

ACCOUNTING CONTAGION: THE CASE OF ENRON

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Abstract

The Enron scandal offers the opportunity to assess the degree to which misleading accounting can affect connected firms and industry rivals. While the market was inept at detecting the inaccuracy of Enron's financial statements, it swiftly punished many connected firms once Enron's faulty accounting was publicized. A cross-sectional analysis documents that the market punished connected firms that had greater exposure to Enron's business, whose financial statements were viewed as more complex, and that had greater financial leverage. Most of the negative news indicating concern with Enron's accounting corresponded with a significant decline in the stock prices of firms in the energy and natural gas (ENG) industry, regardless of an explicit connection to Enron. Furthermore, rival firms with direct exposure to Enron and more aggressive earnings-reporting methods also experienced more detrimental effects. (JEL G39, G14)

Introduction

The ability of financial markets to revalue stocks based on financial statements and other related information has received much attention in the financial literature. Because firms commonly possess asymmetric information, investors may rely on information about one firm as indirect signals for the valuation of others. While the sluggish market recognition of Enron's problems because of misleading financial statements is well documented, less is known about how these problems triggered accounting concerns about the industry and other firms that had relationships with Enron. The damage caused by Enron's misleading accounting statements is not limited to the shareholders and employees of Enron but can affect firms with linkages to Enron. The losses may extend to adverse effects on connected firms that have business relationships with Enron and also on rival firms in the same industry whose financial condition may have been overstated if they had used similar methods as Enron to report financial information.

Since Enron's collapse is attributed to its accounting irregularities,¹ the adverse effects of Enron's collapse on firms with linkages to Enron can be viewed as a form of accounting contagion. To the extent that misleading financial statements cause erroneous valuations of a reporting firm, they can cause erroneous valuations of firms with linkages to that firm.

Our goal is to measure the extent and breadth of corrected valuations following news of Enron's misleading financial statements.² We document negative valuation effects for connected firms that have a high degree of relative exposure to Enron and for all firms in the energy and natural gas (ENG) industry, regardless of an explicit connection to Enron. These results verify the existence of accounting contagion resulting from the recognition of Enron's problems. Furthermore, we identify potential sources of these significant valuation effects using cross-sectional analyses. For the connected firms, those variables that help explain the cross-sectional variation in the valuation effects are relative exposure to Enron, number of footnote disclosures,

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¹ Abdel-khalik (2002), Benston and Hartgraves (2002), Demski (2002), Gillan and Martin (2002), Healey and Palepu (2002), Lev (2002), and Revsine (2002) identify accounting irregularities that caused Enron's collapse.

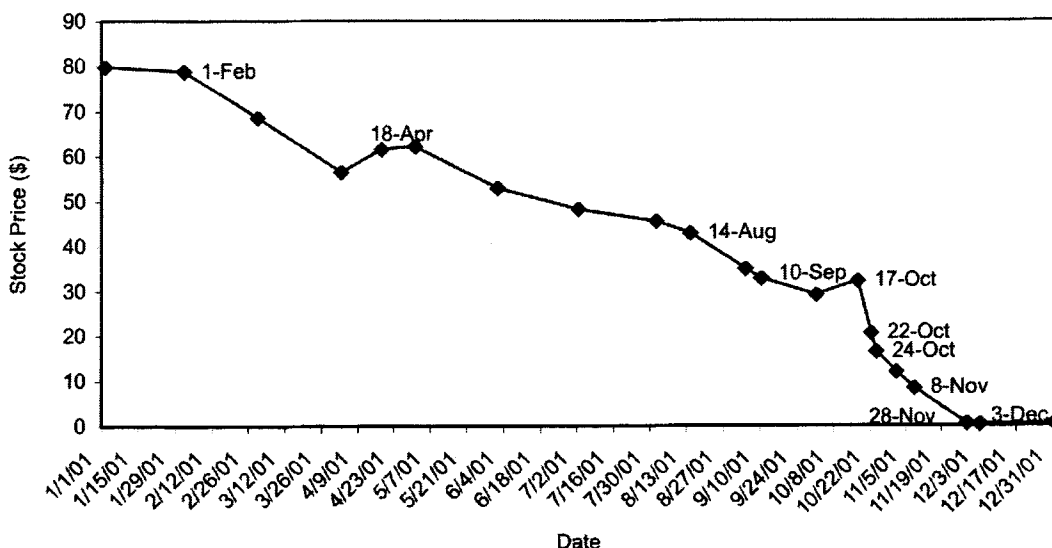
² Lev (2002) reports that, as of December 31, 2000, the market value for Enron was \$75.2 billion while its book value was \$11.5 billion.

membership in the ENG industry, financial leverage, and firm size. For the firms in the ENG industry, the significant explanatory factors are direct exposure to Enron, degree of earnings aggressiveness, financial leverage, prior stock price performance, and correlation in returns. These cross-sectional results substantiate that analysts are considering how firms they monitor are indirectly subjected to a related firm's misleading financial statements.

Chronology of Events Leading to Enron's Demise

Eleven months before going bankrupt, Enron's stock price was \$80 per share. Two months before going bankrupt, its stock price was \$30 per share. The chronology of important events that indicate concern over Enron's accounting information is summarized in Table 1.³ The stock price chart of Enron is shown in Figure 1, with points indicating these critical events identified in the chronology.

Figure 1: Enron's 2001 Stock Price.



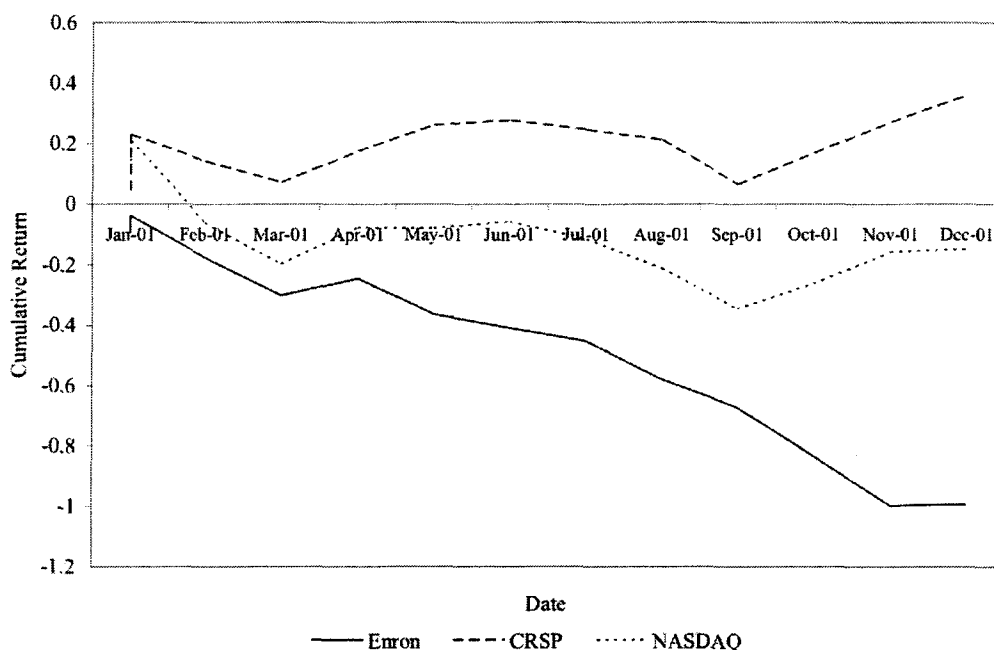
The chronology can be summarized as follows. Event 1 (Feb. 1, 2001) hinted at potential problems for Enron and other energy firms. The first strong indication of concern over Enron financial statements may have been revealed inadvertently on April 18, 2001 (Event 2), during an analysts' conference call to discuss first-quarter earnings. According to the *Houston Chronicle*, an analyst complained to Enron's CEO, "You're the only financial institution that can't come up with a balance sheet or cash flow statement after earnings." About four months later, Skilling resigned (Event 3). The next month (Event 4, September 10, 2001), Enron's accounting statements were questioned by the media. The following month (Event 5, October 17, 2001), Enron reported a large third-quarter loss. Five days later, Enron confirmed its complex accounting transactions (Event 6); this was followed two days later by Enron's announcement that CFO Andrew Fastow

³ Although Enron had several issues of concern to investors (e.g., reports of price fixing in California, abusing political connections, etc.), this study identifies those events related to the issue of inaccurate or insufficient accounting disclosure. Our events are similar to those 'critical events' identified by Healy and Palepu (2002) in their study that also focuses on the accounting disclosure problems at Enron.

had been replaced. Two weeks later, Enron admitted some accounting errors (Event 8), and its credit was downgraded to below-investment grade status 20 days later (Event 9). Just four days later, Enron filed for bankruptcy (Event 10). All 10 events are hypothesized to signal potential accounting irregularities of Enron.

Figure 2 shows the cumulative returns of Enron, Nasdaq, and the CRSP equally weighted composite during 2001. Notice that, during the fourth quarter of 2001, the Nasdaq and CRSP composite indices were experiencing upward trends while Enron was experiencing a downward trend.

Figure 2: 2001 Cumulative Returns for Enron and Market Indexes.



Related Intra-Industry Literature

Our focus is on the extent to which news about Enron's accounting discrepancies can affect the valuations of firms that conducted business with it and firms that are in the same industry. Several studies have documented that valuation effects from various events extend to industry rivals. However, there have been no studies that we are aware of that have examined whether the valuation effects extend to firms connected through business relationships.

In perhaps the most closely related research to the study at hand, Fenn and Cole (1994) investigate whether life insurance competitors were adversely affected by the asset write-down announcements of First Executive and Travelers. They find that negative valuation effects are greater for competitors with more junk bonds and commercial mortgages and for competitors with customers that could easily switch suppliers.

Past studies have found that corporate announcements can influence the values of competitors. It is common for intra-industry studies to predict contagion and/or competitive effects for industry rivals. Lang and Stulz (1992) recognize the coexistence of contagion and competitive effects as they evaluate the intra-industry effects from bankruptcy announcements. They find that competitors experience an average reduction of 1 percent in value with bankruptcy

announcements, showing that the contagion effects dominate the competitive effects. Nonetheless, they document that bankruptcy announcements in concentrated industries benefit those competitors that are in a position to gain market share.

Table 1: Events that Indicate Concern with Enron Accounting Statements.

Event	Date	Description	Source
1	Feb. 1, 2001	General comments about potential problems from volatility, misplaced bets, rogue traders, etc. for the energy industry, including Enron.	<i>Financial Times</i>
2	Apr. 18, 2001	Enron CEO, Jeffrey Skilling, used vulgarity towards analyst, Richard Grubman. Grubman asked to see Enron's balance sheet, Skilling responded that it would not be available until later, in disbelief Grubman stated that Enron was "the only financial institution that can't come up with a balance sheet or cash flow statement," and Skilling responded with vulgar language.	<i>Houston Chronicle</i>
3	Aug. 14, 2001	Enron CEO, Jeffrey Skilling, resigned, becoming the sixth senior executive to leave in a year. Lay said in a conference call with stock analysts, "I never felt better about the company" yet deflected analysts' pleas for more disclosure. Some analysts expressed concern that other surprises may be lurking.	PR Newswire and <i>LA Times</i>
4	Sep. 10, 2001	Report described Enron's poor stock price performance as stemming from "heavy insider trading, indecipherable accounting practices and a stream of executive departures." In general, the credibility of Enron's accounting statements was questioned.	<i>New York Times</i>
5	Oct. 17, 2001	Enron reported a third-quarter loss of \$618M due to \$1B in one-time charges. Enron Chairman, Kenneth Lay, confirmed that part of the one-time charges to earnings was due to complex transactions with limited partnerships created and run by Enron's CFO, Andrew Fastow.	<i>New York Times</i>
6	Oct. 22, 2001	Enron confirmed that the SEC opened an informal inquiry into Enron's complex transactions with limited partnerships tied to an Enron senior executive.	PR Newswire
7	Oct. 24, 2001	Enron CFO Andrew Fastow was replaced in an attempt to restore investor confidence. A class-action lawsuit was filed against Enron and its executives for misleading accounting statements.	Press Release by Enron & Business Wire
8	Nov. 8, 2001	Enron admitted accounting errors, inflating income by \$586M and understating debt by \$2.6B since 1997. This was Enron's first assessment of the degree to which their accounting statements were misleading.	Press Release by Enron
9	Nov. 28, 2001	Enron notified by Dynegy of merger termination. Enron's credit was downgraded to below investment grade.	Business Wire
10	Dec. 2, 2001	Enron filed for bankruptcy.	PR Newswire

Notes: These 10 major event dates reveal some degree of concern over the validity of Enron's accounting statements that ultimately led to the filing of bankruptcy; we obtain the event dates and descriptions from *Lexis-Nexis* daily news articles.

Intra-industry studies have been conducted to evaluate rival effects from not only bankruptcy announcements but also announcements such as loan-loss revisions, stock repurchases, and

takeovers, among others. Aharony and Swary (1996) documented dominant-bank contagion effects, whereby adverse news about one bank's loan prospects causes downward valuations of other banks with similar characteristics. Erwin and Miller (1998) find that rivals of firms conducting share repurchases experienced net competitive effects and suffered significant reductions in their share prices. Song and Walking (2000) find that rivals of takeover targets generate positive valuation effects from the acquisition announcements. Their cross-sectional analyses confirm that the rival valuation effects vary with characteristics that indicate the probability of takeover of the rival.

Hypotheses for Firms Linked to Enron

The Enron debacle is expected to cause the following effects. First, the events associated with Enron are expected to adversely affect firms with which it had business relationships. We evaluate whether the adverse news releases about one firm have contagion effects for these connected firms, such as suppliers, institutional investors, counterparties to trading, and creditors. To the extent that misleading accounting statements cause erroneous valuations of the reporting firm, they can cause erroneous valuations of those firms that rely on the reporting firm for their business.

Some events could contain confounding signals. For example, it may be argued that the replacement of Andrew Fastow could elicit a favorable market response, because it may imply that Enron is making efforts to improve its accounting situation. However, the accounting irregularities were not already recognized by the market, so any event that hints at or confirms the potential accounting irregularities is expected to elicit a negative market response. Any information that casts doubt about the future prospects of Enron may result in negative valuation effects for connected firms.

Some events contained multiple pieces of information. For example, On November 28, 2001 (Event 9), Enron's credit rating was lowered below investment-grade status, and Dynegy terminated its planned merger with Enron, yet both events led to a similar general conclusion of more negative views about Enron's financial condition than were previously recognized from its financial statements. A likely interpretation by the market is increased concerns about the potential degree of Enron's accounting irregularities.

Thus, we hypothesize that the market valuations of connected firms are reduced in response to news about Enron's accounting irregularities. More formally, our first hypothesis is as follows:

Hypothesis 1: The announcements that indicate concern over Enron's accounting information are expected to be associated with negative abnormal returns for connected firms.

Second, the events signaling the potential accounting irregularities of Enron could have affected rivals in the industry. To the extent that the misvaluation of Enron was completely attributed to firm-specific information, recognition of Enron's accounting irregularities should not adversely affect industry rivals. [See, for example, Aharony and Swary (1983).] In fact, it can be hypothesized that the only possible effect on rivals under these circumstances would be positive, because rivals could capture market share that may be lost by Enron due to reputational effects. These positive rival effects are considered to be competitive effects. Consistent with this view is the following hypothesis:

Hypothesis 2A: The announcements that indicate concern over Enron's accounting information are expected to be associated with positive abnormal returns for rival firms.

However, the news about Enron's faulty accounting could signal that rivals also overstated their respective financial condition if they used similarly creative accounting methods that resulted

in overstated earnings. Thus, it can alternatively be hypothesized that industry rivals experienced negative valuation effects, reflecting accounting contagion.

Hypothesis 2B: The announcements that indicate concern over Enron's accounting irregularities are expected to be associated with negative abnormal returns for rival firms.

Since the competitive and contagion effects may coexist for rival firms, an empirical examination would indicate which effect is dominant. A favorable share-price response of industry rivals would support the existence of competitive effects, while a negative share-price response of industry rivals would support the existence of accounting contagion effects.

Samples, Data, and Methods

We investigate how the information disseminated about Enron significantly affected the valuation of (1) Enron, (2) connected firms with business relationships with Enron, and (3) firms in the energy and natural gas industry.⁴ The inclusion of Enron itself in the analysis helps to identify which events cited earlier contain valuable information. The analysis of the other sets of firms addresses the main objectives of our study. The data compiled to assess each of the sets of firms are described next.

Sample of Connected Firms

We identify firms with exposure to Enron based on business relationships, using news reports in *Lexis-Nexis*. According to the news reports, the business relationships primarily include bank credits, financial credits, insurance activities, investments operations, purchase and sale agreements for natural gas and crude oil, and commodity transactions (e.g., derivatives and trading contracts and storage management and natural gas hedging). Of the 96 firms that were reportedly exposed to Enron, 76 firms have share-price data available in CRSP and are used for the analyses.

Sample of Firms in the Energy and Natural Gas Industry

Using Standard & Poor's *Compustat* database, we identify 73 firms in the energy and natural gas industry (SIC code 492X and 493X), of which 14 were reportedly directly exposed to Enron and the remaining 59 are considered not to have been. The subset of 14 directly exposed firms in the ENG industry effectively contains industry members who partner with Enron in some manner, whereas the subset of 59 unexposed firms should contain the more traditional industry competitors.

Models Used to Measure Valuation Effects

We test the share-price response of Enron and various portfolios of firms with linkages to Enron to the information disseminated about Enron using daily common stock returns over the period leading up to its bankruptcy. To estimate the share-price response to the news about Enron, we use the seemingly unrelated regression (SUR) technique described by Johnston (1984) and daily returns from CRSP for all trading days in 2001. He shows that, in the presence of contemporaneous correlation, the SUR method generates more efficient estimates. The first model we use to estimate the share-price response is as follows in (1), where R_{pt} = the return on the portfolio on day t ; R_{mt} = the return on the CRSP equally weighted market index on day t ; R_{mt-1} =

⁴ Based on potential reputational effects, we also examine whether the market penalized (rewarded) institutional investors that increased (reduced) their exposure to Enron during 3Q2001. We did not find statistically significant valuation effects for portfolios of publicly traded institutional investors.

the lagged return on the CRSP equally weighted market index on day $t-1$; $D_{kt} = 1$ on day 0 for event k using the one-day window (1 on day 0 and day +1 for event k using the two-day window)⁵ and 0 otherwise; $\delta_t = 1$ on the final event day (December 2, 2001) and all days following this event and 0 otherwise; β_{0p} = the intercept term for the portfolio; β_{1p} = the market/systematic risk of the portfolio; β_{2p} = the coefficient on the lagged CRSP equally weighted market index for the portfolio; λ_{kp} = the coefficient measuring the abnormal return for event k for the portfolio; β_{3p} = the shift in systematic risk of the portfolio due to the bankruptcy filing; and e_{pt} = the disturbance term for the portfolio on day t .

$$R_{pt} = \beta_{0p} + \beta_{1p}R_{mt} + \beta_{2p}R_{mt-1} + \sum_{k=1}^{10} \lambda_{kp}D_{kt} + \beta_{3p}\delta_t R_{mt} + e_{pt} \quad (1)$$

We estimate model (1) using daily returns for 2001. Following Saunders and Smirlock (1987) and Bhargava and Fraser (1998), we include the lagged market return to control for nonsynchronous trading and a dummy variable to account for shift in systematic risk.⁶

We also use an alternative model that deemphasizes any specific event dates and tests the valuation effect overall (for all event dates combined). A single dummy variable is used to designate all event dates. This alternative model is specified in (2) where $D_{kt} = 1$ on day 0 for each event k using the one-day window (1 on day 0 and day +1 for each event k using the two-day window) and 0 otherwise, $\gamma_{comb,p}$ = the coefficient measuring the average abnormal return to the set of events return for the portfolio, and all other variables were previously defined.

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

When the dummy variable coefficients for individual event dates have the same sign and are significant in model (1), the average valuation effects in model (2) will likely be significant as well. However, if the valuation effects (as measured by the dummy variable coefficients) in model (1) have opposite signs, such an offset could cause an insignificant dummy variable coefficient in model (2).

We expect the estimated coefficients for λ_1 to λ_{10} in model (1) and γ_{comb} in model (2) to be negative for Enron and for the connected firms. The sign on these coefficients for firms in the energy and natural gas industry should be positive if the competitive effects dominate and negative if the contagion effects dominate.

Cross-Sectional Analysis of Valuation Effects on Connected Firms

Accounting contagion effects on firms with linkages to Enron may vary with their respective financial characteristics. Using average abnormal returns (AAR) estimated in model (2) as a measure of accounting contagion effects on each connected firm j with reported exposure to Enron, we explore factors that may explain the cross-sectional variation in these valuation effects. Following Boehmer, Musumeci, and Poulsen (1991), we correct for event-date clustering and event-induced variance in abnormal returns by normalizing the AARs to obtain standardized AARs (SAAR). More specifically, the model we estimate is (3), where $SAAR_j$ = standardized

⁵ We use the two-day window of $[0, +1]$ because the majority of the events are reports from newswire services or from press releases by Enron, making it less necessary to use day -1.

⁶ Since we have a special case where the independent variables are the same across the portfolios, OLS and SUR generate the same coefficient estimates.

average abnormal return for firm j from model (2); Exp_j = dollar value of exposure divided by market capitalization for firm j ; the exposed value is gathered from news reports in *Lexis-Nexis*; $Earnagg_j$ = scaled accruals as specified by Bhattacharya, Daouk, and Welker (2003) for firm j ⁷; $Footnote_j$ = number of footnotes in the 2000 annual report (taken directly from the annual report) scaled by market capitalization for firm j ; $Engindy_j$ = dummy variable set equal to 1 if firm j operates in SIC 492X and 493X; $Finlev_j$ = book value of long-term debt to total assets for firm j ; $Lnsiz_ej$ = natural log of equity market value for firm j ; and ε_j = error term for firm j .

$$SAAR_j = \alpha_0 + \alpha_1 Exp_j + \alpha_2 Earnagg_j + \alpha_3 Footnote_j + \alpha_4 Engindy_j + \alpha_5 Finlev_j + \alpha_6 Lnsiz_ej + \varepsilon_j \quad (3)$$

The data for the independent variables used in the cross-sectional analysis are pulled from annual reports filed in the year 2000 and compiled in *Compustat* unless indicated otherwise. Market capitalization is calculated as the number of shares outstanding multiplied by the share price as of the end of the year 2000 as reported in *CRSP*. The regressions are conducted on a sample of 76 firms that have business relationships with Enron using weighted least squares to control for heteroskedasticity. The expected direction of influence on the connected firms is discussed in turn.

Exposure (Exp). In particular, the firms that have a higher degree of exposure to Enron as a result of their business relationship have more to lose. The exposures arise through bank credits, financial credits, insurance activities, investment operations, purchase and sale agreements for natural gas and crude oil, and commodity transactions (e.g., derivatives and trading contracts and storage management and natural gas hedging). Many firms had arrangements with Enron that could have led to substantial benefits. However, Enron's problems signaled that these firms would not be able to capitalize on the benefits. The firms that have a greater degree of exposure had more to lose and should therefore experience large declines in their valuations. As a result, we expect a negative sign on the α_1 coefficient.

Earnings aggressiveness (Earnagg). Firms that engage in business with Enron may use somewhat similar accounting treatments when reporting transactions related to natural gas contracts or when creating partnerships, even if they are not classified in the same industry. In response to the events associated with Enron, the market may have penalized those firms doing business with Enron that are perceived to use questionable accounting methods. Since more accruals may be taken by firms who seek to delay losses and accelerate gains, accruals can be a proxy for the degree of earnings aggressiveness. Given that Enron had aggressive accounting practices, we hypothesize that firms with aggressive accounting experience contagion effects to a greater extent than those with less aggressive accounting. Therefore, firms with more accruals are expected to be more heavily penalized in response to news about Enron's questionable accounting practices. A negative sign on the α_2 coefficient would be consistent with this reasoning.

Annual report footnotes (Footnote). Another proxy for questionable accounting is the disclosure of information through footnotes. A January 20, 2002, *New York Times* article (among others) indicates that Enron had some degree of disclosure of its complex transactions related to special-purpose entities if the reader can navigate a "tortuous path through the footnote section." Thus, it is possible that, with a greater number of footnotes, the financial standing and valuation of the firm is less clear. We expect that firms with more footnotes experience contagion effects to a

⁷ Scaled accruals is defined as $(\Delta \text{Current Assets} - \Delta \text{Current Liabilities} - \Delta \text{Cash} + \Delta \text{Current portion of long term debt} - \Delta \text{Depreciation and amortization} + \Delta \text{Income taxes payable}) / \text{Total assets in 1999}$. The changes are calculated as the figure for 2000 minus the figure for 1999.

greater extent and a more negative share-price reaction. This view supports an inverse relation between valuation effects and footnote disclosure, thus a negative sign on α_3 .

Energy and natural gas industry (Engindy). To the extent that the market believes that misleading accounting is a widespread practice in this particular industry, share prices of firms in the energy and natural gas industry may be adversely affected. While all firms in this subsample have exposure to Enron through some type of business relationship, those firms that are in the same industry may be subjected to greater punishment if they are more likely to apply the same accounting methods as Enron. The estimated α_4 should be negative.

Financial leverage (Finlev). One of the key issues regarding Enron's financial statements was its lack of complete disclosure about its debt. Gillan and Martin (2002) conclude that Enron accumulated leverage to manipulate reported earnings. Firms with greater financial leverage may be more tempted to use misleading accounting statements. Thus, we anticipate that firms with greater financial leverage are penalized to a greater extent than those with less financial leverage, resulting in a negative α_5 coefficient.

Size of the firm (Lnsiz). Based on the work of Atiase (1985), it can be argued that the contagion effects are inversely related to firm size. [See, for example, Slovin, Sushka, and Bendeck (1991).] Since larger firms may have greater analyst following and less information asymmetry, incremental information should be conveyed about relatively small firms. More specifically, smaller firms would experience more adverse valuation effects in response to incremental information, and a negative sign on α_6 would be revealed. However, Enron was the eighth largest firm in the U.S. and still exhibited major asymmetric information. Moreover, for this particular analysis, larger firms may be viewed as more complex and, as a result, may be subject to greater suspicion. A positive sign on α_6 could also occur. Ultimately, the sign on α_6 is an empirical question.

Cross-Sectional Analysis of Valuation Effects on Rival Firms

Accounting contagion effects on firms in the same industry as Enron may vary with their respective financial characteristics. Once again, we evaluate factors that may explain the cross-sectional variation in standardized average abnormal returns based on the estimates in model (2) for rival firms. The model that we estimate is (4) where Exp_i = dummy variable set equal to 1 if firm i has direct exposure to Enron; $Perform_i$ = percentage stock price change over the year prior to the first important news release on February 1, 2001, for firm i ; $Corr_i$ = correlation between the stock returns of Enron and firm i calculated over the 250-day period prior to the first important news release on February 1, 2001; $Mv bv_i$ = equity market value divided by equity book value for firm i ; and all other variables were previously defined.

$$SAAR_i = \alpha_0 + \alpha_1 Exp_i + \alpha_2 Earnagg_i + \alpha_3 Footnote_i + \alpha_5 Finlev_i + \alpha_6 Lnsiz_i + \alpha_7 Perform_i + \alpha_8 Corr_i + \alpha_9 Mv bv_i + \varepsilon_i \quad (4)$$

Again, accounting data used in these cross-sectional analyses are pulled from annual reports filed in the year 2000 and compiled in *Compustat*. Stock price data are gathered from *CRSP*. The regressions are conducted on the sample of 67 firms in the energy and natural gas industry using weighted least squares.⁸ All of the independent variables listed in the previous cross-sectional

⁸ We are unable to identify the number of footnotes for six firms in the sample; thus the sample size in these regressions is 67.

analysis are included in this analysis of industry rivals, with one exception. The Engindy dummy variable is not included in the cross-sectional analysis of rival firms because all firms in the sample are in the ENG industry and would be designated as 1.0. Plus, the following additional independent variables are included in this analysis.

Exposure (Exp). The firms in the same industry as Enron that also have some business relationship with Enron are expected to suffer to a greater degree. Thus, they should experience more severe contagion effects in response to the events related to Enron's misleading accounting and reveal a negative sign on the α_1 coefficient. This variable replaces the exposure proxy from the previous analysis, since some firms in the sample of rivals do not have any direct exposure.

Recent stock-price performance (Perform). Some firms in the same industry as Enron could have had large stock price runups prior to the events surrounding Enron because of the industry hype and momentum. These firms would be more vulnerable to large corrections once the market recognized that Enron's financial condition was overstated. Therefore, a negative sign on the α_7 coefficient is expected.

Correlation in stock returns (Corr). Not all firms that are classified with the same SIC code have similar operations. Some firms in the ENG industry had operations more similar to Enron than others. Firms that have operations that are most similar to Enron may be expected to experience a more pronounced market correction. A negative sign on the α_8 coefficient would be consistent with this reasoning.

Market-to-book ratio (Mbv). High ratios of market value to book value tend to occur when a firm is perceived to have strong growth opportunities. Some industry rivals may have inflated ratios due to exaggerated growth expectations for the industry. These rival firms may be penalized by news releases that indicate an industry leader, such as Enron, had exaggerated their accounting information. Thus, an inverse relation between market-to-book ratio and valuation effects, and hence a negative sign on α_9 , may be expected.

Results

Table 2 displays the results of the analyses for Enron using one- and two-day event windows. The valuation effects are measured by the dummy variable coefficients. Panel A shows that Enron experienced significant negative valuation effects during several of the one-day event windows, although the strongest effects did not occur until Enron confirmed that the SEC launched an informal investigation into its accounting practices. In panel B, the average abnormal share-price response across all events is significant at the 1 percent level for both the one- and two-day event windows. The fit of the model is stronger when each event is separated (panel A), since that model enjoys the flexibility to derive a distinct estimated market response (as measured by the coefficient) per event. Conversely, the simpler model (panel B), which classifies all events in the same category, can only generate one estimated market response that is forced to be the same across all events. When using either model to derive the market response, it appears that the market underreacted to the various events that signaled Enron's financial problems. The only positive share-price response for Enron occurs at the time it filed for bankruptcy. This may have occurred since the share price was already close to zero and bankruptcy could possibly protect against creditors and therefore transfer wealth from creditors to shareholders. Some investors may have attempted to benefit from the possible wealth transfer. In this case, the favorable share-price response should be specific to Enron and would not be a favorable signal for connected firms or industry rivals.

Table 2: One-Day and Two-Day Abnormal Returns for Enron.

Parameter	<u>One-Day Window</u>		<u>Two-Day Window</u>	
	Estimate	<i>t</i> -statistic	Estimate	<i>t</i> -statistic
<i>Panel A: Abnormal Returns for Each Event</i>				
β_0	-0.006	-0.84	-0.007	- 1.53
β_1	1.271	2.26***	1.131	3.27***
β_2	-0.169	-0.39	-0.167	- 0.49
λ_1	-0.109	-1.79*	-0.028	- 0.65
λ_2	-0.108	-1.74*	-0.042	- 0.94
λ_3	-0.098	-1.61	-0.043	- 1.00
λ_4	-0.096	-1.57	0.026	- 0.59
λ_5	-0.110	-1.80*	-0.070	- 1.64*
λ_6	-0.160	-2.61***	-0.112	- 2.63***
λ_7	-0.147	-2.41**	-0.092	- 2.16**
λ_8	-0.122	-2.00**	-0.047	- 1.11
λ_9	-0.313	-5.12***	-0.425	- 9.93***
λ_{10}	0.139	2.61***	0.536	13.01***
β_3	-2.685	-0.69	-2.512	- 0.91
Adjusted R ²	0.277		0.636	
F-Value	8.26***		34.15***	
<i>Panel B: Abnormal Returns Across All Events</i>				
β_0	-0.005	-0.65	-0.003	-0.34
β_1	1.325	2.43**	1.203	2.21**
β_2	-0.164	-0.30	-0.090	-0.17
γ_{comb}	-0.141	-3.52***	-0.103	-3.56***
β_3	-2.750	-0.62	-2.671	-0.60
Adjusted R ²	0.052		0.053	
F-Value	4.41***		4.49***	

Notes: Estimates are obtained using SUR and daily returns for all trading days in 2001; ***, **, and * indicate significance at 1, 5, and 10 percent, respectively; the OLS adjusted R² and F-values are also provided.

Table 3 shows how connected firms with exposure to Enron are affected by the events using both one- and two-day windows. Again, panel A reports the abnormal returns for each event, and panel B reports the average abnormal return across all the events. In both panels for each event window, the effects on the portfolio of all 76 connected firms are displayed as well as the effects for the quartile of firms with low relative exposure and the quartile of firms with high relative exposure. Relative exposure is defined as the dollar value of the exposure to Enron divided by market capitalization. The fit of the model is not as strong for the subset of firms with relatively low exposure to Enron (both panels in Table 3), likely due to the lower exposure.

Table 3: One-Day and Two-Day Abnormal Returns for Portfolios of Connected Firms.

Parameter	One-Day Window			Two-Day Window		
	All Firms	Low exp.	High exp.	All Firms	Low exp.	High exp.
<i>Panel A: Abnormal Returns for Each Event</i>						
β_0	0.000	-0.001	0.000	0.000	-0.001	0.000
β_1	0.454***	0.307***	0.648***	0.453***	0.307***	0.646***
β_2	0.004	0.066	0.080**	0.007	0.069	0.084**
λ_1	-0.004	-0.005	-0.005	-0.002	0.002	-0.002
λ_2	-0.006*	-0.007	-0.009**	-0.004	-0.002	-0.005**
λ_3	-0.004	-0.004	-0.005	-0.003	0.002	-0.001
λ_4	-0.005	-0.006	-0.007*	-0.002	0.000	-0.004
λ_5	-0.004	-0.004	-0.005	-0.002	0.002	-0.003
λ_6	-0.005	-0.005	-0.006*	-0.002	0.001	-0.003
λ_7	-0.005	-0.005	-0.006	-0.002	0.002	-0.003
λ_8	-0.005	-0.005	-0.007*	-0.002	0.002	-0.003
λ_9	-0.005	-0.006	-0.007*	-0.005	0.001	-0.003
λ_{10}	-0.006*	-0.008	-0.011***	-0.002	0.000	-0.004
β_3	0.140	-0.266	0.464	0.142	-0.260	0.467
Adj. R^2	0.328	0.033	0.552	0.334	0.051	0.533
F-Value	10.26***	1.64*	24.45***	10.52***	2.01**	22.69***
<i>Panel B: Abnormal Returns Across All Events</i>						
β_0	0.000	-0.001	0.000	0.000	-0.001	0.000
β_1	0.453***	0.306***	0.647***	0.451***	0.304***	0.643***
β_2	0.004	0.066	0.080**	0.005	0.067	0.082**
γ_{comb}	-0.005*	-0.006	-0.007**	-0.002	0.001	-0.003**
β_3	0.141	-0.265	0.466	0.144	-0.257	0.470
Adj. R^2	0.324	0.044	0.517	0.319	0.041	0.510
F-Value	30.55***	3.84***	67.01***	29.92***	3.61***	65.34***

Notes: Estimates are obtained using SUR and daily returns for all trading days in 2001; ***, **, and * indicate significance at 1, 5, and 10 percent, respectively; the OLS adjusted R^2 and F-values are also provided.

The results based on two-day event windows are less revealing than those based on one-day event windows; hence our discussion here is focused on the results from the one-day event window. Panel A shows that the most significant impact on the group overall occurred on April 18, 2001 (event 2), when CEO Skilling cursed at an analyst for questioning the accounting methods, and on December 2, 2001 (event 10), when Enron filed for bankruptcy. Panel B shows that the portfolio of firms that conducted business with Enron experienced negative and significant valuation effects from the events in aggregate. The quartile of firms most exposed to Enron exhibits significant adverse effects on the same two event dates as the entire portfolio as well as on four additional event dates. The subset of firms with relatively low exposure is not significantly affected.⁹

⁹ We also examine whether the exposed firms that use Arthur Andersen as their auditor during this time are more greatly penalized by these events. Our results for exposed firms using Andersen are not significant. Since the role of Andersen was not revealed until mid-November 2001, it is likely that this particular set of events would not yet have drawn attention to other Andersen clients. Indeed, Chaney and Philipich (2002) only found significant auditor reputation effects

Table 4 reports the results for firms in the energy and natural gas (ENG) industry using a one-day (two-day) event window. Panel A (panel B) reports the ARs for each event (AARs across all events).¹⁰ In both panels for each event window, the results are first displayed for the portfolio of all 73 rival firms, next for the subset of 14 firms with reported exposure to Enron, and then for the subset of the remaining 59 firms that are considered not to have been directly exposed to Enron. The subset of 59 unexposed firms contains the more traditional industry rivals.

Table 4: One-Day and Two-Day Abnormal Returns for Portfolios of Energy and Natural Gas Rival Firms.

Parameter	One-Day Window			Two-Day Window		
	All Rivals	Exposed	Unexposed	All Rivals	Exposed	Unexposed
<i>Panel A: Abnormal Returns for Each Even</i>						
β_0	0.000	0.001	0.000	0.000	0.001	0.000
β_1	0.301***	0.250***	0.311***	0.298***	0.245***	0.308***
β_2	-0.077**	-0.076	-0.084**	-0.075**	-0.072	-0.082**
λ_1	-0.005*	-0.008*	-0.005	-0.003	-0.005*	-0.002
λ_2	-0.006**	-0.009*	-0.006*	-0.003	-0.006*	-0.003
λ_3	-0.005	-0.008*	-0.004	-0.003	-0.005*	-0.002
λ_4	-0.005*	-0.008*	-0.005*	-0.003	-0.006*	-0.003*
λ_5	-0.005	-0.007	-0.004	-0.003	-0.006*	-0.003
λ_6	-0.005*	-0.008*	-0.005	-0.003	-0.006*	-0.003
λ_7	-0.005*	-0.008*	-0.005*	-0.003	-0.006*	-0.003
λ_8	-0.004	-0.008*	-0.004	-0.002	-0.005*	-0.002
λ_9	-0.005*	-0.008*	-0.005*	-0.003	-0.005*	-0.003
λ_{10}	-0.005	-0.010**	-0.004	-0.003	-0.005*	-0.002
β_3	0.219	0.537	0.123	0.222	0.539	0.125
Adj. R ²	0.243	0.113	0.276	0.239	0.091	0.268
F-Value	7.09***	3.42***	8.23***	6.95***	2.91***	7.94***
<i>Panel B: Average Abnormal Return Across All Events</i>						
β_0	0.000	0.001	0.000	0.000	0.001	0.000
β_1	0.300***	0.249***	0.310***	0.298***	0.245***	0.308***
β_2	-0.077**	-0.076	-0.084**	-0.075**	-0.073	-0.082**
γ_{comb}	-0.005**	-0.008**	-0.005*	-0.003*	-0.005**	-0.003
β_3	0.220	0.537	0.124	0.222	0.540	0.126
Adj. R ²	0.231	0.097	0.257	0.227	0.095	0.253
F-Value	19.54***	7.66***	22.39***	19.13***	7.48***	21.89***

Notes: Estimates are obtained using SUR and daily returns for all trading days in 2001; ***, **, and * indicate significance at 1, 5, and 10 percent, respectively; the OLS adjusted R² and F-values are also provided.

First, across both event windows, nearly every event results in a significant effect on the portfolio of exposed firms in the ENG industry. It appears that the negative news about Enron was interpreted by investors as a negative signal about firms in the industry who have a business relationship with Enron. Second, for the one-day window, the valuation effects are significant for

following the news report on January 10, 2002, that revealed Andersen shredded documents related to the Enron scandal.

¹⁰ As a robustness check, we looked at the nonparametric signed-rank test statistic for the AARs for the sample of connected firms and the sample of rival firms. These statistics confirm what we report in panel B of Tables 3 and 4.

the portfolio of all rivals and the portfolio of unexposed firms across several event dates and for the events in aggregate. A negative signal suggests a dominant accounting contagion effect, whereby Enron's faulty accounting elicits suspicion about the financial statements provided by other industry rivals. Thus, even though the rival's financial statements are not directly altered as a result of Enron, the interpretations of the rival's financial statements that followed some of the conventional (but perhaps also misleading) accounting standards may have been altered. Consequently, just as the deflation of a firm's accounting numbers may cause a reduction in the firm's stock price, it may also cause a reduction in the stock prices of competitors.

The results from the separate cross-sectional analyses of firms that conducted business with Enron and firms in the same industry as Enron are disclosed in Table 5. For each sample, two different dependent variables are used. A regression model is estimated using the standardized average abnormal return (SAAR), where the AAR is measured over both a one-day window and a two-day window. We examine the variance inflation factors (VIFs) to assess the extent of multicollinearity. All of the VIFs are below four, indicating multicollinearity is not substantially influencing the coefficients.¹¹

Table 5: Results of Cross-Sectional Regression Analysis on Connected and Rival Firms.

Expected Sign	Variables	Connected Firms		Rival Firms	
		1-day SAAR	2-day SAAR	1-day SAAR	2-day SAAR
	Intercept	1.502 (2.86***)	1.326 (2.65***)	0.605 (1.06)	0.473 (1.10)
-	Relexp	-0.006 (-3.08***)	-0.006 (-3.42***)	-	-
-	Exposed	-	-	-1.338 (-5.01***)	-0.853 (-4.22***)
-	Earnagg	-0.169 (-0.63)	-0.369 (-1.43)	-0.477 (-2.16**)	-0.188 (-1.12)
-	Footnote	-0.026 (-2.84***)	-0.007 (-0.84)	-0.003 (-0.79)	-0.002 (-0.87)
-	Engindy	-0.760 (-3.55***)	-0.803 (-3.94***)	-	-
-	Finlev	-1.748 (-3.60***)	-1.445 (-3.12***)	-3.807 (-3.65***)	-1.632 (-2.07**)
+ or -	Lnsiz	-0.126 (-1.97**)	-0.077 (-1.27)	-0.002 (-0.02)	-0.076 (-1.17)
-	Perform	-	-	-0.308 (-1.28)	-0.638 (-3.51***)
-	Corr	-	-	0.845 (0.85)	1.454 (1.93*)
-	Mvbk	-	-	0.203 (1.14)	0.156 (1.16)
	Adj. R ²	0.508	0.439	0.449	0.500
	F-Value	12.19***	9.49***	8.76***	10.51***

Notes: The dependent variable is the firm's SAAR from model (2) using weighted least squares; ***, **, and * indicates significance at 1, 5, and 10 percent, respectively.

¹¹ VIFs greater than five often are used to indicate severe multicollinearity. [See Marquardt and Snee (1975).]

Variation in Valuation Effects on Connected Firms

The first two columns of results in Table 5 are from the sample of firms that conducted business with Enron. Several variables are significantly related to the valuation effects of firms that conducted business with Enron. We find three variables that are consistently significant across both models; two additional variables are significant when the dependent variable is the one-day SAAR.

Both models indicate that the *Relexp* variable is negative and significant, which confirms the hypothesis that firms with a greater degree of exposure to Enron experienced more pronounced adverse effects. The *Engindy* variable is negative and significant, which implies that those firms within this specific sample that are also in the same industry as Enron were penalized to a greater degree. The *Finlev* variable is negative and significant, which suggests that firms with a higher degree of financial leverage were penalized to a greater degree.

Using the one-day SAAR as the dependent variable, *Footnote* and *Lnsiz* are also found to be significant. The *Footnote* variable is negative and significant, which indicates that firms with a greater number of footnote disclosures experience greater contagion effects. Lastly, there is some evidence that firm size (*Lnsiz*) is inversely related to valuation effects. To the extent that firm size is a proxy for the degree of complexity as in the case of Enron itself, this finding indicates that misleading information may be underlying the financial statements of larger, more complex firms.

Variation in Valuation Effects on Rival Firms

The last two columns of results in Table 5 are from the sample of firms in the same industry as Enron. We find two variables that are consistently significant across both models, plus three additional variables depending on which dependent variable is used. The firms with direct exposure (*Exposed*) to Enron are more adversely affected. Firms with greater financial leverage (*Finlev*) were penalized to a greater degree, which may result if these firms are more tempted to use misleading accounting.

Using the one-day SAAR as the dependent variable, *Earnagg* is negative and significant. An inverse relationship between the degree of earnings aggressiveness and wealth effects supports the hypothesis that firms with aggressive accounting experienced greater contagion effects than those with less aggressive accounting. Using the two-day SAAR, *Perform* and *Corr* are also found to be significant. The negative sign on the *Perform* variable indicates that firms with a stronger runup were penalized to a greater degree. While the positive sign on the *Corr* variable shows that firms in the ENG industry with operations more similar to Enron are more favorably affected. This result may arise due to competitive repositioning that is expected to benefit close rivals.

Summary

While the direct effect on Enron is known, the indirect effects on connected firms and industry rivals are not well documented. Our analysis measures the depth of the damage caused by Enron's faulty accounting. First, the negative news about Enron on at least two event dates was transmitted to those firms that were known to have exposure to Enron. Second, the negative news about Enron adversely affected firms in the energy and natural gas industry. Overall, the findings substantiate how the inaccurate financial reporting by a single firm may affect not only its shareholders but also the shareholders of connected firms and competitors. While the market was unable to detect the inaccuracy of Enron's financial statements, it swiftly punished firms with linkages once Enron's faulty accounting was publicized.

The underlying reason for the negative effects of firms that did business with Enron or were in the same industry as Enron is not only attributed to exposure to Enron but also to suspicion about accounting methods. A cross-sectional analysis documents that the market punished firms that had greater exposure to Enron's business, that used more aggressive earnings reporting methods, and whose financial statements were more complex. In retrospect, the confusing financial statements

allowed these firms to perform better than they should have before the demise of Enron but resulted in more pronounced corrections following the demise of Enron. Furthermore, any competitive effects that may have been enjoyed by the industry rivals were overwhelmed by adverse accounting contagion effects.

References

- Abdel-khalik, A. Rashad. 2002. "Reforming Corporate Governance Post Enron: Shareholders' Board of Trustees and the Auditor." *Journal of Accounting and Public Policy* 21: 97-103.
- Aharony, Joseph, and Itzhak Swary. 1983. "Contagion Effects of Bank Failures: Evidence From Capital Markets." *Journal of Business* 56: 305-322.
- Aharony, Joseph, and Itzhak Swary. 1996. "Additional Evidence on the Information-Based Contagion Effects of Bank Failures." *Journal of Banking and Finance* 20: 57-69.
- Atiase, Rowland K. 1985. "Predisclosure Information, Firm Capitalization, and Security Price Behavior Around Earnings Announcements." *Journal of Accounting Research* 23: 21-36.
- Benston, George J., and Al L. Hartgraves. 2002. "Enron: What Happened and What We Can Learn from It." *Journal of Accounting and Public Policy* 21: 105-127.
- Bhargava, Rahul, and Donald R. Fraser. 1998. "On the Wealth and Risk Effects of Commercial Bank Expansion into Securities Underwriting: An Analysis of Section 20 Subsidiaries." *Journal of Banking and Finance* 22: 447-465.
- Bhattacharya, Utpal, Hazem Daouk, and Michael Welker. 2003. "The World Price of Earnings Opacity." *Accounting Review* 78: 641-678.
- Boehmer, Ekkehart, Jim Musumeci, and Annette B. Poulsen. 1991. "Event-Study Methodology Under Conditions of Event-Induced Variance." *Journal of Financial Economics* 30: 253-272.
- Chaney, Paul K., and Kirk L. Philipich. 2002. "Shredded Reputation: The Cost of Audit Failure." *Journal of Accounting Research* 40: 1221-1245.
- Demski, Joel S. 2002. "Enron et al. – A Comment." *Journal of Accounting and Public Policy* 21: 129-130.
- Erwin, Gayle R., and James M. Miller. 1998. "The Intra-Industry Effects of Open Market Share Repurchases: Contagion or Competitive?" *Journal of Financial Research* 21: 389-406.
- Fenn, George W., and Rebel A. Cole. 1994. "Announcements of Asset-Quality Problems and Contagion Effects in the Life Insurance Industry." *Journal of Financial Economics* 35: 181-198.
- Gillan, Stuart L., and John D. Martin. 2002. "Financial Engineering, Corporate Governance, and the Collapse of Enron." *Working paper*. University of Delaware.
- Healy, Paul M., and Krishna G. Palepu. 2002. "Governance and Intermediation Problems in Capital Markets: Evidence from the Fall of Enron." *Working paper*. Harvard University.
- Johnston, J., 1984. *Econometric methods*. New York: McGraw Hill.
- Lang, Larry H.P., and Rene M. Stulz. 1992. "Contagion and Competitive Intra-Industry Effects of Bankruptcy Announcements: An Empirical Analysis." *Journal of Financial Economics* 32: 45-60.
- Lev, Baruch. 2002. "Where Have All of Enron's Intangibles Gone?" *Journal of Accounting and Public Policy* 21: 131-135.
- Marquardt, Donald W., and Ronald D. Snee. 1975. "Ridge Regression in Practice." *American Statistician* 29: 3-19.
- Revsine, Lawrence. 2002. "Enron: Sad but Inevitable." *Journal of Accounting and Public Policy* 21: 137-145.
- Saunders, Anthony, and Michael Smirlock. 1987. "Intra- and Interindustry Effects of Bank Securities Market Activities: the Case of Discount Brokerage." *Journal of Financial and Quantitative Analysis* 22: 467-482.
- Slovin, Myron B., Marie E. Sushka, and Yvette M. Bendeck. 1991. "The Intra-Industry Effects of Going-Private Transactions." *Journal of Finance* 46: 1537-1549.
- Song, Moon H., and Ralph A. Walkling. 2000. "Abnormal Returns to Rivals of Acquisition Targets: A Test of the 'Acquisition Probability Hypothesis.'" *Journal of Financial Economics* 55: 143-171.