

Contagion effects of the world's largest bankruptcy: the case of WorldCom

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Received 16 June 2003; received in revised form 23 December 2003; accepted 27 July 2004

Available online 26 November 2004

Abstract

On July 19, 2002 WorldCom sought protection from its creditors when it filed for Chapter 11 bankruptcy, earning the distinction as the largest bankruptcy filing in U.S. history. The events surrounding this history-making occurrence provide an important opportunity to examine the repercussions for WorldCom's stakeholders. We especially focus on the valuation effects of the WorldCom failure on exposed financial institutions for their important monitoring roles as institutional investors and creditors. Despite the heightened uncertainty facing investors during this period, we find that the market is remarkably efficient in distinguishing among the various types of stakeholders. In particular, institutional investors and creditors are largely unaffected by the events, which is expected based on the benefit of diversification. In contrast, large and key competitors are adversely affected by the events, which may be attributed to scrutiny of rivals that are perceived to be facing similar problems. Furthermore, for large and key competitors, these results indicate that contagion effects dominate competitive effects.

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JEL classification: G33; G14

Keywords: WorldCom; Bankruptcy; Contagion; Institutional investors; Creditors; Competitors

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1. Introduction

Few could have imagined that a company with the stature and the size of WorldCom could collapse so quickly. WorldCom had attained a market value of \$180 billion, was the largest Internet carrier, and was the second largest long-distance carrier. Nonetheless, barely five months passed from the time any widespread news report indicated that trouble might be ahead to the time they filed for bankruptcy. On February 6, 2002, the *New York Times* published an article that focused on WorldCom's aggressive accounting in reporting revenue. On July 19, 2002, WorldCom, with \$103.9 billion in assets as of December 31, 2001, made history as the largest bankruptcy in U.S. history, surpassing Enron, which at the time of its filing had \$63.1 billion in assets.

WorldCom's problems stemmed, in part, from its highly publicized admission that it had overstated profits by \$3.8 billion. Long before the firm's accounting irregularities came to light, however, WorldCom and most of its competitors in the telecommunications industry were being hurt by negative market forces.¹ Among these negative forces were overcapacity in their networks, the slowing economy, which had reduced business demand for telecommunications services, and the ongoing price wars that had reduced consumer long-distance rates considerably. Indeed, WorldCom's bankruptcy filing added to an already substantial list of telecommunications firms that had filed for bankruptcy protection in recent years, including Northpoint Communications Group and Global Crossing. Several telecommunications firms were also being probed by the Securities and Exchange Commission (SEC), including Qwest Communications International and Global Crossing, further contributing to a generally unstable environment in the industry.

The existing literature provides evidence that bankruptcy filings have significant repercussions for both the bankrupt firm and a variety of associated stakeholders, including rival firms, client firms, and creditors. For example, [Lang and Stulz \(1995\)](#) and [Ferris, Jayaraman, and Makhija \(1997\)](#) show that bankruptcy announcements generate a dominant industry contagion effect; that is, the stock prices of competitors decline because the bankruptcy reveals adverse information about industry asset values and future prospects. [Datta and Iskandar-Datta \(1995\)](#) also show that stockholders and unsecured creditors are adversely affected by the filing, whereas secured debtholders are unaffected.

These studies analyze the effects of a sample of bankruptcies on different classes of stakeholders. There is evidence, however, that in some cases the sheer magnitude and scope of the bankruptcy of a single firm is sufficiently significant to warrant separate examination.² In such instances, the failure of a single firm provides a natural laboratory for understanding the ramifications of the event. For example in 1990, Laventhol and Horwath, then the seventh

¹ Despite these negative forces, there were some positive trends in the industry. Some telecommunications firms had emerged from bankruptcy protection, including Covad Communications Group Inc. Another positive development was Berkshire Hathaway Inc.'s purchase of \$100 million in convertible bonds of Level 3 Communications Inc. This was generally viewed as a positive signal in the industry.

² Prior studies have also examined the contagion and competitive effect of events (other than bankruptcy) involving a single firm. For example, [Johnston and Madura \(2000\)](#) show that the Citigroup–Travelers merger in 1999 had significant implications for other banks, insurance companies and securities firms, and [Akhigbe and Martin \(2002\)](#) find that Microsoft's acquisitions within the internet/online services segment had adverse valuation effects for internet/online services rivals.

largest public accounting firm in the U.S., filed for Chapter 11 bankruptcy. Baber, Kumar, and Verghese (1995) find that the bankruptcy had significant negative price implications for the firm's clients for two reasons. First, they argue that investors rely on auditors to recover future investment losses. Thus, the failure invalidates this insurance function performed by the auditor.

Second, the failure caused investors to reassess the quality of the firm's audits, triggering a negative share price response for their clients. Other examples of major bankruptcies include the failure of Penn Square Bank in 1982 and Continental Illinois Corporation, a bank holding company, in 1984. In the case of Penn Square, the evidence generally indicates that other banks were adversely affected by the failure (Fraser and Richards, 1985; Karafiath and Glascock, 1989; Lamy and Thompson, 1986; Peavey and Hempel, 1988). However, the market's reaction was not indiscriminate. In particular, banks with the greatest exposure to the failed bank, including upstream banks that had loan participations with Penn Square, were more adversely affected by the events surrounding the bank's failure. In contrast, banks outside Penn Square's economic region were largely unaffected by the events. In the case of Continental Illinois, Swary (1986) finds that the failure had a significant negative impact on other banks, particularly those with a relatively large amount of nonperforming assets.

WorldCom's bankruptcy is one that deserves special examination. Coming as it did on the heels of the Enron collapse, the firm's demise occurred during a period of unprecedented investor awareness, anxiety, and uncertainty. Further, given that WorldCom's bankruptcy is the largest in U.S. history, we expect this history-making event may have significant repercussions for the firm's key stakeholders. The significance of WorldCom's bankruptcy is further highlighted in a statement made by the chairman of the Federal Communications Commission, Michael Powell, shortly after the bankruptcy filing. Recognizing the integral role that WorldCom plays in the economy, the chairman issued a statement assuring the public that:

... we do not believe this bankruptcy filing will lead to an immediate disruption of service to consumers or threaten the operation of WorldCom's Internet backbone facilities. It is my understanding that WorldCom has obtained funding necessary to continue operations during the pendency of its bankruptcy proceeding ... This Commission stands ready to intervene in bankruptcy proceedings as necessary to ensure that the bankruptcy court is aware of and considers our public interest concerns.

The bankruptcy of WorldCom clearly has consequences for its shareholders, who watched their stocks fall from \$6.97 on February 5, 2002, the day before the first negative news event regarding the firm came to light, to \$0.83 on July 19, 2002 when the firm ultimately filed for bankruptcy. In this study, we examine how information released about WorldCom in the months prior to its bankruptcy filing affected institutional investors, creditors, and competitors. Despite the heightened uncertainty facing investors during this period, we find that the market is remarkably efficient in distinguishing among the various types of stakeholders. In particular, institutional investors and creditors are largely unaffected by the events leading to WorldCom's failure. These results are consistent with the basic benefit of diversification; a single bankruptcy, even the world's largest bankruptcy, should have no impact on well-diversified shareholders. In contrast, large and key competitors are

Table 1

Events indicating concern over the future viability of WorldCom

1.	February 6, 2002: Concerns over aggressive accounting practices
2.	March 11, 2002: Request for information from the SEC relating to accounting procedures and loans to officers
3.	April 3, 2002: 4% of overall work force to be eliminated
4.	April 22, 2002: Standard & Poor's and Moody's cut credit ratings
5.	April 30, 2002: Resignation of WorldCom CEO, Bernard Ebbers
6.	May 9, 2002: Standard & Poor's and Moody's cut credit rating to junk status
7.	May 21, 2002: Dividend payments and two tracking stocks to be eliminated
8.	June 4, 2002: Sales of assets and business units
9.	June 25, 2002: CFO fired after uncovering improper accounting of \$3.8 billion in expenses over five quarters starting in 2001; 20% of overall work force to be eliminated; fraud charges filed by SEC
10.	July 1, 2002: Indication of further fraud regarding reversals of reserve accounts; lenders notify WorldCom that they could demand immediate repayment due to default
11.	July 19, 2002: Bankruptcy filing expected on the next business day

This table briefly describes 11 major event dates that indicate some degree of concern over the future viability of WorldCom. We obtain the event dates and descriptions from Lexis–Nexis news articles on events that led up to WorldCom's bankruptcy filing.

adversely affected by the events, which may be attributed to scrutiny of those rivals that are perceived to be facing similar problems. Furthermore, contagion effects appear to dominate any effects from competitive repositioning, for large and key competitors. These results indicate that shareholders, analysts, and portfolio managers are considering how firms with indirect ties to a financially distressed company may be affected.

2. Analyzing the effects on key stakeholders

News releases about the future viability of WorldCom began to be disseminated by the popular press on February 6, 2002, when there was an article published that focused on the aggressive accounting methods used by WorldCom in reporting revenue. Over the next few months, reports were released that indicated WorldCom may have engaged in a variety of fraudulent accounting tactics. A chronology of important events that calls into question the ongoing viability of WorldCom is provided in [Table 1](#). These critical dates are depicted in a time series diagram of WorldCom's stock price in [Fig. 1](#).

2.1. Impact on institutional investors

To put the extent of WorldCom's institutional ownership in perspective, we note that as of December 31, 2001, there are 830 institutional investors that own 56.5% of WorldCom's shares outstanding. By June 30, 2002, there are only 408 institutional investors that own 44.9% of their shares outstanding. [Table 2](#) provides a partial list of WorldCom's institutional investors. Specifically, the top 20 institutional owners and the number of shares as of December 31, 2001 are provided, along with the number of shares as of June 30, 2001 and an indication as to whether the largest institutional investors were making drastic changes in their WorldCom holdings.

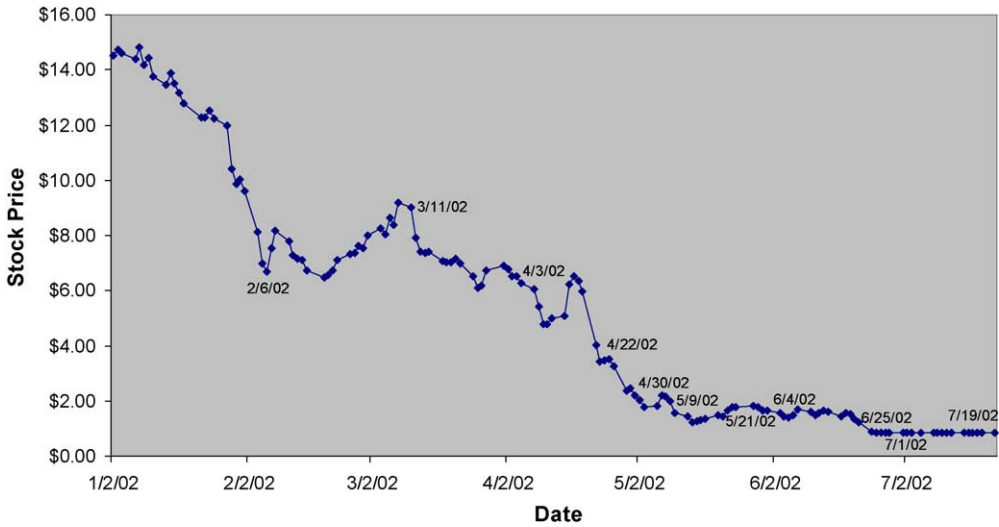


Fig. 1. Time series of WorldCom stock price.

Table 2
Institutional investors with the largest holdings in WorldCom

Institutional investor	Number of shares as of December 31, 2001	Number of shares as of June 30, 2002	Largest +/- in holdings
Wellington Management Co, LLP	119,573,615	58,470,090	-
AXA Financial, Inc	108,188,362	358,688,259	+
Barclays Bank PLC	106,158,868	59,451,051	-
Allianz Dresdner Asset Mgmt AM	99,465,827	154,839,807	+
Citigroup Inc	67,361,737	31,768,349	-
State Str Corporation	67,313,242	27,143,370	-
Vanguard Group	48,343,229	15,097,670	-
JP Morgan Chase & Co	43,720,849	8,169,460	-
Mellon Bank NA	36,340,857	8,895,508	-
Oppenheimerfunds Inc	35,938,991	64,600,221	+
Deutsche Bk Aktiengesellschaft	32,141,918	15,345,315	-
Franklin Resources Inc	31,345,690	11,259,811	-
State Farm Mut Automobile Ins	23,822,564	0	-
College Retire Equities	22,972,661	18,502,355	-
Invesco Capital Mgmt Inc	21,885,885	0	-
Putnam Investment Management	18,675,605	30,638	-
Lord, Abbett & Company	18,412,541	5,612,598	-
Capital Research & Mgmt Co	17,636,500	31,500	-
Primecap Management Company	16,998,675	39,371,805	+
Merrill Lynch Inv Managers (NJ)	16,676,111	0	-

Source: Holdings are obtained from Thomson Financial's *Shareworld* database.

Since shareholders of WorldCom's institutional investors own equity positions in a firm that has equity positions in a variety of companies, theoretically, shareholders of institutional investors should be protected against the negative performance of one firm contained in a well-diversified portfolio, even in the extreme case where the negative performance leads to bankruptcy. Nonetheless, given the sheer magnitude and scope of the WorldCom bankruptcy along with an environment of heightened investor anxiety, shareholders of the institutional investors may suffer significant losses. We suspect that institutions making substantial changes to their exposure to WorldCom over the period of concern do not go unnoticed. In particular, the market may penalize those institutional investors that substantially increase their relative exposure to WorldCom.

2.2. *Impact on creditors*

A particular class of firms that may be more vulnerable to a bankruptcy shock is the group of creditor firms. Since creditors are concerned with the probability of default, and recognizing the fact that a bankruptcy announcement increases this probability, shareholders of the affected creditor may become concerned. Therefore, we analyze the share price reaction of these creditors. Since creditors are higher in the priority structure in terms of their claim on the firm's assets, the adverse effects of an announcement may be mitigated. However, [Datta and Iskandar-Datta \(1995\)](#) note that the information content of bankruptcy announcements is not necessarily the same for all types of debtholders. In other words, all creditors are not created equally. They find that secured creditors are not significantly affected by the bankruptcy announcement (in terms of the change in bond prices), whereas other classes of creditors, such as holders of convertible debt and unsecured debt, experience significant losses. Based on the findings of [Datta and Iskandar-Datta \(1995\)](#), the extent of the mitigating effect for creditors is likely to be a function of whether they are secured or unsecured. Further, the reaction may depend on the extent of creditor diversification ([Winton, 1999](#)). Winton finds that an institution's credit risk depends on monitoring mechanisms that are in place as well as the extent of diversification. Thus, the impact of the events leading to the WorldCom bankruptcy on creditors is an empirical question.

In WorldCom's case, 35 creditors had a significant amount of exposure as shown in [Table 3](#). The average credit exposure is approximately \$1.5 billion per firm, and exposures range from just over \$100 million to nearly \$20.5 billion. The expected impact on these creditors is unclear. Creditors that maintain lending portfolios that are well diversified should not experience adverse valuation effects. However, it is possible that creditors suffer negative valuation effects, to the extent that they are not well diversified. For example, adverse affects may accrue to creditors with substantial exposure to WorldCom relative to their overall credit portfolio, and to creditors that specialize in lending to the telecommunications industry, to the extent that further bankruptcies or default in the industry is expected.

2.3. *Impact on competitors*

[Lang and Stulz \(1995\)](#) and [Ferris et al. \(1997\)](#) show that bankruptcy announcements generate a dominant contagion effect; that is, the stock price of competitors declines because the bankruptcy reveals adverse information about industry asset values and future prospects.

Table 3
Creditors' exposure to WorldCom

Creditor	Amount of exposure (\$ millions)
JP Morgan Chase	20,473.4
Mellon Financial	6,700.2
Citigroup	5,273.1
Bank of New York	2,722.9
Bear Stearns	2,720.0
Morgan Stanley Dean Witter	2,028.4
State Street	2,020.0
Goldman Sachs	1,520.0
Deutsche Bank	1,439.6
Suntrust Banks	1,220.0
ABN Amro Holding	956.3
Wilmington Trust	750.0
Northern Trust	649.9
UBS	369.2
Wells Fargo	352.1
Bank of America	333.7
Firststar	298.3
Credit Suisse First Boston	272.6
Lehman Brothers	270.3
FUNB-Phil Main	186.5
West LB	171.6
Merrill Lynch	155.5
Fleet Boston Financial	150.3
Mizuho Holdings	150.3
BNP Paribas	150.3
Intesabci	150.3
Bank of Tokyo–Mitsubishi	140.2
Verizon Communications	121.2
UMB Financial	112.3
Bank One	100.2
Bank of Nova Scotia	100.2
Credit Lyonnais	100.2
Bayerische Landesbank	100.2
Royal Bank of Scotland	100.2
Lloyds TSB Bank	100.2

They also provide evidence that bankruptcy announcements have competitive effects; that is, some competitors actually gain, including competitors in concentrated industries, which are more likely to benefit from the potential for increased demand and market share arising from the demise of a competitor. Nonetheless, Ferris et al. (1997) conclude that the contagion effects clearly dominate the competitive effects. Further, they find that even small firm bankruptcies have a dominant contagion effect for smaller sized competitors.

Given the evidence in past research and the facts known about the telecommunications industry in general at the time of the bankruptcy filing, we hypothesize that the events leading to WorldCom's bankruptcy may have a dominant contagion effect for competitors. As noted earlier, overcapacity and other adverse trends had created a generally unstable environment in the industry. Several other telecommunications firms had previously filed for bankruptcy,

Table 4
Competitors of WorldCom

Competitors	
Panel A: Largest firms in SIC 4813	
Allegiance Telecom Inc	Level 3 Communications Inc
AT&T Corp	Magyar Tavkozlesi Vallalat RT
BCE Inc	Nippon Telegraph & Telephone Corp
Bellsouth Corp	Qwest Communications Intl Inc
Broadwing Inc	SBC Communications Inc
Compania Anonima Nac Tel de Vene	Sprint Corp
Centurytel Inc	Surewest Communications
Citizens Communications Co	Telefonica de Argentina SA
Commonwealth Tele Entprs Inc	Telefonica de Espana SA
Compania de Telecomm de Chile SA	Telus Corp
Deutsche Telekom AG	Time Warner Telecom Inc
Global Crossing Ltd	Verizon Communications
Panel B: Key competitors	
AT&T	Qwest Communication
General Communications	Sprint FON
Global Crossing	

but the magnitude of WorldCom's filing may still result in strong industry contagion effects. However, given the allegations of accounting fraud surrounding the bankruptcy, significant competitive effects may dominate to the extent that other telecommunications companies are not perceived as engaging in fraudulent activities. In this instance as well, it is difficult to decipher the likely effect because the SEC was probing several other companies in the industry for fraud. In addition, given that WorldCom's collapse came so soon after Enron's collapse (which was largely attributable to accounting fraud), there may have been a perception among investors that the problems are systemic causing widespread negative effects. Another factor that may affect the reaction of rivals is that, given the fragility of the industry, the events leading to the collapse of a major player like WorldCom may signal increased likelihood of further industry consolidation. Under this scenario, smaller rivals are more likely to become acquisition targets, because they are easier and less costly to acquire, and the acquisition is less likely to be challenged on antitrust grounds than the acquisition of larger firms.

Table 4 provides a partial list of WorldCom's competitors. Panel A lists the largest firms who share the telecommunications industry SIC code 4813. Broadly speaking, these firms are considered to be rivals. There are a total of 96 publicly traded firms that are categorized as operating in SIC code 4813 according to Standard & Poor's Compustat database. Panel B also lists a more focused set of rivals.³

³ We thank an anonymous reviewer for suggesting that a more focused set of competitors may reveal better results. We combine two sources to generate this potentially better set of competitors. A Merrill Lynch analyst report on January 4, 2002 specifically states that WorldCom's major competitors are AT&T, Sprint FON, and to a lesser degree Qwest Communication. Industry comparison data in the NetAdvantage database by S&P indicates that WorldCom competitors as of May 31, 2001 are AT&T, General Communication, Global Crossing, and Sprint FON.

3. Data and methodology

To gauge the fallout from information released about the future viability of WorldCom, we examine the response of portfolios returns for institutional investors, creditors, and industry rivals. We require that sample firms have daily stock returns available from CRSP between January 2, 2002 and December 31, 2002. This requirement provides us with a sample of 64 institutional investors, 22 creditors, and 96 competitors.

We use the seemingly unrelated regression (SUR) technique developed by Johnston (1984). He shows that in the presence of contemporaneous correlation, the SUR methodology generates more efficient estimates. The first model we use to estimate the share price response is as follows:

$$R_{p,t} = \beta_{0p} + \beta_{1p}R_{m,t+1} + \beta_{2p}R_{m,t} + \beta_{3p}R_{m,t-1} + \sum_{k=1}^{11} \lambda_{kp}D_{kt} + \beta_{4p}\delta_t R_{m,t} + e_{p,t} \quad (1)$$

where $R_{p,t}$ is the return on the portfolio on day t ; $R_{m,t+1}$ the return on the market portfolio on day $t + 1$; $R_{m,t}$ the return on the market portfolio on day t ; $R_{m,t-1}$ the return on the market portfolio on day $t - 1$; D_{kt} is 1 for event k , and 0 otherwise (Table 1 lists the date of each event); δ_t is 1 on the final event day (July 19, 2002) and all days following this event, and 0 otherwise; β_{0p} the intercept term for the portfolio; β_{1p} , β_{2p} , β_{3p} the lead, contemporaneous, and lagged market betas for the portfolio; λ_{kp} the coefficient measuring the abnormal return for event k for the portfolio; β_{4p} the shift in systematic risk of the portfolio due to the bankruptcy filing; $e_{p,t}$ the disturbance term for the portfolio on day t .

We estimate Eq. (1) using daily returns for the period from January 2, 2002 to October 9, 2002. The CRSP value-weighted NYSE/AMEX index is used to represent the market portfolio. Similar to the intervention analysis used in Box and Tiao (1975), Scholes and Williams (1977), Larcker, Gordon, and Pinches (1980), Saunders and Smirlock (1987) and Bhargava and Fraser (1998), we include the concurrent, as well as the lead and lagged market returns to control for nonsynchronous trading. We also include a dummy variable to account for a potential shift in systematic risk.⁴ Negative and significant coefficient estimates for λ_1 to λ_{11} , which represent abnormal returns for each of the events, may be revealed for the portfolios of institutional investors and creditors. For rival firms, the expected sign on these coefficients is unclear as previously discussed. Positive and significant coefficient estimates for the risk shift parameters, β_1 to β_4 , indicate that the portfolio has greater market risk exposure in the period following WorldCom's bankruptcy filing.

The second model we use to estimate the abnormal share price movement is:

$$R_{p,t} = \beta_{0p} + \beta_{1p}R_{m,t+1} + \beta_{2p}R_{m,t} + \beta_{3p}R_{m,t-1} + \gamma_{\text{comb,p}}D_{kt} + \beta_{4p}\delta_t R_{m,t} + e_{p,t} \quad (2)$$

⁴ The advantage of the SUR approach over the ordinary least squares (OLS) method is that by adding this dummy variable it allows the returns and systematic risk following an event to be examined at the same time. We evaluate different risk shift dates and find qualitatively similar results to those reported in the paper. Furthermore, Durbin–Watson statistics do not indicate that first-order auto-correlation is a problem in the models.

where $\gamma_{\text{comb},p}$ is 1 for each event k , and 0 otherwise; and all other variable were previously defined. The coefficient, γ_{comb} , represents the average abnormal share price response to the set of important events related to the deterioration of WorldCom.

4. Results

We evaluate the potential contagion effects related to the important events leading up to the bankruptcy of WorldCom that are displayed in Table 1. First, we analyze the impact of the information disseminated about WorldCom on their shareholders. These results are reported in Table 5. Second, we analyze whether portfolios of WorldCom stakeholder firms were affected. In Tables 6–8, we report the results for all the stakeholder firms in each category, and for several subgroups.⁵

4.1. Impact on WorldCom shareholders

Panel A of Table 5 shows that the share price of WorldCom is significantly affected by only the most severe event day (July 1, 2002).⁶ Not until further fraud is uncovered and default occurs does the share price of WorldCom elicit a significantly negative reaction. It is likely that at this point in time that bankruptcy was unequivocal; this also explains why the actual bankruptcy filing did not generate a significant reaction. Panel B of Table 5 indicates that, on average, the events leading up to the bankruptcy have significant and negative valuation effects.

4.2. Impact on institutional shareholders

In Table 2, we list WorldCom's 20 largest institutional investors as a partial representation of institutional owners. Data for institutional ownership are from Thomson Financial's Shareworld database that makes available quarterly institutional holdings based on the SEC's requirement to file 13F forms. We identify all institutional owners with positions as of December 31, 2001, the end of the quarter immediately preceding the first release of information, and June 30, 2002, the end of the quarter immediately preceding their bankruptcy filing. In total, there are 893 institutional investors that owned WorldCom shares during one or both periods.

⁵ We evaluate equations (1) and (2) using the standard event window of $t = -1$ to $+1$. In doing so, we find that $t = 0$ captures the WorldCom reaction, whereas day $+1$ captures the reaction by stakeholders that are connected to WorldCom. Also, the intra-industry study of bankrupt firms by Lang and Stulz (1995) documents the most pronounced effects on day $+1$ among non-bankrupt firms during bankruptcy announcements, indicating the market needs time to assess the economic impact of the announcements. Thus, the results we report for WorldCom use $t = 0$ and the results we report for all the stakeholders use $t = +1$.

⁶ It should be noted that Eqs. (1) and (2) are adjusted by omitting the risk shift factor, since WorldCom's stock was delisted on July 30, 2002. Furthermore, we examine their cumulative abnormal return surrounding the bankruptcy filing. The 3-day CAR $[-1, +1]$ is 35.76%, statistically significant at the 1% level. This suggests that all price adjustments resulting from the publicized difficulties for WorldCom must have occurred prior to the official announcement of bankruptcy.

Table 5
Abnormal returns and risk shift for WorldCom

Parameter	WorldCom	<i>t</i> -statistic
Panel A: Abnormal returns for each event		
β_0	0.0029	0.23
β_1	-1.0902	-1.05
β_2	1.4231	1.65*
β_3	1.5598	1.82*
λ_1	-0.1692	-1.29
λ_2	-0.0589	-0.45
λ_3	0.0230	0.23
λ_4	-0.1267	-0.96
λ_5	0.0477	0.36
λ_6	-0.0085	-0.06
λ_7	-0.0706	-0.54
λ_8	-0.1031	-0.78
λ_9	-0.0464	-0.35
λ_{10}	-0.7921	-5.95***
λ_{11}	-0.0693	-0.50
Adjusted R^2	0.2547	
<i>F</i> -value	4.05***	
Panel B: Abnormal returns across all events		
β_0	0.0032	0.24
β_1	-1.1852	-1.14
β_2	1.8331	2.02**
β_3	2.0462	2.27**
γ_{comb}	-0.1178	-2.59***
Adjusted R^2	0.1265	
<i>F</i> -value	5.52***	

This table shows the coefficient estimates for WorldCom in response to the 11 events that indicated concern over its future viability. We obtain the estimates using OLS with daily returns from January 2, 2002 to December 31, 2002. We estimate the abnormal returns and risk shift in two ways: $R_t = \beta_{0p} + \beta_1 R_{m,t+1} + \beta_2 R_{m,t} + \beta_3 R_{m,t-1} + \sum_{k=1}^{11} \lambda_k D_{kt} + e_t$ (Panel A) and $R_t = \beta_0 + \beta_1 R_{m,t+1} + \beta_2 R_{m,t} + \beta_3 R_{m,t-1} + \gamma_{\text{comb}} D_{kt} + e_t$ (Panel B), where R_t is the return on WorldCom on day t ; $R_{m,t+1}$, $R_{m,t}$, and $R_{m,t-1}$ are market returns on the day $t+1$, t , and $t-1$, respectively; D_{kt} is a dummy variable equal to 1 for event k and 0 otherwise; β_{0p} is the intercept, β_{1p} , β_{2p} , and β_{3p} are the lead, contemporaneous, and lagged market betas for WorldCom; λ_k is WorldCom's abnormal response to event k ; γ_{comb} is WorldCom's average abnormal response to all the 11 events; and e_t is the error term. We also report the R^2 , adjusted R^2 , and *F*-values. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

In Table 1, we report the number of shares owned on December 31, 2001, the number of shares owned on June 30, 2002, and provide an indicator of whether the institutional investor was in the top 5% of institutional investors with the greatest increase (+) or decrease (-) in the number of WorldCom shares between these two periods. Interestingly, each of the 20 largest institutional investors clearly expressed their opinions on the future prospects for WorldCom, by either substantially reducing or substantially increasing their exposure to WorldCom. The vast majority, 16 of the top 20 holders, significantly reduced their exposure to WorldCom during the period. Only 4 of the top 20 holders significantly increased their exposure to WorldCom.

Table 6
Abnormal returns and risk shift for institutional investors

Parameter	All institutions	<i>t</i> -statistic	Large decrease in exposure	<i>t</i> -statistic	Large increase in exposure	<i>t</i> -statistic
Panel A: Abnormal returns for each event						
β_0	0.0005	1.70*	0.0005	1.30	0.0008	1.44
β_1	-0.0024	-0.12	0.0616	2.75***	0.0078	0.23
β_2	0.8024	24.14***	0.8394	22.90***	0.9909	17.94***
β_3	-0.0082	-0.41	-0.0393	-1.77*	0.0375	1.12
λ_1	0.0001	0.08	0.0001	0.03	-0.0023	-0.88
λ_2	-0.0002	-0.10	-0.0005	-0.27	-0.0020	-0.76
λ_3	-0.0001	-0.08	-0.0004	-0.19	-0.0021	-0.80
λ_4	-0.0000	-0.01	-0.0003	-0.14	-0.0021	-0.78
λ_5	-0.0003	-0.15	-0.0005	-0.26	-0.0020	-0.74
λ_6	-0.0000	-0.00	-0.0001	-0.05	-0.0022	-0.82
λ_7	-0.0001	-0.08	-0.0004	-0.21	-0.0019	-0.72
λ_8	-0.0002	-0.09	-0.0005	-0.24	-0.0020	-0.77
λ_9	-0.0002	-0.11	-0.0006	-0.30	-0.0018	-0.68
λ_{10}	0.0000	0.01	-0.0001	-0.06	-0.0022	-0.83
λ_{11}	0.0001	0.08	-0.0000	-0.01	-0.0023	-0.84
β_4	0.1758	4.17***	0.1803	3.88***	0.2064	2.95***
<i>N</i>	64		16		16	
Adjusted R^2	0.8927		0.8820		0.8187	
<i>F</i> -value	139.58***		125.60***		76.25***	
Panel B: Abnormal returns across all events						
β_0	0.0005	1.72*	0.0005	1.31	0.0008	0.45
β_1	-0.0026	-0.13	0.0615	2.75***	0.0079	0.24
β_2	0.8019	24.39***	0.8386	23.03***	0.9914	18.24***
β_3	-0.0082	-0.41	-0.0392	-1.78*	0.0375	1.14
γ_{comb}	-0.0012	-0.91	-0.0007	-0.18	-0.0021	-0.83
β_4	0.1763	4.23***	0.1811	3.92***	0.2059	2.99***
<i>N</i>	64		16		16	
Adjusted R^2	0.8948		0.8834		0.7500	
<i>F</i> -value	426.19***		379.76***		145.78***	

This table shows the coefficient estimates for portfolios of institutional investors in response to the 11 events that indicated concern over the future viability of WorldCom. We obtain the estimates using SUR and daily returns from January 2, 2002 to December 31, 2002. We estimate the abnormal returns and risk shift in two ways: $R_{p,t} = \beta_{0p} + \beta_{1p}R_{m,t+1} + \beta_{2p}R_{m,t} + \beta_{3p}R_{m,t-1} + \sum_{k=1}^{11} \lambda_{kp}D_{kt} + \beta_{4p}\delta_t R_{m,t} + e_{p,t}$ (Panel A) and $R_{p,t} = \beta_{0p} + \beta_{1p}R_{m,t+1} + \beta_{2p}R_{m,t} + \beta_{3p}R_{m,t-1} + \gamma_{\text{comb},p}D_{kt} + \beta_{4p}\delta_t R_{m,t} + e_{p,t}$ (Panel B), where $R_{p,t}$ is the return on the portfolio of exposed firms on day t ; $R_{m,t+1}$, $R_{m,t}$, and $R_{m,t-1}$ are market returns on the day $t+1$, t , and $t-1$, respectively; D_{kt} is a dummy variable equal to 1 for event k and 0 otherwise; δ_t is equal to 1 on the final event day (July 19, 2002) and all subsequent days and 0 otherwise; β_{0p} is the intercept, β_{1p} , β_{2p} , and β_{3p} are the lead, contemporaneous, and lagged market betas for the portfolio; λ_{kp} is the portfolio's abnormal response to event k ; γ_{comb} is the portfolio's average abnormal response to all the 11 events; β_{4p} is the portfolio's shift in systematic risk; and $e_{p,t}$ is the error term. We also report the OLS R^2 , adjusted R^2 , and F -values. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 7
Abnormal returns and risk shift for creditors

Parameter	All creditors	<i>t</i> -statistic	Least exposure	<i>t</i> -statistic	Most exposure	<i>t</i> -statistic
Panel A: Abnormal returns for each event						
β_0	0.0006	1.23	0.0007	1.82*	0.0008	1.42
β_1	0.0712	2.48***	0.1054	2.81***	0.0560	1.58
β_2	1.1463	24.40***	1.0833	17.67***	1.2728	21.98***
β_3	-0.0483	-1.70*	-0.0395	-1.06	-0.0756	-2.16**
λ_1	0.0001	0.04	-0.0027	-0.22	0.0016	0.48
λ_2	-0.0004	-0.15	-0.0028	-0.38	0.0009	0.29
λ_3	-0.0007	-0.25	-0.0028	-0.51	0.0005	0.14
λ_4	-0.0004	-0.14	-0.0027	-0.39	0.0010	0.32
λ_5	-0.0008	-0.29	-0.0026	-0.54	0.0005	0.15
λ_6	-0.0003	-0.13	-0.0027	-0.38	0.0009	0.29
λ_7	-0.0010	-0.40	-0.0028	-0.65	0.0002	0.05
λ_8	-0.0009	-0.33	-0.0028	-0.59	0.0003	0.09
λ_9	-0.0014	-0.53	-0.0029	-0.79	-0.0004	-0.12
λ_{10}	-0.0005	-0.18	-0.0027	-0.42	0.0008	0.25
λ_{11}	-0.0008	-0.29	-0.0032	-0.55	0.0004	0.12
β_4	0.1782	2.99***	0.3875	4.99***	-0.0033	-0.05
<i>N</i>	22		6		6	
Adjusted R^2	0.8883		0.8406		0.8417	
<i>F</i> -value	133.48***		88.88***		89.64***	
Panel B: Abnormal returns across all events						
β_0	0.0006	1.23	0.0007	1.19	0.0008	1.41
β_1	0.0713	2.47***	0.1055	2.80***	0.0561	1.57
β_2	1.1458	24.31***	1.0827	17.60***	1.2723	21.85***
β_3	-0.0482	-2.64***	-0.0393	-1.06	-0.0754	-2.14**
γ_{comb}	-0.0006	-0.29	-0.0017	-0.60	0.0006	0.23
β_4	0.1787	2.99***	0.3882	4.98***	-0.0028	-0.04
<i>N</i>	22		6		6	
Adjusted R^2	0.8871		0.8389		0.8394	
<i>F</i> -value	393.89***		261.29***		262.37***	

This table shows the coefficient estimates for portfolios of creditors in response to the 11 events that indicated concern over the future viability of WorldCom. We obtain the estimates using SUR and daily returns from January 2, 2002 to December 31, 2002. We estimate the abnormal returns and risk shift in two ways: $R_{p,t} = \beta_{0p} + \beta_{1p}R_{m,t+1} + \beta_{2p}R_{m,t} + \beta_{3p}R_{m,t-1} + \sum_{k=1}^{11} \lambda_{kp} D_{kt} + \beta_{4p} \delta_t R_{m,t} + e_{p,t}$ (Panel A) and $R_{p,t} = \beta_{0p} + \beta_{1p}R_{m,t+1} + \beta_{2p}R_{m,t} + \beta_{3p}R_{m,t-1} + \gamma_{comb,p} D_{kt} + \beta_{4p} \delta_t R_{m,t} + e_{p,t}$ (Panel B), where $R_{p,t}$ is the return on the portfolio of exposed firms on day t ; $R_{m,t+1}$, $R_{m,t}$, and $R_{m,t-1}$ are market returns on the day $t+1$, t , and $t-1$, respectively; D_{kt} is a dummy variable equal to 1 for event k and 0 otherwise; δ_t is equal to 1 on the final event day (July 19, 2002) and all subsequent days and 0 otherwise; β_{0p} is the intercept, β_{1p} , β_{2p} , and β_{3p} are the lead, contemporaneous, and lagged market betas for the portfolio; λ_{kp} is the portfolio's abnormal response to event k ; γ_{comb} is the portfolio's average abnormal response to all the 11 events; β_{4p} is the portfolio's shift in systematic risk; and $e_{p,t}$ is the error term. We also report the OLS R^2 , adjusted R^2 , and F -values. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

As a reference point, the same analysis is conducted for the 20 largest Enron institutional investors as of June 30, 2001, the end of the quarter immediately preceding the first release of negative information on the future viability of Enron. In the precedent-setting case of Enron, only 10 of the top 20 institutional investors significantly decreased their exposure to Enron

Table 8
Abnormal returns and risk shift for competitors

Parameter	SIC 4813	<i>t</i> -statistic	Small rivals	<i>t</i> -statistic	Large rivals	<i>t</i> -statistic	Key rivals	<i>t</i> -statistic
Panel A: Abnormal returns for each event								
β_0	0.0008	0.94	0.0029	1.33	0.0006	0.62	0.0016	0.87
β_1	0.0217	0.42	0.1217	0.87	0.0516	0.83	0.0439	0.37
β_2	0.9656	11.55***	0.8346	3.66***	1.1–700	11.35***	1.8119	9.19***
β_3	-0.1050	-2.08**	-0.1671	-1.21	-0.1062	-1.71*	-0.1972	-1.66*
λ_1	-0.0050	-1.16	0.0010	0.08	-0.0098	-1.46	-0.0178	-1.23
λ_2	-0.0053	-1.25	0.0046	0.40	-0.0134	-2.01**	-0.0232	-1.63*
λ_3	-0.0049	-1.15	0.0025	0.22	-0.0111	-1.67*	-0.0188	-1.30
λ_4	-0.0043	-1.01	0.0013	0.12	-0.0090	-1.34	-0.0151	-1.04
λ_5	-0.0047	-1.09	0.0048	0.42	-0.0129	-1.94**	-0.0195	-1.35
λ_6	-0.0055	-1.29	0.0038	0.33	-0.0129	-1.92**	-0.0233	-1.63*
λ_7	-0.0046	-1.08	0.0040	0.35	-0.0121	-1.81*	-0.0184	-1.27
λ_8	-0.0059	-1.38	0.0023	0.20	-0.0122	-1.83*	-0.0248	-1.72*
λ_9	-0.0103	-2.39**	0.0122	1.06	-0.0260	-3.89***	-0.0579	-4.00***
λ_{10}	-0.0055	-1.28	0.0043	0.37	-0.0133	-1.98**	-0.0233	-1.60
λ_{11}	-0.0043	-0.99	0.0040	0.34	-0.0117	-1.72*	-0.0165	-1.12
β_4	-0.2130	-2.01**	-0.0826	-0.29	-0.1736	-1.33	-0.7912	-3.17***
<i>N</i>	96		24		24		5	
Adjusted R^2	0.5276		0.0919		0.5696		0.4231	
<i>F</i> -value	19.61***		2.69***		23.06***		13.22***	
Panel B: Abnormal returns across all events								
β_0	0.0008	0.94	0.0029	1.34	0.0006	0.59	0.0016	0.80
β_1	0.0220	0.43	0.1211	0.88	0.0523	0.80	0.0457	0.35
β_2	0.9646	11.62***	0.8342	3.69***	1.1689	10.95***	1.8056	8.56***
β_3	-0.1066	-2.12**	-0.1650	-1.21	-0.1100	-1.70*	-0.2080	-1.63*
γ_{comb}	-0.0055	-1.43	0.0041	0.39	-0.0131	-2.67***	-0.0235	-2.42**
β_4	-0.2120	-2.01**	-0.0822	-0.29	-0.1727	-1.28	-0.7853	-2.94***
<i>N</i>	96		24		24		5	
Adjusted R^2	0.5333		0.1074		0.5333		0.3313	
<i>F</i> -value	58.13***		7.01***		58.14***		25.77***	

This table shows the coefficient estimates for competitors of WorldCom in response to the 11 events indicating concern over the future viability of WorldCom. We obtain the estimates using SUR and daily returns from January 2, 2002 to December 31, 2002. We estimate the abnormal returns and risk shift in two ways: $R_{p,t} = \beta_{0p} + \beta_{1p}R_{m,t+1} + \beta_{2p}R_{m,t} + \beta_{3p}R_{m,t-1} + \sum_{k=1}^{11} \lambda_{kp}D_{kt} + \beta_{4p}\delta_t R_{m,t} + e_{p,t}$ (Panel A) and $R_{p,t} = \beta_{0p} + \beta_{1p}R_{m,t+1} + \beta_{2p}R_{m,t} + \beta_{3p}R_{m,t-1} + \gamma_{\text{comb,p}}D_{kt} + \beta_{4p}\delta_t R_{m,t} + e_{p,t}$ (Panel B), where $R_{p,t}$ is the return on the portfolio of exposed firms on day t ; $R_{m,t+1}$, $R_{m,t}$, and $R_{m,t-1}$ are market returns on the day $t+1$, t , and $t-1$, respectively; D_{kt} is a dummy variable equal to 1 for event k and 0 otherwise; δ_t is equal to 1 on the final event day (July 19, 2002) and all subsequent days and 0 otherwise; β_{0p} is the intercept, β_{1p} , β_{2p} , and β_{3p} are the lead, contemporaneous, and lagged market betas for the portfolio; λ_{kp} is the portfolio's abnormal response to event k ; γ_{comb} is the portfolio's average abnormal response to all the 11 events; β_{4p} is the portfolio's shift in systematic risk; and $e_{p,t}$ is the error term. We also report the OLS R^2 , adjusted R^2 , and F -values. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

over their unraveling period. In comparison, 16 of the 20 largest WorldCom institutional investors decreased their positions in WorldCom, which is a statistically significant increase in the proportion of institutional investors reacting in this manner. This comparison indicates that institutional investors could have become more cautious and responsive in making and changing investments in the post-Enron environment.

Table 6 shows that institutional shareholders are not significantly affected by the events leading up to WorldCom's demise. Indeed, neither the reaction to each of the 11 individual events separately (Panel A) nor the average effect across all events (Panel B) is significant for the portfolio of all institutional investors. Furthermore, the reaction is invariant with respect to whether the institutions were increasing or decreasing their relative exposure to WorldCom. We separately examine a portfolio containing the quartile of institutional investors with the largest decrease in their relative exposure and a portfolio containing the quartile of those with the largest increase in their relative exposure.⁷ Not finding significant valuation effects for institutional investors is consistent with the idea that these institutions are well diversified, and are less vulnerable to shocks associated with a particular company, albeit even the world's largest bankruptcy.⁸ Despite the heightened investor anxiety during the post-Enron period, the market appears to be efficient in distinguishing firms that are well diversified, and are, therefore, less vulnerable.

The risk shift parameter, β_4 , is positive and significant in Panel A and Panel B for all of the subsets. We surmise that this increased market exposure is most likely a result of general economic conditions.

4.3. Impact on creditors

Table 7 reports the reaction of WorldCom creditors. The portfolio of all creditors is insignificant for each of the 11 event days (Panel A), as well as over the combined dates (Panel B). The quartile of creditors with the most relative exposure is separately examined from the quartile of creditors with the least relative exposure.⁹ Neither subset shows significant valuation effects. Thus, it appears that the creditors are also considered to be well diversified. Generally, the risk shift parameter, β_4 , is positive and significant. Again, we believe it is likely that increased sensitivity to market conditions is due to general economic conditions.

4.4. Impact on competitors

Table 8 reports the reaction of competitors. In Panel A, it can be seen that the reaction of all rivals that share SIC code 4813, is only significant for the most severe event date (July

⁷ Relative exposure is defined as the value of WorldCom holdings/market value of the institutional investor. We also examine the quartile of institutional investors with the largest relative WorldCom holdings separately from the quartile with the smallest relative holdings. These subsets also are not significantly affected by the WorldCom events.

⁸ We thank an anonymous reviewer for pointing out that the institutional ownership data do not allow us to ascertain how gradual or abrupt the position changes occurred, which may contribute to not detecting significant results.

⁹ Relative exposure is defined as the reported WorldCom credit exposure/market value of the creditor.

1, 2002). Panel B of Table 8 does not indicate that, on average, the events leading up to the bankruptcy have significant and negative valuation effects on the portfolio of rivals that share SIC code 4813. Since pooling all rivals may obscure important effects, we consider the impact on small rivals, large rivals, and key rivals separately.

Across both panels, the quartile of rivals that contains the smallest rivals, based on market value, do not show significant effects. However, the largest quartile of rivals and the key rivals exhibit a dominant contagion (negative) effect for most of the 11 events leading up to WorldCom's failure. The average effect across all events (Panel B) is significantly negative for the larger rivals and key rivals, as well. An *F*-test shows the responses between the largest and smallest rivals are significantly different at the 0.01 level. This difference in reaction may be explained by several factors. First, given WorldCom's size, the events leading to their bankruptcy sent strong signals to large rivals that they are not immune to scrutiny and/or bankruptcy. If there had been a perception in the industry that some firms were too big to fail, WorldCom's failure eliminated this misconception and exposed their vulnerability. Further, given the overcapacity in the industry, many analysts were predicting consolidation. Under this scenario, smaller rivals are more likely to become acquisition targets than larger rivals, a fact that would accrue benefits to smaller rivals.

The risk shift parameter, β_4 , is negative and significant in Panel A and Panel B for the portfolio of rivals that share SIC code 4813 and for the portfolio of key rivals. This result indicates that competitors experienced a significant decrease in their sensitivity to market conditions in the post-bankruptcy period. This finding is plausible to the extent that the telecommunications industry had inflated market betas during the base period leading to the collapse of WorldCom. Inflated betas could be expected for the telecommunications industry that had overcapacity and a generally unstable environment in the base period.

5. Summary

On July 19, 2002 WorldCom sought protection from its creditors when it filed for Chapter 11 bankruptcy, earning the distinction as the largest bankruptcy filing in U.S. history. The events surrounding this history-making occurrence provide an important opportunity to examine the repercussions for WorldCom's stakeholders. We examine the impact of the events on the firm's institutional investors, creditors, and competitors. Despite the heightened uncertainty facing investors during this period, we find that markets are remarkably efficient in distinguishing among the various types of stakeholders. In particular, institutional investors and creditors are largely unaffected by the events. These results are consistent with the basic benefit of diversification; a single bankruptcy, even the world's largest bankruptcy, should have no impact on well-diversified shareholders. In contrast, large and key competitors are adversely affected by the events leading to the demise of WorldCom. The reactions may be attributed to scrutiny of rivals that are perceived to be facing similar problems. Thus, contagion effects appear to dominate any competitive repositioning for large and key competitors. This study indicates that shareholders, analysts, and portfolio managers are considering how firms with indirect ties to a financially distressed company may be affected.

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