

# Financial Frictions and Reaction of Stock Prices to Monetary Policy Shocks

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## Abstract

This paper reveals a new theoretical implication of the credit channel of monetary policy: the stock prices of financially more constrained firms are *less* responsive to monetary policy shocks. In order to study this implication, we use Enron scandal as an exogenous increase in the monitoring cost of the Arthur Andersen clients relative to other firms. We find that Arthur Andersen clients' stock prices have responded about 50 to 60 basis points less than other firms to a 10 basis point surprise reduction in federal funds target rate in the final days of the scandal, which is in line with the new implication of the credit channel. Moreover, this effect is particularly strong among firms with no ratings, high R&D spending, and positive accruals, likely reflecting that a reliable financial statement is a more important monitoring tool for opaque firms.

Keywords: monetary policy, stock market, credit channel, financial constraints

Yes, it is a black box. But it is a black box that's growing the wholesale business by about 50 percent in volume and profitability. That's a good black box.

Jeff Skilling, Enron CEO, February, 21, 2001

It's in a bunch of complex businesses. Its financial statements are nearly impenetrable. So why is Enron trading at such a huge multiple?

Bethany McLean, Fortune Magazine, March, 5,2001

# 1 Introduction

This paper studies the relationship between financial frictions and the reaction of stock prices to monetary policy shocks. Using the financial accelerator framework of Bernanke, Gertler, and Gilchrist (BGG, 1999), we initially reveal a new theoretical implication of the credit channel of monetary policy: The stock prices of financially more constrained firms, i.e. firms subject to greater monitoring costs, are *less* responsive to monetary policy shocks because monetary policy affects stock prices through external finance and firms with greater monitoring cost rely less on external finance.

Because the main source of financial frictions in BGG framework is monitoring costs, the ideal test of this theoretical result requires an experiment with treatment and control groups where the monitoring cost of the treatment group is increased relative to that of the control group. Due to the absence of these ideal conditions, the papers in the literature usually rely on indirect proxies of financial constraints which might suffer from endogeneity problems. Instead, we recognize that firms' financial statements serve greatly to reduce the monitoring costs of investors and use the ENRON accounting scandal of 2001 and the resulting demise of its auditing firm, Arthur Andersen, as an exogenous large shock to the monitoring cost of other Arthur Andersen clients in comparison to the clients of other auditing companies. We find that the stock price of Arthur Andersen clients have responded about 50 to 60 basis points less than other firms to a 10 basis point surprise reduction in federal funds target rate in the final days of the scandal. This effect is very large, considering that, on average, a 10 basis points surprise decrease in federal funds target rate leads to a 100 basis points increase during this time period.

Our paper is closely related to the widely studied topic of monetary policy transmission to the real economy, in particular the credit channel.<sup>1</sup> The implications of credit channel for firms' investment and hiring decisions are extensively studied in a long strand of literature

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<sup>1</sup>More recently, the meaning of credit channel has been blurred due to alternative mechanisms that have been proposed to explain how this channel should work. Here, we refer to the traditional credit channel which is today more widely known as the firm (borrower) balance sheet channel.

pioneered by Gertler and Gilchrist (1994), Kashyap, Lamont, and Stein (1994), and Oliner and Rudebusch (1996) among others. Our paper is also related to an extensive literature on how monetary policy affects stock prices.<sup>2</sup> However, because these two strands of literature grew separately, there are relatively very few papers that study how the credit channel influences the sensitivity of stock prices to monetary policy which is the intersection we focus on.

Due to the difficulties in measuring financial constraints, the papers in this intersection look at indirect proxies, most notably firm size, using the license provided by Gertler and Gilchrist (1994) who argue that "in nearly every study the "likely to be constrained" firms are much smaller on average than the control group". Perez-Quiros and Timmermann (2000) use lagged change in monetary base as a proxy of monetary policy and find that small firms' stock prices react more strongly to monetary policy. Lamont, Polk, and Saa-Requejo (2001) recognize that the modern monetary policy is actually based on interest rates rather than monetary base. Therefore, they study federal funds rate and discount window rate and find no evidence that the relative performance of constrained firms reflects monetary policy, credit conditions, or business cycles. Ehrmann and Fratscher (2004) recognize that investors are not caught totally off-guard when federal funds target rate changes and therefore stock prices should only react to the surprise component in the target rate change. They calculate the surprise component of federal funds target rate change using the difference between the actual target rate change and the anticipated change measured by the survey expectations. In their study on the S&P 500 firms, they find that firms with small size, poor credit ratings, and low debt to capital ratios, or a high Tobin's q are affected significantly more by monetary policy. Subsequent papers in this literature focus on the same problem in a more international setting.<sup>3</sup>

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<sup>2</sup>A long but incomplete list includes Geske and Roll (1983), Kaul (1987), Lee (1992), Thorbecke (1997), Patelis(1997), Bomfim and Reinhart (2000), Kuttner (2001), Cochrane and Piazzesi (2002), Bomfim (2003), Fuhrer and Tootell (2003), Dupor and Conley (2004), Rigobon and Sack (2004), Bernanke and Kuttner (2005), Gurkaynak, Sack, and Swanson (2005), Bjørnland and Leitemo (2009). See also Sellin (2001) for an earlier survey.

<sup>3</sup>See, for example, Ammer, Vega, and Wongsman (2010) and Laeven and Tong (2012).

Our contribution addresses two shortcomings in this literature. First, the hypotheses in these papers are not based on an explicitly formulated theory which generates a lack of clear definition of financial constraints. We address this problem by providing a clean analysis based on the financial accelerator framework of Bernanke, Gertler, and Gilchrist (1999) who define financial frictions as monitoring costs.<sup>4</sup> While the framework is not new, the novel implication of the model is loud and clear: firms subject to greater monitoring costs are less responsive to monetary policy shocks because monetary policy affects firms stock prices through external finance and firms with greater monitoring cost rely less on external finance. While there are myriads of ways to model financial constraints we focus on this particular model with monitoring costs, not only because of its popularity but also because we want to trade the vague definition of financial constraints in previous studies with a more precise and clear one that we can more easily study.

Second, we address the endogeneity problem associated with indirect proxies of financial constraints as this problem has been increasingly recognized in the empirical corporate finance literature over the last decade.<sup>5</sup> For this purpose, we use Enron scandal as an exogenous variation in the monitoring cost of the Arthur Andersen clients relative to other firms. This approach alleviates the omitted variable problem because the origin of the accounting scandal is outside of the firms we study, a sample that excludes Enron. Before the scandal Enron was a highly praised firm for its success and the subpar accounting practices of Enron and Arthur Andersen did not come to surface until 2001. This pattern is evident not only in mass media but also in the academic literature on auditor choice that put all the Big N accounting firms into the same quality category until Enron scandal. Therefore, it is reason-

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<sup>4</sup>The Bernanke, Gertler, Gilchrist (1999) framework is in essence an application of the costly state verification model in Townsend (1979). Due to space constraints, we do not list thousands of citations of these papers here.

<sup>5</sup>As an example of bias in previous studies, Ehrmann and Fratscher (2004) aim to solve the endogeneity problem caused by the mismeasurement of monetary policy surprises but they ignore the the mismeasurement and omitted variable bias caused by using proxies for vaguely defined financial constraints. They find that the stock prices of small firms in their sample, consisting of S&P 500 firms, respond more to monetary policy shocks. However, we find that in a more comprehensive sample of the overall stock market smaller firms' stock prices react less to monetary policy shocks even after controlling for liquidity of the stock. While these results are outside of the scope of this paper they are available upon request.

able to assume that the auditor choice did not have any sizable effect on market valuation of the firms before the scandal. Nevertheless, we also address any remaining endogeneity concerns by using an instrumental variable approach and a placebo experiment.

## 2 The Model and a New Empirical Prediction

In this section, we show that the responsiveness of a firm's market value of equity to monetary policy shocks decreases as financial frictions increase. For this purpose, we follow the popular framework in Bernanke, Gertler, Gilchrist (1999), Appendix A in particular. The only difference is that we normalize the price of capital and aggregate return on capital to one, since these variables are the same for all firms and we are interested in cross-sectional comparison.

If we let  $w$  be the firm's profitability,  $K$  be its capital and  $B$  be the face value of debt, we can write the firm's problem subject to costly state verification as

$$V = \max_{K,B} E (wK - B)^+$$

subject to the incentive compatibility constraint of the lender

$$R(K - N) = E (\mathbb{I}_{wK \geq B} B + \mathbb{I}_{wK < B} (1 - \mu) wK)$$

where  $R$  is the gross risk-free rate,  $N$  is given net worth, or book equity, of the firm,  $\mu$  is the monitoring cost, and  $\mathbb{I}$  denotes the indicator function that is equal to one if the corresponding condition is satisfied and zero otherwise. We are interested in  $\partial \ln V / \partial R \partial \mu$  because the interest rate is set by the monetary authority and monitoring cost is the main source of financial frictions.

Defining  $v \equiv V/N$ ,  $k \equiv K/N$ , and  $\bar{w} \equiv B/K$ , we can rewrite the firm's problem as

$$v = \max_{k, \bar{w}} E(w - \bar{w})^+ k \quad (1)$$

subject to

$$R(k - 1) = E(\mathbb{I}_{w \geq \bar{w}} \bar{w} + \mathbb{I}_{w < \bar{w}} (1 - \mu) w) k. \quad (2)$$

Because we are interested in how the percentage change in stock prices in response to a change in risk-free rate varies with monitoring costs and because net worth,  $N$ , is a state variable independent of interest rate we can directly work with  $v$ , instead of  $V$ , which reduces our problem's dimension.

We start by showing that firms using more external finance are more responsive to monetary policy shocks.

**Proposition 1** *The sensitivity of a firm's stock value to monetary policy shocks,  $\partial \ln V / \partial R$  increases as the ratio of total capital to internal funds,  $K/N$ , increases.*

**Proof.** Solving constraint (2) for  $k$  and plugging the solution into objective function (1) gives an unconstrained problem in  $\bar{w}$ . Then, using the envelope theorem, we get  $d \ln V / dR = 1/R - 1/[R - E(\mathbb{I}_{w \geq \bar{w}} \bar{w} + \mathbb{I}_{w < \bar{w}} (1 - \mu) w)]$ . Using constraint (2), this reduces to  $d \ln V / dR = (1 - k)/R$  which is negative because  $k > 1$  and moreover  $|d \ln V / dR|$  increases in  $k \equiv K/N$ .

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Intuitively, monetary policy affects the firm's behavior by changing the premium the firm has to pay on external finance. Therefore, a firm that relies more on external finance will be affected more by the monetary policy shock. The next proposition establishes that firms subject to greater monitoring costs use less external finance.

**Proposition 2** *Let  $f(w)$  and  $F(w)$  denote the pdf and cdf of the firm's productivity,  $h(w) \equiv f(w)/(1 - F(w))$  denote the hazard rate, and let  $\bar{w}h(\bar{w})$  be increasing in  $\bar{w}$ . Then, the ratio of total capital to internal funds,  $K/N$ , decreases in monitoring costs,  $\mu$ .*

**Proof.** See Appendix. ■

Intuitively, firms with greater monitoring costs rely less on external finance as they have to pay a higher premium. The assumption regarding the hazard rate is imposed by Bernanke, Gertler and Gilchrist (1999) to guarantee a non-rationing outcome which is particularly realistic for the publicly listed firms we study. We refer the reader to Appendix A.1 of Bernanke, Gertler and Gilchrist (1999) for details.

Putting these two proposition together, we conclude that firms with higher monitoring costs rely less on external finance which makes them less sensitive to monetary policy shocks. Therefore, the two propositions lead to the following corrolary which is the main theoretical result of this paper.

**Corollary 3** *The monetary policy sensitivity of stock price is less for firms that are subject to greater monitoring costs.*

We will test this theoretical result in the next section.

## 3 Empirical Analysis: Motivation and Data

### 3.1 Motivation of Empirical Strategy

There are two main empirical challanges in testing our hypothesis: endogeneity of the financial constraints and identification of monetary policy actions. In terms of the first challenge, the ideal test of our main theoretical result requires an experiment with treatment and control groups where the monitoring cost of the treatment group increases relative to that of the control group. Due to the absence of these ideal conditions, the papers in the literature generally rely on indirect proxies of financial constraints which might suffer from endogeneity problems, in particular from omitted variable bias. Instead, our identification approach recognizes that firms' financial statements serve greatly to reduce the monitoring costs of



investors and uses the ENRON accounting scandal of 2001 and the resulting demise of its accounting firm, Arthur Andersen, as an exogenous large shock to the monitoring cost of other Arthur Andersen clients in comparison to other auditors' clients.

There are two implicit assumptions in this approach. The first one is that the auditor choice did not have any sizable effect on market valuation of the firms before the scandal. In particular, the perceived probability of an Arthur Andersen client to engage in fraud prior to Enron was not different compared to clients of other firms. This pattern is evident not only in mass media, which highly praised Enron before the scandal, but also in the academic literature on auditing quality that put all the Big N accounting firms, including Arthur Andersen, into the same quality category until ENRON scandal.<sup>6</sup> Consistent with this pattern, Eisenberg and Macey (2004) and Agrawal and Chada (2005) find that Arthur Andersen clients did not get involved with more financial restatements than other firms in the years preceding the ENRON scandal. Similarly, Dyck, Morse, and Zingales (2013) find that Arthur Andersen clients were not more likely to engage in earnings manipulation compared to other firms and their paper indeed makes the same identification assumption in their study of economic cost of fraud.

A weaker, but still sufficient, version of this assumption is that the auditor choice is independent of the characteristics that might affect how a firm's stock price sensitivity to monetary policy shocks changes with increasing monitoring costs. This is a weaker assumption than assuming that the auditor choice does not have a material effect on market valuation. Nevertheless, we also hedge against any remaining endogeneity concerns we might have overlooked by using the auditor choice in 1995 as an instrument in an IV framework, noting that firms usually establish long-term relationships with their auditor and while the characteristics that affect their market valuation varies over time these changes are unlikely to be correlated by their auditor choice long time ago. Using lagged dependent variables is

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<sup>6</sup>See, for example, Francis, et. al. (1999). This tendency of pooling Big N accounting firms into the same quality has continued in the top accounting journals even after the Enron scandal. See, for example, and Chaney, Jeter, and Shivakumar (2004) and Chang, Dasgupta, and Hilary (2009).

quite common in the macroeconomics and finance literature but researchers generally use one year lags. By using a long lag, we try to be as conservative as possible and stack the odds against ourselves although the lag length does not have any qualitative effect on our results. We also use the auditor choice in 1998 and 1999 as instruments in a separate regression because we find that the auditor choice in earlier years do not have any explanatory power for the auditor choice in 2000 once we control for these years.

The second assumption relies on contagion effects of accounting fraud based on sharing the same auditing firm: the reliability of financial statements by other Arthur Andersen clients decreased relative to clients of other auditors. Consistent with this assumption, Dyck, Morse, and Zingales (2013) find that the probability of fraud detection has increased drastically for former Arthur Andersen clients once they switched to another auditor after the scandal. Moreover, Gleason, Jenkins, Johnson (2008) use stock returns to provide evidence for the contagion effect of accounting restatements on the financial statement credibility of non-restating firms. They argue that the contagion effect is unrelated to changes in analysts' earnings-per-share forecasts and that it is stronger for the firms with low accounting quality that share the same external auditor. This finding is also consistent with our assumption that the Enron scandal has decreased the reliability of financial statements and hence the cost of monitoring for other Arthur Andersen clients.

Under these two assumptions, our approach addresses the first challenge of alleviating the endogeneity problem related with financial constraints. In order to address the second challenge, the endogeneity of monetary policy actions, we follow the approach of Kuttner (2001) and Bernanke and Kuttner (2005) to dissect the monetary policy actions into the unexpected (*surprise*) component and the anticipated (*expected*) component on FOMC announcement dates because the equity market would have already responded to anticipated policy actions. The identification of the surprise element in the target rate change relies on the price of the current month 30-day federal funds futures contracts, a price which encompasses market expectations of the effective federal funds rate. We follow this method because

federal funds futures outperform target rate forecasts based on other financial market instruments or based on alternative methods, such as sophisticated time series specifications and monetary policy rules.<sup>7</sup> Another advantage of looking at one-day changes in near-dated federal funds futures is that federal funds futures do not exhibit predictable time-varying risk premia (and forecast errors) over daily frequencies.<sup>8</sup> Similarly, over daily frequencies, the effect of Enron scandal on risk premia of the firms is negligible compared to the effect of the monetary policy surprise on FOMC announcement dates.

The ENRON scandal is not a sudden event but rather a scandal that got unveiled over the course of 2001 and there is no perfectly reliable way to figure out investors' belief on the probability of an accounting scandal. Therefore, we need an FOMC announcement day that is late enough in 2001 to incorporate the full effect of the scandal and also has a sizeable monetary policy surprise. Moreover, we need to avoid the unscheduled FOMC announcements to avoid the effect of timing shocks which would reduce the exogeneity of the measured policy surprise. We choose the scheduled FOMC announcement on 6 November, 2001 because this date includes a sizeable monetary policy surprise (-10 basis points) for the 50 basis points reduction in federal funds target rate on that date and it is very close to 8 November, 2001 when Enron filed the 8-K report announcing that it will restate financial documents dating from 1997 through the second quarter of 2001.<sup>9</sup>

As a comparable "before treatment" date we choose 15 May 2001 because this date shares similar characteristics to the announcement on 6 November 2001. In particular, the

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<sup>7</sup>See Evans (1998) and Gürkaynak, Sack and Swanson (2007) for details.

<sup>8</sup>See, for example, Piazzesi and Swanson (2008). Details of this policy surprise measure are given in the data section.

<sup>9</sup>The financial restatement announcement on November 8 has not been a big surprise to the market participants. On October 16, 2002, Enron posted huge losses in shareholder's equity as a nonrecurring item related to the termination of "certain structured finance arrangements". On October 22, 2001, Enron announced that the SEC had requested information regarding certain related party transactions. Following October 16, 2001, Enron's stock price fell almost 75 percent from \$33.84 to \$9.05 by November 7, 2001, the day before it announced that it would restate earnings for 1997 through 2001. In the days surrounding the restatement announcement, its stock price fell from \$9.05 to \$8.63, a drop of less than 5 percent suggesting that the market priced in the financial restatement before the announcement. This suggests that the financial restatement announcement on November 8 has not been a big surprise to the market participants which together justifies our use of 6 November 2001 FOMC announcement as the "after" period.

change in federal funds target rate on both dates was -50bp, both of them were scheduled announcements and they have a similar size for the monetary policy surprise, -8bp vs -10bp, both of which are negative so that we do not need to worry about asymmetric effects of expansionary and contractionary policy shocks. The other FOMC dates in early 2001 were either unscheduled which would introduce timing shocks and violate exogeneity of monetary policy surprise or had zero or positive surprises.

Our main analysis is a difference in differences approach implemented as the regression

$$return = \beta_0 + \beta_1 AAClient + \beta_2 After + \delta AAClient * After + controls + error$$

where  $\delta$  is the parameter of interest. *AAClient* is a dummy variable equal to one if the firm's financial statements for year 2000 is audited by Arthur Andersen and zero otherwise. *After* is a dummy variable that is equal to one for the observations on 6 November 2001 and zero for observations on 15 May 2001.

For our main analysis, we are not using any time series dimension because the probability of accounting scandal assigned by investors has been changing over time in 2001, which is hard to measure. Despite the absence of such a measure we can still attempt a panel data analysis if we are content with an imperfect proxy of the investor's beliefs about the scandal. To facilitate this analysis, we assume that the fate of Enron in 2001 was tied to the outcome of the scandal and hence use Moody's Expected Default Frequency (EDF) as a proxy the investor's belief about the scandal. Our results are validated by this panel data analysis which is presented in a separate robustness section.<sup>10</sup>

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<sup>10</sup>Our results are robust when we use Enron's daily stock price instead of Moody's daily EDF, which is not surprising given that Enron's stock price is a direct ingredient to EDF measure. We have also tried monthly CHS score of Campbell, Hilscher and Sziglayi (2008). While the results are qualitatively similar they have lower statistical significance, as expected from the increased measurement error due to matching daily data with monthly proxies.

## 3.2 Data Description

**Monetary Policy Surprise:** Following Bernanke and Kuttner’s analysis, we define an event as either an FOMC meeting or an announced change in the funds target rate. Kuttner (2001) and Bernanke and Kuttner (2005) obtain the corresponding surprise change in the target rate by first calculating the change in the rate implied by the corresponding futures contract, given by 100 minus the futures contract price, and then scaling this result by a factor associated with the number of days of the month in which the event occurred because the payoff of the contract is determined by the average realized federal funds effective rate during the month. Accordingly, the unexpected target rate change, for an event taking place on day  $d$  of month  $m$ , is given by

$$\Delta i^u = \frac{D}{D-d}(f_{m,d}^0 - f_{m,d-1}^0),$$

where  $f_{m,d}^0 - f_{m,d-1}^0$  is the change in the current-month implied futures rate, and  $D$  is the number of days in the month. To suppress the end-of-month noise in the federal funds rate, the unscaled change in the implied futures rate is used as the measure of target rate surprise when the event occurs on the last three days of a month. If the event happens on the first day of a month,  $f_{m-1,D}^1$  is used instead of  $f_{m,d-1}^0$ . The expected federal funds rate change is defined as the difference between the actual change minus the surprise:

$$\Delta i^e = \Delta i - \Delta i^u,$$

where  $\Delta i$  is the actual federal funds rate change. The data for the decomposition of the federal funds target rate changes can be obtained from Kenneth Kuttner’s webpage.<sup>11</sup>

**Firm-level data:** Our dependent variable, the stock returns on particular FOMC announcement dates, comes from the daily CRSP files. The auditor information in year 2000 and balance sheet variables we use to calculate our control variables come from Compustat

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<sup>11</sup><http://econ.williams.edu/people/knk1/research>

annual files and the market values used to calculate control variables come from CRSP. To ensure the liquidity of the stock, we discard penny stocks, stocks with price less than \$5, following the definition in Amihud (2002). We also apply further filters following Kashyap, Lamont, and Stein (1994). In particular, we only keep the firms having December as their fiscal year end because we want to keep the informativeness of financial statements similar across companies. Moreover, we discard the firms that have undergone a significant merger and acquisition in 2001 as indicated by the footnote of the sales item in Compustat (SALE\_FN).<sup>12</sup>

For our difference in differences analysis, we only use firms that have stock return data on both FOMC announcement dates of interest (May 15 and November 6) and therefore we implicitly control for firm-specific fixed effects on returns because, in a balanced panel of two dates, difference in difference regression and fixed effects panel regression provide the same coefficient estimates. However, for our panel data analysis with longer sample, the eight scheduled FOMC announcement dates in 2001, we use an unbalanced panel to give a more comprehensive picture.

Our control variables are the usual suspects from the cross-sectional asset pricing literature that is related with stock returns. Market Leverage is calculated by dividing book value of debt by the sum of book value of debt and market value of common equity. The market value of common equity is price times shares outstanding from CRSP as of December 31, 2000. The book value of debt is total assets minus book equity where book equity is equal to the sum of common equity and deferred taxes as in Fama and French (1992), (Compustat items CEQ and TXDITC, respectively). Book-to-Market is book value of equity divided by market value of equity. Assets is total assets (Compustat Item AT). Profitability is operating income (Compustat Item OIBDP) divided by total assets.<sup>13</sup>

Table 1 provides key statistics for the control variables that we employ in our study, both

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<sup>12</sup>See Anantharaman and Lee (2014) and Kinney, Pamrose, and Scholz (2004) for examples of use of SALE\_FN as an indicator of merger and acquisition activities.

<sup>13</sup>We ignore CAPM beta because its effect on daily returns is negligible.

for the full sample and for the subsamples of clients of different Big 5 accounting firms. A clear pattern in this Table is that the key statistics for our control variables are remarkably similar across different subsamples. Therefore, we can safely argue that Arthur Andersen firms have similar characteristics to other firms, at least for the key characteristics we are studying. We also find that all the Big 5 accounting firms are very diversified in terms of their clientele, further supporting this argument.

[TABLE 1 ABOUT HERE]

## 4 Empirical Results: Difference in Differences

This section presents the results from the regression

$$return = \beta_0 + \beta_1 AAClient + \beta_2 After + \delta AAClient * After + controls + error$$

where  $\delta$  is the parameter of interest. *AAClient* is a dummy variable equal to one if the firm's financial statements for year 2000 is audited by Arthur Andersen and zero otherwise. *After* is a dummy variable that is equal to one for the observations on 6 November 2001 and zero for observations on 15 May 2001. Because monetary policy surprises were expansionary on both dates, our theory implies that Arthur Andersen clients' prices should have reacted relatively less positively to the monetary policy shock on November 6. Therefore, we expect  $\delta < 0$ .

[TABLE 2 ABOUT HERE]

Column 1 of Table 2 presents the results of this regression without any additional control variables. The first line tells us that following the Enron scandal, the sensitivity of stock prices of Arthur Andersen clients to a 10 basis points reduction in the federal funds target rate decreased by about 70 basis points. This effect is very large, considering that, on

average, a 10 basis points surprise decrease in federal funds target rate leads to about a 100 basis points increase during this time period.<sup>14</sup>

Column 2 presents the results of the same regression after including control variables. Our controls do not seem to affect average returns on these two dates, with the exception of market leverage which has a negative relationship with returns.<sup>15</sup> More importantly, the coefficient of interest  $\Delta \text{Client}^*$  After practically stays the same.

The necessary and sufficient identification assumption for columns 1 and 2 is that the auditor choice is independent of the characteristics that might affect how a firm's stock price sensitivity to monetary policy shocks changes with increasing monitoring costs. However, it is possible that the perceived auditing quality between clients of Big 5 auditing firms and the remaining firms might have been different in 2000 which is also evident from the academic accounting literature of that time which studies auditing quality by considering Big N auditing firms and other firms as providing different quality services. Therefore, column 3 repeats the regression by focusing on the subsample of Big 5 auditing firms' clients. Because the firms that prepare clean balance sheets and hence have non-missing control variables tend to be clients of the Big 5 accounting firms the number of observations in column 3 is hardly different from the number of observations in column 2 and the coefficient estimates are very close to each other, as expected.

Despite our best efforts, it is still possible that there may be some endogeneity concerns that we might have overlooked. In order to address any remaining concerns, we use the auditor choice in fiscal year 1995 as an instrument in an IV framework, noting that firms usually establish long-term relationships with their auditor and the characteristics that affect their market valuation varies over time and these changes are unlikely to be correlated with their auditor choice long time ago. Using lagged dependent variables is quite common in the macroeconomics and finance literature but researchers generally use one year lags.

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<sup>14</sup>The 100bp figure comes from a panel regression of stock prices to monetary policy surprises on the scheduled FOMC announcements dates, excluding any additional controls.

<sup>15</sup>The asset pricing literature is divided regarding the relationship between market leverage and stock prices, see, for example, Gomes and Schmid (2009) and Ozdagli (2012) among others.



By using a long lag, we try to be as conservative as possible. Column 4 shows that the resulting coefficient for AAClient\*After has similar sign and magnitude and the Hausman test with t-statistic equal to 0.74 suggests that endogeneity is not a big concern. In unreported regressions, we find that once we control for the auditor choice in years 1998 and 1999 the auditor choice in earlier years do not have any explanatory power for the auditor choice in 2000. Therefore, column 5 reports the instrumental variable estimates using the auditor choice in 1998 and 1999 as instruments and these estimates are similar to our previous estimates. All of these instruments pass the standard tests for instrument weakness and overidentification.

Finally, we separate our sample into rated and unrated firms in columns 6 and 7 and we find that almost all the effect seems to stem from unrated firms, consistent with Sufi (2007) who argues that the unrated firms are more opaque and hence monitoring costs are more important for them.<sup>16</sup> This finding is also consistent with the monitoring cost channel we study in this paper because financial statements are more important instruments for more opaque firms which lack other sources of signaling, such as bond prices. These opaque firms experience a greater shock to their monitoring cost after a decrease in the reliability of their financial statements. Of course, there might be some characteristic of unrated firms other than opaqueness that might generate this result. To address this issue, we also use an instrumental variable approach from Faulkender and Petersen (2006), Sufi (2007), and Santos and Winton (2008) where instrumental variables are whether a firm is in the S&P 500, whether the firm is listed on the New York Stock Exchange, whether the firm is in a three-digit SIC industry that other firms with credit ratings are also in. The IV estimate for the difference between rated and unrated firms is -2.05 ( $p < 0.05$ ) and the Hausman test cannot reject the null hypothesis of equality between the two coefficients ( $p = 0.2$ ).

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<sup>16</sup>Following Avromov, Chordia, Jostova, and Philipov (2007) and Colla, Ippolito, and Li (2013) we denote a firm-year to be rated if it has at least one monthly Standard & Poor's long-term issuer rating, as recorded in Compustat.

As discussed in popular textbooks like Angrist and Pischke (2009), the Achilles heel of the difference in differences approach is the non-parallel time trend across firms. We check for this possibility by separating stocks into portfolios by their auditing firms and running a regression of different portfolio returns on a linear trend. In unreported regressions results, we find that the p-value for the hypothesis of equal time trends is 0.3 which suggests that a monotonic time trend is not a primary concern. Nevertheless, we note that a linear time trend might not be the perfect way to approach this issue. Therefore, we study the robustness of our results in more depth in a panel data setting where time trend is not a concern because we use the policy surprise in each FOMC announcement date in 2001 which differ across dates.

## 5 Robustness of Empirical Results: Panel Data

So far, we are not using any time series dimension because the probability of accounting scandal assigned by investors has been changing over time in 2001, which is hard to measure. Nevertheless, it is not very unrealistic to assume that Enron’s fate in 2001 was tied to the outcome of the accounting scandal involving Arthur Andersen. Therefore, we can use the perceived proximity to default of Enron’s stock price as a proxy for investors’ belief regarding the accounting scandal.

We specify our econometric model as

$$\begin{aligned}
 \text{return} = & \beta_0 + \beta_1 \text{Surprise} + \beta_2 \text{AAClient} + \beta_3 \text{Surprise} * \text{AAClient} \\
 & + \delta_1 \text{EDF} * \text{AAClient} + \delta_2 \text{EDF} * \text{Surprise} + \delta_3 \text{EDF} * \text{Surprise} * \text{AAClient} \\
 & + \text{time dummies} + \text{other controls} + \text{error}
 \end{aligned}$$

where Surprise is the monetary policy surprise on the scheduled FOMC announcement dates in 2001. EDF is calculated by first taking the logarithm of Moody’s daily Expected Default

Frequency in order to control for non-linearities and then taking its equally-weighted 10-day moving average (up to but not including the FOMC dates) in order to reduce the mismeasurement due to high volatility of the daily EDF measure.<sup>17</sup> We do not add EDF as an additional control on its own because our time dummies takes care of that. We are interested in  $\delta_3$ , that is, how Enron's proximity to default affects the relative stock price reaction of Arthur Andersen clients to monetary policy surprises and our theory suggests that  $\delta_3 < 0$  once we scale Surprise so that a positive surprise implies an expansionary shock.

For the event dates, we use the scheduled FOMC announcement dates in 2001. We do not use any further data after 2001 because 2002 was riddled with accounting scandals involving other auditing firms, starting in January with Homestore.com whose auditing firm is PricewaterhouseCoopers, and in February with Qwest whose auditing firm is KPMG.<sup>18</sup>

**[TABLE 3 ABOUT HERE]**

Table 3 summarizes the results. Consistent with the results in the previous section and our conjecture that ties Enron's fate to the accounting scandal, we find that as Enron's proximity to default increases Arthur Andersen clients react less to monetary policy surprises in comparison to other firms. The results in Table 3 can be compared to the ones in Table 2 if we use the estimates in Table 3 in order to calculate the relative change in the monetary policy sensitivity of Arthur Andersen clients' stock prices from May 15 to November 6, 2001. During this period, our EDF measure has changed by  $\Delta EDF = 2.79$ . Therefore, column 1 of Table 3 implies that a 10 basis points surprise decline in federal funds target rate generates a  $1.71 * (\Delta EDF) * 10 \approx 50$  basis points less reaction in the stock prices of Arthur Andersen clients in comparison to other firms which is in the ballpark of the numbers reported in Table 2. Moreover, columns 2 and 3 of Table 3 imply that the difference between rated and

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<sup>17</sup>We have also tried Hodrick-Prescott filter which leads to similar results. However, we prefer moving average of past values because it eliminates look-ahead bias inherent in the Hodrick-Prescott filter.

<sup>18</sup>See <http://www.forbes.com/2002/07/25/accountingtracker.html>.

**Coefficient of EDF\*Surprise\*AAClient when firms are double sorted**

	<u>Rated</u>	<u>Unrated</u>	<u>Unrated-Rated</u>
<b><u>Big</u></b>	1.793 (1.681) 498	-4.571 (2.965) 222	-6.365* (3.401)
<b><u>Small</u></b>	4.671 (4.055) 44	-4.288** (1.792) 990	-8.960** (4.333)
<b><u>Small-Big</u></b>	2.877 (4.292)	0.282 (3.456)	

Each cell gives from top to bottom: The coefficient, standard error, and number of firms. See Table 3 and text for details of variable construction.

unrated firms is  $-6.285 * (\Delta EDF) * 10 \approx -175$  basis points (-1.75 percentage points) which is close to the -1.23 percentage point reported in Table 2.

An obvious concern regarding this result is that larger firms are more likely to be rated and the firm size is the main culprit behind our results. Indeed, columns 4 and 5 show that if we divide our sample into large and small firms based on the median firm size we observe a pattern similar to the one for rated and unrated firms. In order to address this concern, we divide our sample into four groups based on size and rating availability and compare the coefficients of EDF\*Surprise\*AAClient for each group in the table below. As expected, majority of the sample is concentrated in the Big&Rated and Small&Unrated groups. The message of the table is clear: The difference between rated and unrated Arthur Andersen clients survives both in big and small groups whereas the difference between big and small firms becomes statistically insignificant and actually goes the opposite direction.

Having eliminated the concern that the results are driven by firm size, we continue to follow Sufi (2007) and use alternative measures firm opaqueness (R&D spending and accruals, in particular) to establish the robustness of our results. Columns 6 and 7 provide a comparison of firms with low and high R&D spending (relative to total assets) and finds a

very similar pattern, which is actually stronger in terms of its magnitude, compared to the difference between rated and unrated firms.

We also repeat the same analysis for firms with positive accruals, who are more likely to engage in earnings management and hence need better auditing, using two different accruals measure. The first measure comes from Sloan (1996) which is also used in Sufi (2007) and the second one modifies this measure by adding accruals (unremitted earnings) from unconsolidated subsidiaries (Compustat item ESUB) because off-balance sheet assets have played a very significant role in Enron scandal which in turn might have drawn investors attention on them. Beside addressing the earning management issue that is directly relevant to the reliability of financial statements, accruals have the additional advantage of providing extra credibility to our hypothesis because they are actually negatively correlated with R&D spending in our sample, with Pearson and Spearman correlations of -0.2 and -0.1 respectively. Columns 8 and 9 for the Sloan accrual measure and columns 10 and 11 for the modified accrual measure both confirm the results that we have obtained using R&D spending.

**[TABLE 4 ABOUT HERE]**

Before wrapping up, we provide two more robustness checks in Tables 4 and 5. Table 4 replicates the results of Table 3 including Industry\*Auditor level clustering of standard errors and a full set of interacted Industry Dummy controls using SIC2 level industry codes (EDF\*IndDummy, Surprise\*IndDummy, EDF\*Surprise\*IndDummy) for each of the 69 industries in our sample. The results are very similar to those in Table 3. Finally, Table 5 provides the results from a placebo-experiment using the data from 2000. As expected, none of the coefficients of interest are statistically significant and they actually go in the opposite direction of the ones in Table 2 when we compare firms based on R&D and accruals which provides further credibility to the results in Table 3.

**[TABLE 5 ABOUT HERE]**

## 6 Conclusion

In this paper, we have studied the relationship between financial frictions and the reaction of stock prices to monetary policy shocks. Following Bernanke, Gertler, and Gilchrist framework we theoretically show that financially more constrained firms' stock prices should react less to monetary policy. We also present strong empirical evidence based on the differential effect of the Enron/Arthur Andersen scandal on the Arthur Andersen clients' sensitivity to monetary policy after the scandal.

An important message of the paper is that any empirical analysis of financial frictions, monetary policy, and stock prices should be based on strong theoretical foundations and a clear definition of the financial friction. In the context of Bernanke, Gertler, and Gilchrist (1999) the financial friction is based on the costly state verification theory of Townsend (1979). This is certainly not the only source of financial friction, neither in the real world nor in our theoretical worlds. While we choose the BGG framework due to its popularity and clean definition of the constraint; it would be also interesting to analyze and test the implications of other types of financial constraints on the relationship between stock prices and monetary policy. We leave the continuation of this ambitious research agenda to future work.

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## 8 Appendix: Proof of Proposition 2

Using constraint (2), we can write

$$R\left(\frac{k-1}{k}\right) = \Gamma(\bar{w}) - \mu G(\bar{w})$$

where

$$\Gamma(\bar{w}) - \mu G(\bar{w}) = \bar{w} + \int_0^{\bar{w}} ((1-\mu)w - \bar{w}) dF(\bar{w})$$

It is clear that for a given value of  $\bar{w}$ ,  $k$  is decreasing in  $\mu$ . Moreover, Bernanke, Gertler, Gilchrist (1999) shows that

$$\begin{aligned}
\Gamma'(\bar{w}) - \mu G'(\bar{w}) &= 1 - F(\bar{w}) - \mu \bar{w} f(\bar{w}) \\
&= [1 - F(\bar{w})][1 - \mu \bar{w} h(\bar{w})] > 0
\end{aligned}$$

in equilibrium if  $\bar{w}h(\bar{w})$  is increasing in  $\bar{w}$ . To summarize their argument, because  $\bar{w}h(\bar{w})$  is increasing in  $\bar{w}$  there exists a  $\bar{w}^*$  so that  $\Gamma'(\bar{w}) - \mu G'(\bar{w}) \leq 0$  if  $\bar{w} \geq \bar{w}^*$ , where  $\bar{w}^*$  satisfies  $1 - \mu \bar{w}^* h(\bar{w}^*) = 0$ . Appendix A.1 of Bernanke, Gertler, Gilchrist (1999) shows that  $\bar{w} > \bar{w}^*$  cannot be an equilibrium. In particular, if the lender gives the firm  $K - N$ , its expected payoff from this lending,  $E(\mathbb{I}_{wK \geq B} B + \mathbb{I}_{wK < B} (1 - \mu) wK) = [\Gamma(\bar{w}) - \mu G(\bar{w})] K$ , will decrease in the face value of debt,  $B = \bar{w}N$ , for  $\bar{w} > \bar{w}^*$  because  $\Gamma''(\bar{w}) - \mu G''(\bar{w}) < 0$ . Therefore, both the firm and the lender would benefit from a lower  $\bar{w}$  when  $\bar{w} > \bar{w}^*$  and hence the equilibrium value of  $\bar{w}$  cannot be in this region.

Therefore, we only need to establish that  $d\bar{w}/d\mu < 0$ . By substituting the incentive compatibility constraint (2) of the lender into the objective function of the firm (1), we obtain

$$v = \max_{\bar{w}} \frac{R \int_{\bar{w}}^{\infty} (w - \bar{w}) dF(w)}{R - \left[ \bar{w} + \int_0^{\bar{w}} ((1 - \mu) w - \bar{w}) dF(\bar{w}) \right]} = \frac{RP(\bar{w})}{R - [\Gamma(\bar{w}) - \mu G(\bar{w})]}.$$

which has the first order condition

$$\Omega(\bar{w}, \mu) = P'(\bar{w})(R - [\Gamma(\bar{w}) - \mu G(\bar{w})]) + P(\bar{w})[\Gamma'(\bar{w}) - \mu G'(\bar{w})] = 0$$

which should satisfy  $\partial\Omega(\bar{w}, \mu)/\partial\bar{w} < 0$  at the equilibrium value of  $\bar{w}$  because the second order condition,  $d^2v/d\bar{w}^2 < 0$ , dictates that  $\Omega(\bar{w} + \varepsilon, \mu) > 0$  and  $\Omega(\bar{w} - \varepsilon, \mu) < 0$  for any positive value of  $\varepsilon$  at the equilibrium value of  $\bar{w}$ .

Full differentiation of both sides yields

$$\frac{\partial \Omega(\bar{w}, \mu)}{\partial \bar{w}} \frac{d\bar{w}}{d\mu} = P(\bar{w}) G'(\bar{w}) - P'(\bar{w}) G(\bar{w}).$$

It is straight forward to show that the right side is positive which, combined with  $\partial \Omega(\bar{w}, \mu) / \partial \bar{w} < 0$ , gives  $d\bar{w}/d\mu < 0$ .

Table 1. Descriptive Statistics

ALL FIRMS						ARTHUR ANDERSEN CLIENTS					
<u>Variable</u>	<u># Obs</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Min</u>	<u>Max</u>	<u>Variable</u>	<u># Obs</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Min</u>	<u>Max</u>
Return %	1388	0.84	3.23	-26.83	46.00	Return %	269	0.79	2.97	-15.31	18.04
Market Lev	1291	0.36	0.27	0.00	0.98	Market Lev	253	0.39	0.27	0.00	0.96
Book-to-Market	1291	0.64	0.63	-1.28	5.91	Book-to-Market	253	0.68	0.69	-0.32	5.91
Log(Total Assets)	1388	6.61	1.92	1.62	13.71	Log(Total Assets)	269	6.65	1.79	2.07	13.04
Profitability	1375	0.09	0.18	-1.58	0.77	Profitability	267	0.11	0.15	-0.87	0.69
ERNST & YOUNG CLIENTS						DELOITTE & TOUCHE CLIENTS					
<u>Variable</u>	<u># Obs</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Min</u>	<u>Max</u>	<u>Variable</u>	<u># Obs</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Min</u>	<u>Max</u>
Return %	326	0.91	3.26	-26.83	24.69	Return %	191	0.66	3.81	-12.01	46.00
Market Lev	303	0.32	0.27	0.00	0.98	Market Lev	176	0.40	0.26	0.01	0.95
Book-to-Market	303	0.58	0.61	-0.79	4.28	Book-to-Market	176	0.68	0.57	-0.28	3.46
Log(Total Assets)	326	6.38	1.87	1.62	12.01	Log(Total Assets)	191	6.88	2.11	2.59	12.92
Profitability	323	0.05	0.23	-1.58	0.48	Profitability	190	0.13	0.13	-0.34	0.72
KPMG CLIENTS						PRICEWATERHOUSECOOPERS CLIENTS					
<u>Variable</u>	<u># Obs</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Min</u>	<u>Max</u>	<u>Variable</u>	<u># Obs</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Min</u>	<u>Max</u>
Return %	216	0.85	3.29	-12.39	26.02	Return %	333	0.95	2.80	-12.03	17.06
Market Lev	205	0.37	0.27	0.00	0.94	Market Lev	303	0.36	0.25	0.00	0.96
Book-to-Market	205	0.60	0.53	-0.64	3.63	Book-to-Market	303	0.63	0.68	-1.28	5.20
Log(Total Assets)	216	6.58	1.95	2.34	13.71	Log(Total Assets)	333	6.91	1.85	1.99	12.63
Profitability	213	0.07	0.21	-1.15	0.60	Profitability	329	0.11	0.16	-0.78	0.77

Table 2. The Effect of ENRON Scandal on Stock Price Sensitivity to Monetary Policy  
Arthur Andersen Clients vs Other Firms  
15 May 2001 vs 6 November 2001

VARIABLES	(1) OLS No Controls	(2) OLS With Controls	(3) BIG 5	(4) IV AA1995	(5) IV AA9899	(6) RATED	(7) UNRATED
AAClient*After	-0.665** (0.291)	-0.718** (0.300)	-0.769** (0.301)	-0.587* (0.349)	-0.891*** (0.317)	-0.024 (0.403)	-1.250*** (0.419)
						-1.226** (0.581)	
AAClient	0.271 (0.190)	0.325 (0.202)	0.340* (0.200)	0.356 (0.256)	0.475** (0.221)	-0.075 (0.258)	0.616** (0.289)
After	0.332** (0.139)	0.299** (0.148)	0.349** (0.149)	0.282* (0.160)	0.310** (0.151)	0.468** (0.187)	0.200 (0.206)
Log(Asset)		0.048 (0.043)	0.048 (0.040)	-0.009 (0.048)	0.017 (0.045)	-0.115** (0.057)	0.197** (0.093)
Book-to-Market		0.125 (0.157)	0.163 (0.156)	-0.050 (0.158)	0.107 (0.167)	0.164 (0.223)	0.040 (0.214)
Market Lev.		-0.791* (0.404)	-0.862** (0.388)	-0.067 (0.437)	-0.537 (0.438)	-0.901 (0.649)	-1.013* (0.584)
Profitability		0.273 (0.505)	0.073 (0.496)	0.916 (0.857)	1.153** (0.526)	-1.228 (1.336)	0.189 (0.569)
Constant	0.685*** (0.085)	0.539* (0.289)	0.548** (0.273)	0.567 (0.378)	0.482 (0.305)	2.040*** (0.625)	-0.118 (0.519)
Observations	2,776	2,556	2,454	1,726	2,200	970	1,586
R-squared	0.003	0.005	0.006	0.004	0.009	0.018	0.010

The dependent variable (returns) is expressed in percentage points. The second line between columns 7 and 8 is the estimate for the difference in the two subsamples. Heteroskedasticity-robust standard errors are in parentheses. We have also calculated standard errors clustered at the auditor level and block-bootstrapped standard errors which were smaller than heteroskedasticity-robust errors; hence we report heteroskedasticity-robust errors throughout. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. After=1 refers to 15 May 2001 and After=0 refers to 6 November 2001. The dependent variable is the daily stock returns on 15 May 2001 and 6 November 2001 from CRSP. All balance sheet variables used for calculating control variables is from Compustat. Market Leverage is calculated by dividing book value of debt by the sum of book value of debt and market value of common equity. The market value of common equity is price times shares outstanding from CRSP as of December 31, 2000. The book value of debt is total assets minus book equity where book equity is equal to the sum of common equity and deferred taxes as in Fama and French (1992), (Compustat items CEQ and TXDITC, respectively). Book-to-Market is book value of equity divided by market value of equity. Assets is total assets (Compustat Item AT). Profitability is operating income (Compustat Item OIBDP) divided by total assets. Column BIG 5 refers to the subsample of Big 5 auditing firms' clients listed in Table 1. Column IV is the instrumental variable regression with the auditor choice of 1995 as the instrument.

Table 3. The Effect of ENRON Scandal on Stock Price Sensitivity to Monetary Policy  
 Arthur Andersen Clients vs Other Firms  
 The Eight Scheduled FOMC Announcement Dates in 2001

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	ALL	RATED	UNRATED	BIG	SMALL	LOW R&D	HIGH R&D	ACCR <=0	ACCR >0	ACC2 <=0	ACC2 >0
EDF*Surprise*AAclient	-1.71 (1.15)	1.99 (1.60)	-4.30*** (1.55)	0.53 (1.50)	-3.87** (1.72)	1.23 (1.67)	-8.43*** (2.72)	-0.71 (1.44)	-7.09** (2.80)	-0.66 (1.58)	-8.12*** (2.93)
			-6.29*** (2.23)		-4.40* (2.28)		-9.66*** (3.19)		-6.38** (3.14)		-7.46** (3.33)
Surprise*AAclient	-1.25 (1.50)	-0.51 (1.88)	-1.70 (2.14)	-2.48 (1.68)	-0.09 (2.43)	-0.02 (2.31)	-0.37 (4.15)	-1.18 (1.83)	-1.84 (4.04)	-1.87 (2.06)	-0.75 (4.50)
EDF*AAclient	-4.59 (6.94)	-13.60* (8.10)	1.72 (10.15)	-14.15* (7.90)	4.54 (11.21)	-21.08* (11.74)	15.39 (19.09)	-10.78 (8.00)	22.39 (17.90)	-13.04 (9.36)	35.04* (18.89)
EDF*Surprise	0.15 (0.58)	0.88 (0.75)	-0.24 (0.81)	1.25* (0.70)	-0.88 (0.91)	0.99 (1.09)	2.22 (1.37)	-0.24 (0.74)	-0.01 (1.51)	-0.23 (0.86)	0.24 (1.61)
Surprise	12.74*** (1.63)	10.92*** (1.93)	13.69*** (2.29)	12.90*** (1.83)	12.48*** (2.63)	6.46** (2.87)	19.57*** (3.80)	12.39*** (1.91)	10.98*** (4.15)	13.23*** (2.17)	10.24** (4.45)
Constant	-31.02*** (11.00)	-21.38* (12.68)	-36.04** (15.46)	-28.02** (12.26)	-33.06* (17.69)	5.39 (18.11)	-71.47*** (26.18)	-32.97*** (12.62)	-13.40 (28.21)	-38.94*** (14.34)	-10.79 (30.02)
Observations	11,382	4,037	7,345	5,371	6,011	2,880	3,121	6,913	2,112	5,681	1,923
R-squared	0.05	0.08	0.05	0.09	0.04	0.04	0.10	0.06	0.05	0.06	0.05
Number of permno	1,754	542	1,212	720	1,034	430	540	1,047	328	878	303

All regressions include firm and time fixed effects. Errors clustered at firm level. Both the dependent variable (returns) and surprise component of fed funds target rate change are expressed in basis points. Surprise is scaled so that positive surprises indicate expansionary shocks. The results for other control variables are not reported to save space. The second line between columns 7 and 8 is the estimate for the difference in the two subsamples. Calculation of firm level controls is discussed in Table 2. EDF is the 10-day moving average of the log of Moody's Expected Default Frequency for Enron. The AAclient dummy is absorbed by the fixed effect and standalone EDF is absorbed by the date fixed effects. ACCR is ratio of accruals to total assets as in Sufi (2007) and ACC2 is the same object where accruals also include Equity in Earnings – Unconsolidated Subsidiaries (Compustat item ESUB). BIG vs SMALL and HIGH R&D vs. LOW R&D is determined using the median of AT and XRD/AT from Compustat respectively.

Table 4. Industry\* Auditor Clustering and Interacted Industry Fixed Effects  
The Effect of ENRON Scandal on Stock Price Sensitivity to Monetary Policy  
Arthur Andersen Clients vs Other Firms  
The Eight Scheduled FOMC Announcement Dates in 2001

VARIABLES	(1) ALL	(2) RATED	(3) UNRATED	(4) BIG	(5) SMALL	(6) LOW R&D	(7) HIGH R&D	(8) ACCR <=0	(9) ACCR >0	(10) ACC2 <=0	(11) ACC2 >0
EDF*Surprise*AAClient	-2.31*	1.01	-4.61**	-0.35	-4.13*	3.09	-9.23**	-1.32	-9.59***	-1.21	-9.19***
	(1.36)	(1.47)	(1.93)	(1.19)	(2.26)	(2.04)	(4.08)	(1.22)	(2.71)	(1.75)	(2.96)
Surprise*AAClient	-1.92	-1.92	-2.74	-3.53*	-0.18	-0.22	-1.63	-1.98	-3.44	-2.50	-2.30
	(1.88)	(1.85)	(2.73)	(2.01)	(2.84)	(2.30)	(5.41)	(1.62)	(5.40)	(1.91)	(6.24)
EDF*AAClient	-1.15	-9.40	3.39	-11.92*	9.84	-26.80***	8.89	-6.34	19.92	-9.15	31.14
	(6.72)	(8.18)	(9.22)	(7.12)	(11.56)	(9.88)	(20.93)	(7.85)	(15.62)	(11.11)	(21.67)
EDF*Surprise	-30.82**	6.84***	52.09***	5.52***	193.76***	-17.70**	50.46***	-31.61**	73.72***	193.36***	54.72***
	(12.65)	(1.70)	(3.59)	(1.57)	(4.83)	(7.06)	(6.43)	(12.76)	(11.08)	(4.37)	(11.52)
Surprise	2.49	-18.83	4.88	-6.55***	119.99***	-39.66***	-182.84***	3.49*	185.36***	-156.89***	167.76***
	(2.63)	(25.09)	(3.02)	(2.49)	(5.67)	(7.23)	(11.83)	(1.78)	(9.34)	(2.68)	(8.53)
Constant	31.59	112.78	299.63**	-214.57***	362.64***	306.80***	250.85**	17.99	175.09**	-457.43***	-83.12*
	(84.70)	(73.66)	(143.53)	(63.74)	(132.53)	(103.10)	(115.42)	(90.59)	(72.37)	(85.45)	(44.50)
Observations	11,382	4,037	7,345	5,371	6,011	2,880	3,121	9,270	2,112	5,681	1,923
R-squared	0.08	0.15	0.08	0.15	0.07	0.11	0.13	0.09	0.11	0.10	0.11
Number of permno	1,754	542	1,212	720	1,034	430	540	1,426	328	878	303

See Table 2 for details. Errors are clustered at the Industry(SIC2)\*Auditor level.



Table 5. Pseudo-Experiment with pre-Scandal data  
The Effect of ENRON Scandal on Stock Price Sensitivity to Monetary Policy  
Arthur Andersen Clients vs Other Firms  
The Eight Scheduled FOMC Announcement Dates in 2000

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	ALL	RATED	UNRATED	BIG	SMALL	LOW R&D	HIGH R&D	ACCR <=0	ACCR >0	ACC2 <=0	ACC2 >0
EDF*Surprise*AAClient	-0.67 (4.50)	6.86 (4.88)	-3.24 (6.62)	-1.08 (4.19)	0.91 (8.24)	-1.28 (7.43)	12.54 (14.27)	-3.25 (4.46)	12.35 (14.59)	-5.09 (6.02)	12.00 (15.94)
Surprise*AAClient	0.13 (3.47)	4.95 (3.82)	-1.67 (5.11)	-0.16 (3.37)	1.10 (6.27)	-1.38 (5.73)	1.07 (10.84)	0.44 (3.55)	0.58 (10.74)	0.30 (4.47)	2.81 (11.86)
EDF*AAClient	-2.08 (16.93)	24.06 (19.74)	-19.11 (23.82)	14.12 (17.91)	-17.58 (28.61)	-29.30 (26.52)	-9.31 (45.94)	-0.77 (18.45)	-10.64 (42.00)	38.32* (21.36)	-24.06 (46.85)
EDF*Surprise	22.74*** (2.46)	6.40** (3.19)	30.67*** (3.27)	13.54*** (2.74)	32.55*** (4.14)	21.02*** (4.21)	54.88*** (5.88)	20.69*** (2.75)	31.41*** (5.52)	22.61*** (3.60)	32.57*** (5.79)
Surprise	17.95*** (2.02)	1.44 (2.24)	25.53*** (2.74)	5.86*** (1.89)	29.45*** (3.55)	14.05*** (3.42)	44.71*** (5.25)	15.32*** (2.25)	28.80*** (4.54)	20.22*** (3.19)	30.68*** (4.91)
Constant	101.84*** (8.38)	40.66*** (9.56)	128.22*** (11.16)	63.99*** (8.35)	134.32*** (13.82)	93.14*** (15.71)	222.03*** (20.21)	98.53*** (9.36)	114.88*** (18.90)	118.77*** (12.59)	119.16*** (20.49)
Observations	13,019	4,096	8,923	6,224	6,795	3,222	3,576	10,463	2,556	6,401	2,258
R-squared	0.04	0.03	0.06	0.03	0.06	0.03	0.11	0.04	0.05	0.05	0.04
Number of permno	2,014	553	1,461	834	1,180	501	571	1,603	411	998	366

See Table 2 for details.