.05	-0.02	0.15*	0.30***	0.09	--			
	(0.99)	(0.99)	(0.54)	(0.84)	(0.08)	(0.00)	(0.31)				
Leverage	-0.02	0.14	0.25***	-0.16*	-0.39***	-0.50***	-0.22**	0.10	--		
	(0.85)	(0.10)	(0.00)	(0.07)	(0.00)	(0.00)	(0.01)	(0.24)			
ROA	0.15*	-0.07	-0.01	0.03	0.25***	0.27***	0.26***	0.48***	0.17*	--	
	(0.09)	(0.41)	(0.90)	(0.69)	(0.00)	(0.00)	(0.00)	(0.00)	(0.05)		
Cash/assets	0.05	0.09	-0.08	-0.20**	-0.06	0.00	-0.12	0.29***	-0.15*	0.01	--
	(0.57)	(0.28)	(0.34)	(0.02)	(0.46)	(0.98)	(0.18)	(0.00)	(0.09)	(0.89)	
Undrawn Lehman credit line / assets	-0.02	0.33***	0.20*	-0.05	-0.27**	-0.40***	-0.15	0.15	0.29***	-0.01	0.05
	(0.83)	(0.00)	(0.06)	(0.64)	(0.01)	(0.00)	(0.16)	(0.17)	(0.01)	(0.92)	(0.62)

Table XXIII. Multivariate Analyses of Borrower Abnormal Returns

The sample consists of 115 industrial (non-financial, non-utility) firms in Dealscan, CRSP, and Compustat that had active syndicated loans with Lehman Brothers acting as a lender at the time of Lehman's bankruptcy. All regressions are estimated with the portfolio weighted least squares (PWLS) approach of Chandra and Balachandran (1992) over Day -290 to Day +10 using a seven-day event period (-5,+1) and the Fama-French-Carhart four-factor model. Day 0 is September 15, 2008. The reported coefficients represent the marginal effect of the independent variable on the client's (-5,+1) percentage CAR. In specifications (5) through (8), the sample consists of only those firms with non-missing data on the amount of undrawn credit lines from Lehman. All variable definitions are in Appendix B. All specifications include industry dummies (coefficients unreported) that correspond to the 12 Fama-French industry classifications. T-statistics are reported in parentheses below estimated coefficients. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lead lender dummy	-3.150**	-3.248**	-3.514**	-3.402**	-3.212*	-2.772*	-3.27**	-2.981*
	(-2.19)	(-2.28)	(-2.44)	(-2.33)	(-1.95)	(-1.67)	(-1.99)	(-1.77)
Equity underwriter dummy	-2.814**	-2.779**	-2.821**	-2.744**	-4.46***	-4.9***	-4.3***	-4.2***
	(-2.07)	(-2.10)	(-2.09)	(-2.06)	(-2.79)	(-3.03)	(-2.68)	(-2.63)
Debt underwriter dummy	1.204	0.896	1.232	1.085	-1.827	-1.358	-1.722	-0.994
	(1.09)	(0.75)	(1.10)	(0.91)	(-1.22)	(-0.91)	(-1.16)	(-0.66)
Investment grade dummy	1.407*			0.378	-0.917	-0.511	-0.63	0.595
	(1.66)			(0.27)	(-0.52)	(-0.29)	(-0.36)	(0.32)
Ln(market cap)		0.504*		0.091	0.455	0.385	0.245	0.063
		(1.67)		(0.18)	(0.70)	(0.59)	(0.39)	(0.09)
Ln(age)			1.155**	1.050*	1.372*	1.519*	1.386*	1.148
			(2.18)	(1.75)	(1.73)	(1.89)	(1.74)	(1.42)
Market-to-book assets	-2.261**	-2.590*	-2.541**	-2.583*	-2.457	-2.653*	-2.226	-2.289
	(-1.77)	(-1.95)	(-1.96)	(-1.96)	(-1.55)	(-1.66)	(-1.41)	(-1.44)
Leverage	-1.701	-1.148	-1.533	-0.924	-2.66	-1.813	-2.387	-0.441
	(-0.52)	(-0.34)	(-0.49)	(-0.27)	(-0.54)	(-0.36)	(-0.48)	(-0.09)
ROA	33.89**	34.29***	32.5***	31.8***	28.9**	30.8**	28.1**	32.5**
	(2.87)	(2.87)	(2.77)	(2.71)	(2.08)	(2.20)	(2.02)	(2.27)
Cash /assets	0.490	0.455	3.346	3.654	-2.324	-21.525	-1.302	-21.049
	(0.07)	(0.06)	(0.45)	(0.49)	(-0.18)	(-1.30)	(-0.10)	(-1.25)
Undrawn Lehman credit line / assets					-49.18	-120.8*		
					(-0.83)	(-1.73)		
(Undrawn Lehman credit line / assets)x(Cash/assets)						2576**		
						(2.10)		
Large undrawn Lehman credit line dummy							-1.322	-3.318*
							(-1.18)	(-1.82)
(Large undrawn Lehman credit line dummy)x(Cash/assets)								43.16*
								(1.93)
R^2	0.37	0.37	0.39	0.39	0.40	0.42	0.41	0.44
# Firms	115	115	115	115	76	76	76	76

Table XXIV. Abnormal Profitability and Investment after Lehman's Failure

The sample consists of 111 industrial (non-financial, non-utility) firms in Dealscan, CRSP, and Compustat that had active syndicated loans with Lehman Brothers acting as a lender at the time of Lehman's bankruptcy and that survived to the end of fiscal Year 0, where fiscal Year 0 is the fiscal year of Lehman's bankruptcy. In Panels A and B, abnormal profitability of sample firm *i* in fiscal Year *t* is defined as:

$$AP_{i,t} = P_{i,t} - P_{i,-1} - (PI_{i,t} - PI_{i,-1})$$

where $P_{i,t}$ is profitability of sample firm *i* in fiscal Year *t* and $PI_{i,t}$ is the profitability in fiscal Year *t* of a non-sample firm matched to sample firm *i* on the basis of industry and profitability in fiscal Year -1. Matching firms are selected such that the absolute value of the difference in profitability between the matching firm and sample firm in Year -1 is minimized, subject to the constraint that the matching firm issued at least one bank loan in the three years prior to Lehman's bankruptcy and has the same two-digit SIC code as the sample firm. In Panel A, profitability in Year *t* is measured as EBITDA (Compustat annual item #13) scaled by the book value of assets (item #6) in Year *t* and is expressed as a percentage. In Panel B, profitability in Year *t* is measured as operating cash flow (item #308) scaled by the book value of assets in Year *t* and is expressed as a percentage. In Panel C, abnormal investment is expressed as a percentage and is defined as:

$$Abnormal\ Investment = \frac{I_{i,t} - I_{i,-1}}{A_{i,-1}} - \frac{II_{i,t} - II_{i,-1}}{AI_{i,-1}}$$

where $I_{i,t}$ is sample firm *i*'s investment in fiscal year *t*, defined as the sum of capital expenditures (item #128), increase in investments (item #113), and acquisition expenses (item #129), $II_{i,t}$ is investment in fiscal year *t* of a non-sample firm matched to sample firm *i* on the basis of industry and market-to-book ratio of assets in fiscal Year -1, $A_{i,-1}$ is sample firm *i*'s total assets (book value) in Year -1, and $AI_{i,-1}$ is the matching firm's total assets in Year -1. Matching firms are selected such that the absolute value of the percentage difference in market-to-book asset ratios between the sample firm and matching firm is minimized, subject to the constraint that the matching firm has the same two-digit SIC code as the sample firm. The table reports means and medians. The t-statistic is based on the cross-sectional standard deviation. The signed-rank statistic is based on a Wilcoxon signed-rank test of whether the median differs from zero. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

Event Year (fiscal)	Mean	t-stat	Median	signed-rank	N
Panel A: Abnormal Profitability (ROA)					
Year 0	0.43%	0.43	0.01%	1.14	111
Year 1	-0.92%	-0.81	0.52%	0.56	103
Panel B: Abnormal Profitability (Cash-flow-ROA)					
Year 0	-1.04%	-1.25	-0.36%	-1.07	111
Year 1	-1.24%	-1.66*	-1.19%	-2.18**	103
Panel C: Abnormal Investment					
Year 0	-1.5%	-0.33	-0.24%	-0.96	111
Year 1	-6.09%	-2.36**	-1.41%	-2.12**	103