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Does Credible Auditing Add Value?*

Ricardo D. Brito[**]
Ibmec São Paulo and CNPq

Eduardo P. Peres[***]
Faculdades Ibmec/RJ

ABSTRACT: This article studies the impact of the year 2002 audit failures on the auditors' clients' stock prices. Specifically, we examine the Big 5's clients stock market impact surrounding various dates on which one of the Big 5's audit procedures and independence were under scrutiny: Omnicom, Merck, WorldCom, Qwest, Xerox, Bristol Meyers, Duke Energy, El Paso and AOL events. In general, on failures involving Arthur Andersen, Andersen's former client's and clients of the auditor in place experienced statistically negative market reactions. On events involving other Big 4, clients didn't experience statistically negative market reactions. The SEC order to CEO's certification causes volatility but not statistically negative market reactions.

Key words: financial reporting, auditors' independence, accounting mistakes, market reaction

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Corresponding authors:
[**] *Ricardo D. Brito*
Ibmec São Paulo and CNPq.
E-mail: RicardoDOB@isp.edu.br.

[***] *Eduardo P. Peres*
Faculdades Ibmec - RJ - Brazil
E-mail: edulpp@uol.com.br

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1. INTRODUCTION

Financial reporting is a mean for management to communicate firm performance to outside investors, and the reaction of stock prices to financial statements announcements suggest that investors regard accounting information as credible. Less evident is whether or not the assurance provided by independent auditor enhances the credibility of reported financial statements. Or, does credibility arise from other sources, such as managers' legal liabilities for providing misleading disclosures?

There are few evidences on the subject, which is the goal of this paper.[1] By studying the year 2002's accounting mistakes involving Arthur Andersen and others Big 4, it is shown that stock prices react to variations in the credibility of the auditor, but that the reaction is just temporary. In general, on failures involving Arthur Andersen, Andersen's former clients' and clients of the auditor in place at the time of the disclosure experienced statistically negative market reactions on days surrounding the event, but have soon recovered their value. On events involving other Big 4, clients didn't experience statistically negative market reactions. The SEC order to CEO's certification causes volatility but not statistically negative market reactions.

Section 2 reviews the market structure of the independent audit industry looking at the relations between audit quality and firm value (De Angelo (1981)), and adapts Holthausen and Verrecchia's (1988) models of price reactions to imprecise disclosure. In section 3, the event study structure used is described, before the data are presented in section 4. Section 5 shows and analyzes the empirical results. Finally, section 6 concludes.

2. THEORY

The need for audit arises due to the existence of costs of contracting. When an exhaustively specified and perfectly enforced explicit contract is prohibitively costly to negotiate and enforce, there are potential conflicts of interest between managers and outside investors, and audit services are demanded as an imperfect monitoring device.[2]

Costly contracting also motivates the independence problem of auditing. Because consumers incur costs of evaluating audit quality or independence, perfect independence is prohibitively costly to negotiate and enforce.

In what follows, the market structure of the independent audit industry is described as in De Angelo (1981), looking at the relations between audit quality and firm value. Next, Holthausen and Verrecchia's (1988) model of price reactions to imprecise disclosure in a risk-neutral perfect-market environment is presented and then adapted to coach aspects of the predicted value added (or agency costs reduction) by independent auditing.

2.1. The market structure of the independent audit industry

In general, the quality of audit services is defined as the market-assessed joint probability that a given auditor will both (a) discover a breach in the client's accounting system, and (b) report the breach. The probability that a given auditor will discover a breach depends on auditor's technical skills. The conditional probability of reporting a discovered breach is a measure of auditor's independence from a given client.

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[1] See Healy and Palepu (2001) for a review of the empirical disclosure literature.

[2] See Jensen and Meckling (1976) and Watts and Zimmerman (1983) for the agency cost theory and the monitoring role of auditing.

As described by De Angelo (1981), the relationship between clients and incumbent auditors is a bilateral monopoly due to the presence of start-up and transactions costs, which make costliness available perfect substitutes absent (to auditors and to clients). Given audit technology is characterized by significant client-specific start-up costs, incumbent auditor posses cost advantages over potential competitors in the future audits of a given client. These advantages to incumbency imply the absence of perfect substitute auditors in future periods and enables incumbent auditors to earn client-specific quasi-rents by setting future audit fees above the avoidable costs. Transactions costs of changing auditors also enable incumbents to raise future fees without making it profitable for clients to switch.

In such environment, termination of the relationship imposes costs on both parties. If terminated, incumbent auditors will lose the wealth equivalent to client-specific quasi-rent stream. And clients will be forced to bear transactions costs of switching and duplication of start-up costs associated with training a new auditor.

Although termination is not costless, if termination justification is not easily verifiable, its potential benefit to client varies depending on the discovery of breaches. By discharging and blaming the auditor, the client can avoid or minimize the negative valuation impact associated with the report of the breach. Because the quasi-rents are client-specific, clients can potentially extract accounting concessions from incumbent auditors by a credible threat of termination, and the latter have a lessened incentive to disclose a discovered breach in the formers' records. Thus, the incumbent is not a perfectly independent auditor since his conditional probability of reporting the breach may be less than one to retain the client in future periods.

Rational consumers recognize that incumbent auditors are not perfectly independent from clients and this lower expected level of independence is reflected in reduced client firm value. Simultaneously, rational firms recognize the negative valuation consequences and try to reduce this wealth impact by choosing incumbent auditors perceived by the market as having fewer incentives to act opportunistically to retain a particular client. Finally, a corollary of these rational actions is that higher auditor's independence means ability to charge higher audit fees.

From the above, the auditor faces a tradeoff. The incentive to omit the breach is provided by the present value of quasi-rents specific to the client, which is lost if the auditor discloses and is dismissed. The incentive to report the breach is provided by the lost of some portion of the present value of quasi-rents specific to other current clients, both through termination and reduced fees, in case the fraud turns public. It follows that the auditor with greater proportion of quasi-rents coming from one client is less independent from that particular client. On the other hand, greater proportion of quasi-rents to other current clients provides bigger collateral, and the more independent is the auditor from a particular client.

Given audit quality is costly to evaluate, one potential response from consumers is to develop surrogates for audit quality. For example, by assuming that client-specific quasi-rents are identical across audit clients, De Angelo (1981) argues that auditor size credibly signals the audit quality. Bigger auditors with a greater number of clients have greater collateral and rationally supply a higher level of audit quality. Another surrogate may be the recent history of the failures made by the auditor.

In the next subsection, we present a review of Holthausen and Verrecchia's (1988) model of price reaction to imprecise disclosure. And, in the subsection following next, we propose an extension that tries to bridge the gap between their risk-neutral perfect-market environment and the risk-averse imperfect-market environment by discounting firm value for lower than optimal auditor credibility.

2.2. Price reactions to imprecise disclosure

Concerned with the price reactions to imprecise disclosure, Holthausen and Verrecchia (1988) assume a world where the risk-free interest rate is zero and the individuals are risk-neutral. Represented by its uncertain liquidating dividend, the firm value is modeled a normal random variable $\tilde{u}$ with market's common knowledge mean *m* and variance *v*, $\tilde{u} \sim N(m, v)$. Although $\tilde{u}$ will not be revealed in the analysis, some less than perfect information about the firm's value is disclosed by an auditor, represented by $\tilde{y} = \tilde{u} + \tilde{\eta}$, where $\tilde{\eta}$ is a normal random variable with mean *0* and variance *n*, $\tilde{\eta} \sim N(0, n)$. The reciprocal of the variance *(1/n)* is the precision of the information content of the disclosure $\tilde{y}$ made by the auditor.

Assuming the auditor disclosure $\tilde{y}_{-1} = \tilde{u} + \tilde{\eta}_{-1}$ with $\tilde{\eta}_{-1} \sim N(0, n_{-1})$ was made on date *–1*, the market prices of the firm before (on date *–2*) and at disclosure are respectively given by:

$$p_{-2} = m, \tag{1}$$

$$p_{-1} = m + \frac{v}{v + n_{-1}}(y_{-1} - m);\ ^{3} \tag{2}$$

and the firm's return on *-1* is:

$$r_{-1} = p_{-1} - p_{-2} = \frac{v}{v + n_{-1}}(y_{-1} - m), \tag{3}$$

which means a positive return in case good news is disclosed ($y > m$) and a negative return in case of bad news ($y < m$).

If, on date *0*, a second imprecise information is released $\tilde{y}_0 = \tilde{u} + \tilde{\eta}_0$, with $\tilde{\eta}_0 \sim N(0, n_0)$ and $\text{cov}(\tilde{\eta}_{-1}, \tilde{\eta}_0) = \rho\sqrt{n_{-1}n_0}$, the market price of the firm changes to:

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[3] This result comes from the conditional expectation of the normal distribution. Given the bivariate normal distribution $\begin{pmatrix} \tilde{u} \\ \tilde{y}_{-1} \end{pmatrix} \sim N\left(\begin{pmatrix} m \\ m \end{pmatrix}, \begin{pmatrix} \sigma_u^2 & \rho\sigma_u\sigma_{-1} \\ \rho\sigma_u\sigma_{-1} & \sigma_{-1}^2 \end{pmatrix}\right)$, and the conditional density:

$$f(u \mid y_{-1}) = \frac{f(u, y_{-1})}{f(y_{-1})} = \frac{(1-\rho^2)^{-1/2}}{\sigma_u\sqrt{2\pi}} \exp\left\{ -\frac{1}{2(1-\rho^2)} \left(\frac{u - m - \rho\frac{\sigma_u}{\sigma_{-1}}(y_{-1} - m)}{\sigma_u} \right)^2 \right\},$$

the conditional expectation of $\tilde{u}$ given $\tilde{y}_{-1}$ is:

$$E[u \mid y_{-1}] = \int_{-\infty}^{\infty} u f(u \mid y_{-1}) du = m + \rho\frac{\sigma_u}{\sigma_{-1}}(y_{-1} - m).$$

$$p_0 = m + \frac{v\left(n_0 - \rho\sqrt{n_{-1}n_0}\right)\left(y_{-1} - m\right) + v\left(n_{-1} - \rho\sqrt{n_{-1}n_0}\right)\left(y_0 - m\right)}{\left(v + n_{-1}\right)\left(v + n_0\right) - \left(v + \rho\sqrt{n_{-1}n_0}\right)^2} \qquad (4)$$

with return on *0*:

$$r_0 = p_0 - p_{-1}$$

$$= \frac{-v\left(v + \rho\sqrt{n_{-1}n_0}\right)\left(n_{-1} - \rho\sqrt{n_{-1}n_0}\right)\left(y_{-1} - m\right) + v\left(v + n_{-1}\right)\left(n_{-1} - \rho\sqrt{n_{-1}n_0}\right)\left(y_0 - m\right)}{\left(v + n_{-1}\right)\left[\left(v + n_{-1}\right)\left(v + n_0\right) - \left(v + \rho\sqrt{n_{-1}n_0}\right)^2\right]}, \qquad (5)$$

which depends on the parameters □ , n_{-1}, n_0 and on the disclosed values y_{-1} and y_0.

Note that, due to the assumed risk neutrality, investors unconditionally value risky assets as their means, $p_{-2} = E\left[p_{-1}\right] = E\left[p_0\right] = m$, and demand no expected premium for bearing the risk on carrying the firm through disclosures, $E_{-2}\left[r_{-1}\right] = E_{-1}\left[r_0\right] = 0$. Also, as long as there is no news after some date *T*, the firm's return is zero from *T* on, $r_{T+} = p_{T+} - p_T = 0 \quad \forall\, T_+ > T$.[4]

If however, say on date *0*, the market reviews its common knowledge values for the parameters of auditor's report $\tilde{\eta}$, due to the revelation of a mistake made in previous auditing of clients' statements (disclosed on *–1*), the clients' returns are different from zero.

This kind of review of the parameters of the auditor report implies the correlation between $\tilde{y}_{-1}$ and $\tilde{y}_0$ is perfect $\rho = 1$, and is an example of intertemporal sufficiency, in which $E\left[\tilde{u} \mid \tilde{y}_{-1} = y_{-1}, \tilde{y}_0 = y_0\right] = E\left[\tilde{u} \mid \tilde{y}_0 = y_0\right]$. Three cases are possible:

A. Fault

At time *0*, the market realizes that, on date *–1*, the auditor has failed to report a discovered breach in the client's statements, meaning the imprecise information previously disclosed was not just $y_{-1} = u + \eta_{-1}$, but $y_{-1,b} = y_{-1} + b$, with a positive bias b.

If the market does not review n simultaneously, $n_0 = n_{-1}$, it is a situation of intertemporal sufficiency where $y_0 = y_{-1}$, and the client's firm price decreases from:

$$p_{-1} = m + \frac{v}{v + n_{-1}}\left(y_{-1,b} - m\right) \qquad (6)$$

to:

$$p_0 = m + \frac{v}{v + n_{-1}}\left(y_{-1} - m\right);$$

and generates a negative return:

[4] The general result is that, for holding the uncertain firm, risk-neutral investors demand the risk-free return, which has been assumed to be zero for simplicity in the analysis.

$$r_0 = -\frac{v}{v+n_{-1}} b < 0 . \quad (7)$$

Additionally assuming all the auditor's clients are independently and identically distributed on $\tilde{u}$,[5] if the auditor has equally biased all his clients, or if there is full contagion through them, a negative return for the cross-section average of clients also results:

$$\bar{r}_0 = -\frac{v}{v+n_{-1}} b < 0 , \quad (8)$$

where $\bar{r}_0$ denotes the auditor's clients cross-section average return.

In case of contagion, clients with unbiased statements can soon recover value by making this clear through many means (for example, by replacing the biased auditor), and a positive return is expected for the cross-section average of the auditor's clients during some time after the fraud.

The results in equations (7) and (8) hold in the general environment where the market regards the auditor as not perfectly independent, $\tilde{\eta}_{-1} \sim N(b_{-1}, n_{-1})$ with $b_{-1} > 0$.[6] Then, an upward review of the auditor's bias $b = b_0 - b_{-1} > 0$ also causes the returns in equations (7) and (8).

B. Pure Mistake

An auditing fail that becomes public on date *0* can also make the market to reconsider the auditor's precision is less than thought, $(1/n_0) < (1/n_{-1})$ (i.e. increase in variance: $n_0 > n_{-1}$) keeping his bias fixed, what changes the client' price from (2) to:

$$p_0 = m + \frac{v}{v+n_0}(y_{-1} - m) \quad (9)$$

with return:

$$r_0 = \left[\frac{v}{v+n_0} - \frac{v}{v+n_{-1}} \right](y_{-1} - m) < (>)\, 0 \quad \Leftrightarrow \quad (y_{-1} - m) > (<)\, 0 \quad (10)$$

This means the decrease in precision implies a negative return to those firms present selling above m and a positive return to those firms now valued below m. The intuition is that the market becomes less confident about the information y_{-1} that has sponsored valuations different from m.

In this case, if the auditor's clients are independently and identically distributed on $\tilde{u}$, the return of the cross-section average of clients is zero:

$$\bar{r}_0 = 0 . \quad (11)$$

[5] The *i.i.d.* assumption is just for simplicity and without loss of generality.
[6] Since mean and variance are sufficient statistics for the normal distribution, less-than-unity probability to report a discovered breach, i.e. less-than-perfect independence, translates into a non-zero mean b_{-1} for $\tilde{\eta}_{-1}$.

Curiously in the present situation, the clients aren't able to recover value by hiring a new auditor with the previously higher precision $\left(1/n_{-1}\right)$. For example, if the new auditor opinion comes on date *1*, under the reasonable assumption the correlation between the old opinion $\tilde{y}_0 = y_{-1}$ and the new opinion $\tilde{y}_1$ is perfect $\rho = 1$,[7] the new opinion is going to be:

$$y_1 = m + \frac{v + \sqrt{n_0 n_{-1}}}{v + n_0}\left(y_{-1} - m\right)$$

and the price:

$$p_1 = m + \frac{v\left(n_{-1} - \sqrt{n_0 n_{-1}}\right)\left(y_{-1} - m\right) + v\left(n_0 - \sqrt{n_0 n_{-1}}\right)\left(\frac{v + \sqrt{n_0 n_{-1}}}{v + n_0}\left(y_{-1} - m\right)\right)}{\left(v + n_0\right)\left(v + n_{-1}\right) - \left(v + \sqrt{n_0 n_{-1}}\right)^2}$$

$$= m + \frac{v}{\left(v + n_0\right)}\left(y_{-1} - m\right) = p_0$$

does not change. Even if the correlation between old and new auditors' opinions is less-than-perfect, the time *0* conditional expectation of the price with auditor replacement:

$$E_0\left[p_1\right] = m + \frac{v\left(n_{-1} - \rho\sqrt{n_0 n_{-1}}\right)\left(y_{-1} - m\right) + v\left(n_0 - \rho\sqrt{n_0 n_{-1}}\right)\left(E_1\left[y_2\right] - m\right)}{\left(v + n_0\right)\left(v + n_{-1}\right) - \left(v + \rho\sqrt{n_0 n_{-1}}\right)^2}$$

$$= m + \frac{v}{\left(v + n_0\right)}\left(y_{-1} - m\right) = p_0$$

is the same as the price without replacement, not providing incentives to proceed on such a change.

C. Both

It is also possible that, when a auditor's fail become public on date *0*, the market reviews both y_{-1} and n_{-1}, moving the firm's assessed value from (6) to (9), when the instantaneous return will be:

$$r_0 = \left[\frac{v}{v + n_0} - \frac{v}{v + n_{-1}}\right]\left(y_{-1} - m\right) - \frac{v}{v + n_{-1}}b. \qquad (12)$$

Now, for auditor's clients independently and identically distributed on $\tilde{u}$, the instantaneous return of the cross-section average is:

[7] The assumption of perfect correlation is sensible given the precision is the only parameter being revised in this case.

$$\bar{r}_0 = -\frac{v}{v+n_{-1}} b < 0\,, \qquad (13)$$

which coincides with equation (8) in the previous case of fault.

2.3. Price reaction to imprecise disclosure under risk aversion

To incorporate the impact on prices of the interactions among firm insiders, independent auditors and outside investors, we adapt Holthausen and Verrecchia (1988). With null risk-free interest rate, suppose risk-averse outside investors discount the firm's liquidating dividend (*u*) due to uncertainty in value (*v*), and due to imprecision and bias in the report of the incumbent auditor (*n* , *b*). The market prices of the firm before (at time *–2*) and after (at time *–1*) disclosure may be respectively written as:

$$p_{-2} = m - d^{u}_{-2}(v), \qquad (14)$$

where: $d^{u}_{-2}(v) \geq 0\ \forall\ v$ is the discount function before disclosure, increasing on the uncertainty of firm value, $\partial d^{u}_{-2}(v)/\partial v > 0$, and such that there is no discount for the risk-free firm, $d^{u}_{-2}(0) = 0$; and

$$p_{-1} = m + \frac{v}{v+n_{-1}}\left(y_{-1,b} - m - b\right) - d^{u}(v, n_{-1}) - d^{b}(b), \qquad (15)$$

where: $y_{-1,b} = y_{-1} + b$ is the biased disclosure of the auditor, $d^{u}(v, n) \geq 0$ is the discount function for uncertainty after disclosure, increasing on the uncertainty of firm value, $\partial d^{u}(v, n)/\partial v > 0$, and on the imprecision of the incumbent auditor, $\partial d^{u}(v, n)/\partial n > 0$; and such that there is no discount for the risk-free firm, $d^{u}(0,\cdot) = d^{u}(\cdot,0) = 0$, the discount for uncertainty usually reduces with information arrival, $d^{u}(v, n) \leq d^{u}_{-2}(v)\ \forall\ v, n \geq 0$, but in case disclosure is the most imprecise it informs nothing, $d^{u}(v, \infty) = d^{u}_{-2}(v)\ \forall\ v \geq 0$; $d^{b}(b) > 0\ \forall\ b > 0$ with $d^{b}(0) = 0$ is the discount function for bias, increasing on the bias of the incumbent auditor, $\partial d^{b}(b)/\partial b > 0$.

Without loss of generality, assume all firms' uncertain values are independently and identically distributed as $\tilde{u} \sim N(m, v)$, and the client firm chooses the auditor's precision and bias respectively on intervals $n \in \left[n^{L}, \infty\right)$ and $n \in \left[n^{L}, \infty\right)$.

Then, the choice of an optimal auditor is the solution to the problem:

$$\max_{n,b} E_{-2}\left[p_{-1}\right] = \max_{n,b}\left\{ m + \frac{v}{v+n} E\left[\tilde{y}_{-1,b} - m - b\right] - d^{u}(v, n) - d^{b}(b) \right\}, \qquad (16)$$

s.t.: $$\tilde{y}_{-1,b} = \tilde{y}_{-1} + b; \qquad (17)$$

or, substituting (17) in (16):

$$\max_{n,b} E_{-2}\left[p_{-1}\right] = \max_{n,b}\left\{m - d^{u}(v, n) - d^{b}(b)\right\}. \tag{18}$$

From the first order conditions of (18):

$$\frac{\partial E_{-2}\left[p_{-1}\right]}{\partial n} = -\frac{\partial d^{u}(v, n)}{\partial n} < 0$$

and

$$\frac{\partial E_{-2}\left[p_{-1}\right]}{\partial b} = -\frac{\partial d^{b}(b)}{\partial b} < 0$$

imply an auditor with skills $(n, b) = (n^{L}, 0)$, meaning the firm's optimal auditor has the highest available precision and is not biased.[8]

Now, the market prices of the firm after disclosure is given by:

$$p_{-1} = m + \frac{v}{v + n^{L}}\left(y_{-1} - m\right) - d^{u}\left(v, n^{L}\right); \tag{19}$$

and the firm's return on *-1* is:

$$\begin{aligned} r_{-1} &= p_{-1} - p_{-2} \\ &= \frac{v}{v + n^{L}}\left(y_{-1} - m\right) + \left[d^{u}_{-2}(v) - d^{u}\left(v, n^{L}\right)\right], \end{aligned} \tag{20}$$

where, from the above: $\left[d^{u}_{-2}(v) - d^{u}\left(v, n^{L}\right)\right] \geq 0 \ \forall \ n \geq 0$.

Different from in Holthausen and Verrecchia (1988), equation (20) shows that, with risk-averse investors, the market demands an expected premium for bearing the risk on carrying the firms through disclosure, $E_{-2}\left[r_{-1}\right] = \left[d^{u}_{-2}(v) - d^{u}\left(v, n^{L}\right)\right]$. Like in Holthausen and Verrecchia (1988), as long as there is no news after some date *T*, the firm's return is zero from *T* on, $r_{T+} = p_{T+} - p_{T} = 0 \ \forall \ T_{+} > T$.

If however, say on date *0*, the market realizes the auditor made mistakes in the disclosure of his clients' information, and reviews *y* or *n*, the clients' returns are different from zero. Three cases are possible:

A. Fault

The market realizes that information disclosed was biased upward by the auditor, who has disclosed $y_{-1,b} = y_{-1} + b$, with $b > 0$, instead of just y_{-1}.

This causes the client's firm price to decrease from:

[8] This corner solution is just because we have abstracted from the auditing costs, which could be sensibly modeled as an increasing function of the required precision, thus resulting in an interior optimum.

$$p_{-1} = m + \frac{v}{v+n^L}\left(y_{-1,b} - m\right) - d^u\left(v, n^L\right) \qquad (21)$$

to:

$$p_0 = m + \frac{v}{v+n^L}\left(y_{-1} - m\right) - d^u\left(v, n^L\right) - d^b(b) \qquad (22)$$

with negative return:

$$r_0 = -\frac{v}{v+n^L} b - d^b(b) < 0\,. \qquad (23)$$

In this case of fault, if the auditor has equally biased all his clients, who are independently and identically distributed on $\tilde{u}$, a negative instantaneous return for the cross-section average of the auditor's clients also results:

$$\bar{r}_0 = -\frac{v}{v+n^L} b - d^b(b) < 0 \qquad (24)$$

where $\bar{r}_0$ denotes the auditor's clients cross-section average.

The last term in equation (23) shows firms pays an extra charge to have a biased auditor ($- d^b(b)$).

Because a biased auditor is not optimal, the firm can recover value by dismissing the biased auditor and hiring an unbiased one.

B. Pure Mistake

The market realizes that the true auditor's precision is $\left(1/n^*\right) < \left(1/n^L\right)$, or $n^* > n^L$, what makes the client's price to change from (19) to:

$$p_0 = m + \frac{v}{v+n^*}\left(y_{-1} - m\right) - d^u\left(v, n^*\right); \qquad (25)$$

with instantaneous return:

$$r_0 = \left[\frac{v}{v+n^*} - \frac{v}{v+n^L}\right]\left(y_{-1} - m\right) - \left[d^u\left(v, n^*\right) - d^u\left(v, n^L\right)\right]; \qquad (26)$$

and instantaneous return of the cross-section average of independently and identically distributed clients:

$$\bar{r}_0 = -\left[d^u\left(v, n^*\right) - d^u\left(v, n^L\right)\right] < 0\,. \qquad (27)$$

The term in brackets in equation (26) or the cross-section average in (27) shows that all firms pays a price to have an imprecise auditor. About the sign of first term, it depends on whether $(y_{-1} - m)$ is positive or negative. A decrease in precision implies a negative return to those firms present selling above m and a positive return to those firms now valued below *m*. The intuition is that the market becomes less confident about the information *y* that has sponsored valuations different from m.

Different from Holthausen and Verrechia (1988), clients in this situation can recover some of the value lost by hiring a new auditor with the optimal precision $\left(1/n^L\right)$. For example, if the new auditor opinion comes on date *1*, under the reasonable assumption the correlation between the old opinion $\tilde{y}_0 = y_{-1}$ and the new opinion $\tilde{y}_1$ is perfect $\rho = 1$, the new opinion is going to be:

$$y_1 = m + \frac{v + \sqrt{n^* n^L}}{v + n^*}\left(y_{-1} - m\right),$$

resulting in the new price:

$$p_1 = m + \frac{v}{v + n^*}\left(y_{-1} - m\right) - d^u\left(v, n^L\right) \qquad (28)$$

and generating the return:

$$r_1 = -\left[d^u\left(v, n^L\right) - d^u\left(v, n^*\right)\right] > 0\,, \qquad (29)$$

which provides a incentive to replace auditors with less-than-optimal level of precision.

If the correlation between old and new auditors' opinions is less-than-perfect, the time *0* conditional expectation of the price with auditor replacement is:

$$E_0\left[p_1\right] = m + \frac{v}{\left(v + n^*\right)}\left(y_{-1} - m\right) - d^u\left(v, n^L\right), \qquad (28')$$

and the expected return is:

$$E_0\left[r_1\right] = -\left[d^u\left(v, n^L\right) - d^u\left(v, n^*\right)\right] > 0\,, \qquad (29')$$

providing the same incentive as above to replace auditors with less-than-optimal level of precision.

Thus, it is the discount asked by the risk-averse investors for holding firms with an imprecise auditing that provides the incentive to discharge auditors with less-than-optimal precision. Although the expected price with the new auditor is lower than before the reduction in precision, $E_0\left[p_1\right] \le p_{-1}$, meaning there is an expected permanent loss when the incumbent auditor's precision decreases, it is higher than the price with this less-than-optimal incumbent auditor, $E_0\left[p_1\right] \ge p_0$.

C. Both

It is also possible that, when the fail become public, the market reviews both *y* and *n*, moving the firm's assessed value from (21) to:

$$p_0 = m + \frac{v}{v+n^*}\left(y_{-1} - m\right) - d^u\left(v, n^*\right) - d^b\left(b\right) \qquad (30)$$

when the return will be:

$$r_0 = \left[\frac{v}{v+n^*} - \frac{v}{v+n^L}\right]\left(y_{-1} - m\right)$$
$$- \frac{v}{v+n^L} b - \left[d^u\left(v, n^*\right) - d^u\left(v, n^L\right)\right] - d^b\left(b\right). \qquad (31)$$

Now, for auditor's clients independently and identically distributed on $\tilde{u}$, the instantaneous return of the cross-section average is:

$$\bar{r}_0 = -\frac{v}{v+n^L} b - \left[d^u\left(v, n^*\right) - d^u\left(v, n^L\right)\right] - d^b\left(b\right) < 0\,.$$

Again, because an imprecise and biased auditor is not optimal, the firm can recover value by replacing the incumbent auditor for an unbiased and less imprecise one.

3. STATISTICAL APPROACH

The event study analysis, similar to Brown and Warner (1985), is used to examine whether or not the independent auditor credibility and precision impact on stock prices. The event window extends from June 10th 2002 to August 20th 2002, a period in which many accounting mistakes involving Arthur Andersen and others Big 4 were disclosed: Omnicom, Merck, WorldCom, Qwest, Xerox, Bristol Meyers, Duke Energy, El Paso AOL; and the SEC ordered the CEO's of all firms with revenue greater than \$ 1.2 billion to certify the validity of their financial reports.

Define $\varepsilon_{i,t}$ as the excess return for security *i* at day *t*. To obtain robust results, for every security *i*, the excess return for each day *t* is estimated using three procedures:

(i) Mean adjusted returns:

$$\varepsilon_{i,t} = R_{i,t} - \overline{R}_i\,;$$

where: $R_{i,t}$ designates the observed continuously compounded return for security *i* at date *t*, and $\overline{R}_i = \frac{1}{250}\sum_{t=-250}^{-1} R_{i,t}$.

(ii) Market adjusted returns:

$$\varepsilon_{i,t} = R_{i,t} - R_{m,t}\,;$$

where: $R_{m,t}$ is the return on the S&P500 for day t [9].

(iii) OLS market model:

$$\varepsilon_{i,t} = R_{i,t} - \hat{\alpha}_i - \hat{\beta}_i R_{m,t};$$

where $\hat{\alpha}_i$ and $\hat{\beta}_i$ are OLS values for the estimation period.

The excess return is averaged among companies audited by the same independent auditor:

$$\bar{\varepsilon}_t^F = \frac{1}{N}\sum_{i-1}^{N_F}\varepsilon_{i,t} \quad \text{for each} \quad F = \begin{Bmatrix} \text{Andersen, Deloitte,} \\ \text{Ernst Young, KPMG, Price} \end{Bmatrix};$$

where: N_F is the number of companies audited by auditor F. Firms involved in mistakes were excluded from the sample not to bias the results.

To control for other factors except the auditor, the average excess return of the other four auditors (complement of F) is subtracted from the average excess return of F. Thus, the abnormal return of F is given by:

$$\bar{A}_t^F = \bar{\varepsilon}_t^F - \bar{\varepsilon}_t^{F^C}$$

where: F^C stands for the complement of F and $\bar{\varepsilon}_t^{F^C} = \frac{1}{4}\sum_{d=F^C}\bar{\varepsilon}_t^d$.

Given the abnormal return based on each method, the statistical significance of the event period abnormal return is assessed. The null hypothesis to be tested is that $\bar{A}_t^F = 0$, and thus concerns effect of the event on returns to the average of F clients. The test statistic is the ratio of $\bar{A}_t^F$ to its estimated standard deviation:

$$\frac{\bar{A}_t^F}{\hat{S}\left(\bar{A}_t^F\right)}$$

where: $\hat{S}\left(\bar{A}_t^F\right) = \sqrt{\left(\sum_{t=-250}^{-1}\left(\bar{A}_t^F - \bar{\bar{A}}^F\right)^2\right)\Big/249}$ and $\bar{\bar{A}}^F = \frac{1}{250}\sum_{t=-250}^{-1}\bar{A}_t^F$.

The cumulative abnormal returns (CARs) are also computed.

4. DATA

The sample from June 10th 2002 to August 20th 2002 has 683 companies listed in the US' stock exchanges. The companies' return data for our study were obtained from Economatica. In the sample, Andersen is the auditor of 114 companies, Deloitte has 109 clients, 164 firms

[9] To verify the robustness of the results, other benchmarks like de CRSP equal weighted and value weighted index were used.

are audited by Ernst Young, 103 by KPMG, and PwC audits 186 clients. The remaining 7 are split between BDO Seidman with 3 and Grand Thornton with 4.

5. EMPIRICAL RESULTS

Tables 1.A and B show the cumulative average abnormal return and their respective t-statistics. Table 1.A gives support to the hypothesis that variation in the auditor's credibility has short run impact on the auditor's clients' value. Table 1.B provides evidence that CEO's certification adds no value.

Table 2 shows that the whole period cumulated abnormal returns were negative in general, but not strongly significant, what might be interpreted as weak evidence that the loss of credibility was pervasive. Stronger in the data is the fact that excess returns between the audit firm's clients and non-clients were not significantly different. This gives support to the hypothesis that negative impacts on values due to auditor loss in credibility don't have long run idiosyncratic effects. This happens because the lower precision audit provided is not optimal for the firm, which takes actions to recover the credibility in its financial statements relative to the market in general.

6. CONCLUSION

On studying the year 2002's accounting mistakes, involving Arthur Andersen and others Big 4: Omnicom, Merck, WorldCom, Qwest, Xerox, Bristol Meyers, Duke Energy, El Paso and AOL events, it is shown that stock prices react to variations in the credibility of the auditor, but that the reaction is just temporary, pattern predicted by our extension of Holthausen and Verrecchia (1988). In general, on failures involving Arthur Andersen, Andersen's former clients' and clients of the auditor in place at the time of the disclosure experienced statistically negative market reactions, providing evidence to De Angelo's (1981) theory of the incumbent auditor. On events involving other Big 4, clients didn't experience statistically negative market reactions, which may be evidence that the market-assessed precision of the auditor in question was not affected. The SEC order to CEO's certification causes volatility but not statistically negative market reactions.

Table 1.a: OLS market model (S&P 500)

	Cumulative Average Abnormal Returns					
Window	**Auditor Clients' CAAR**		**Auditor Non-Clients CAAR**		**Clients - Non Clients CAAR**	
June 12th 2002 - Omnicom's account is suspect; Andesen's client						
(-1,-1)	-0.23%	-0.42	-0.30%	-0.63	0.06%	0.18
(-1,0)	-1.68%	-2.15	-1.07%	-1.56	-0.61%	-1.22
(0,0)	-1.45%	-2.64	-0.77%	-1.63	-0.68%	-1.90
(0,+1)	-1.28%	-1.63	-0.74%	-1.08	-0.54%	-1.07
(-1,+1)	-1.51%	-1.64	-1.04%	-1.28	-0.48%	-0.76
(-1,+2)	-1.28%	-1.21	-0.74%	-0.78	-0.54%	-0.76
June 21st 2002 - Merck included co-payments among revenue (Source: WSJ); as a PwC's client						
(-1,-1)	-0.43%	-0.91	-0.32%	-0.64	-0.11%	-0.41
(-1,0)	-0.15%	-0.22	0.22%	0.31	-0.38%	-1.05
(0,0)	0.28%	0.59	0.54%	1.09	-0.27%	-1.01
(0,+1)	0.15%	0.22	0.11%	0.15	0.04%	0.13
(-1,+1)	-0.28%	-0.34	-0.21%	-0.25	-0.06%	-0.15
(-1,+2)	-0.67%	-0.68	-0.66%	-0.68	-0.01%	-0.02
June 21st 2002 - Merck included co-payments among revenue; as an Andersen's client						
(-1,-1)	-0.34%	-0.61	-0.32%	-0.64	-0.02%	-0.05
(-1,0)	0.41%	0.52	0.22%	0.31	0.18%	0.34
(0,0)	0.75%	1.36	0.54%	1.09	0.20%	0.53
(0,+1)	-0.05%	-0.06	0.11%	0.15	-0.16%	-0.29
(-1,+1)	-0.39%	-0.42	-0.21%	-0.25	-0.17%	-0.26
(-1,+2)	-1.26%	-1.19	-0.66%	-0.68	-0.60%	-0.79
June 26th 2002 - Worldcom admits error in its accounting (Source: WSJ); as an Andersen's client						
(-1,-1)	-0.87%	-1.58	-0.55%	-1.11	-0.32%	-0.86
(-1,0)	-1.69%	-2.15	-0.34%	-0.48	-1.34%	-2.57
(0,0)	-0.82%	-1.48	0.20%	0.41	-1.02%	-2.72
(0,+1)	-1.15%	-1.47	0.03%	0.04	-1.18%	-2.27
(-1,+1)	-2.02%	-2.19	-0.52%	-0.62	-1.50%	-2.34
(-1,+2)	-1.55%	-1.48	0.13%	0.13	-1.69%	-2.33
June 26th 2002 - Worldcom admits error in its accounting; as a KPMG's client						
(-1,-1)	-0.32%	-0.60	-0.55%	-1.11	0.23%	0.83
(-1,0)	-1.21%	-1.59	-0.34%	-0.48	-0.87%	-2.14
(0,0)	-0.90%	-1.69	0.20%	0.41	-1.10%	-3.94
(0,+1)	-1.42%	-1.86	0.03%	0.04	-1.45%	-3.57
(-1,+1)	-1.74%	-1.98	-0.52%	-0.62	-1.22%	-2.38
(-1,+2)	-1.22%	-1.23	0.13%	0.13	-1.35%	-2.23
June 26th 2002 - SEC takes a hard line on Qwest (Source: WSJ); as an Andersen's client						
(-1,-1)	-0.87%	-1.58	-0.55%	-1.11	-0.32%	-0.86
(-1,0)	-1.69%	-2.15	-0.34%	-0.48	-1.34%	-2.57
(0,0)	-0.82%	-1.48	0.20%	0.41	-1.02%	-2.72
(0,+1)	-1.15%	-1.47	0.03%	0.04	-1.18%	-2.27
(-1,+1)	-2.02%	-2.19	-0.52%	-0.62	-1.50%	-2.34
(-1,+2)	-1.55%	-1.48	0.13%	0.13	-1.69%	-2.33

Table 1.a: OLS market model (S&P 500)- cont.

	Cumulative Abnormal Returns					
Window	**Auditor Clients' CAAR**		**Auditor Non-Clients CAAR**		**Clients - Non Clients CAAR**	
June 26th 2002 - SEC takes a hard line on Qwest; as a Deloitte's client						
(-1,-1)	-0.14%	-0.28	-0.55%	-1.11	0.40%	1.16
(-1,0)	-1.12%	-1.49	-0.34%	-0.48	-0.78%	-1.59
(0,0)	-0.98%	-1.89	0.20%	0.41	-1.18%	-3.39
(0,+1)	-1.08%	-1.43	0.03%	0.04	-1.11%	-2.25
(-1,+1)	-1.22%	-1.34	-0.52%	-0.62	-0.70%	-1.23
(-1,+2)	-0.09%	-0.09	0.13%	0.13	-0.22%	-0.34
July 1st 2002 - Xerox holders, SEC target KPMG (Source: WSJ)						
(-1,-1)	0.52%	0.98	0.71%	1.50	-0.19%	-0.64
(-1,0)	-0.37%	-0.48	0.11%	0.16	-0.48%	-1.13
(0,0)	-0.89%	-1.67	-0.60%	-1.27	-0.29%	-1.00
(0,+1)	-2.05%	-2.68	-1.46%	-2.15	-0.59%	-1.41
(-1,+1)	-1.53%	-1.75	-0.75%	-0.94	-0.78%	-1.50
(-1,+2)	-2.09%	-2.11	-1.00%	-1.06	-1.09%	-1.80
July 8th 2002 - Merck booked billions it never collected; as a PwC's client						
(-1,-1)	-0.10%	-0.21	-0.31%	-0.61	0.21%	-0.41
(-1,0)	-0.85%	-1.26	-0.74%	-1.03	-0.10%	-1.05
(0,0)	-0.75%	-1.60	-0.44%	-0.88	-0.31%	-1.01
(0,+1)	-0.65%	-0.97	-0.41%	-0.57	-0.24%	0.13
(-1,+1)	-0.75%	-0.91	-0.72%	-0.86	-0.03%	-0.15
(-1,+2)	-0.09%	-0.09	0.27%	0.28	-0.36%	-0.02
July 8th 2002 - Merck booked billions it never collected; as an Andersen's client						
(-1,-1)	0.06%	0.10	-0.31%	-0.61	0.36%	-0.05
(-1,0)	0.09%	0.11	-0.74%	-1.03	0.83%	0.34
(0,0)	0.03%	0.06	-0.44%	-0.88	0.47%	0.53
(0,+1)	-0.15%	-0.19	-0.41%	-0.57	0.26%	-0.29
(-1,+1)	-0.09%	-0.10	-0.72%	-0.86	0.62%	-0.26
(-1,+2)	0.44%	0.42	0.27%	0.28	0.17%	-0.79
July 13th 2002 - El Paso admits federal probes into round-trip trades (Source: FT); PwC's client						
(-1,-1)	0.09%	0.20	0.10%	0.21	-0.01%	-0.03
(-1,0)	0.72%	1.07	0.77%	1.09	-0.04%	-0.14
(0,0)	0.63%	1.34	0.66%	1.37	-0.04%	-0.15
(0,+1)	0.69%	1.03	0.91%	1.30	-0.22%	-0.67
(-1,+1)	0.79%	0.96	1.01%	1.25	-0.23%	-0.58
(-1,+2)	2.10%	2.16	2.03%	2.17	0.08%	0.17
July 13th 2002 - Duke Ener.admits federal probes into round-trip trades (Source: FT); Deloitte's client						
(-1,-1)	-0.45%	-0.86	0.20%	0.43	-0.65%	-1.94
(-1,0)	-0.10%	-0.14	0.92%	1.33	-1.02%	-2.13
(0,0)	0.34%	0.66	0.71%	1.50	-0.37%	-1.11
(0,+1)	0.67%	0.89	0.89%	1.29	-0.22%	-0.46
(-1,+1)	0.22%	0.24	1.09%	1.36	-0.87%	-1.54
(-1,+2)	1.04%	0.97	2.24%	2.41	-1.20%	-1.87

Table 1.a: OLS market model (S&P 500)- cont.

	Cumulative Abnormal Returns					
Window	**Auditor Clients' CAAR**		**Auditor Non-Clients CAAR**		**Clients - Non Clients CAAR**	
June 26th 2002 - SEC takes a hard line on Qwest; as a Deloitte's client						
(-1,-1)	-0.14%	-0.28	-0.55%	-1.11	0.40%	1.16
(-1,0)	-1.12%	-1.49	-0.34%	-0.48	-0.78%	-1.59
(0,0)	-0.98%	-1.89	0.20%	0.41	-1.18%	-3.39
(0,+1)	-1.08%	-1.43	0.03%	0.04	-1.11%	-2.25
(-1,+1)	-1.22%	-1.34	-0.52%	-0.62	-0.70%	-1.23
(-1,+2)	-0.09%	-0.09	0.13%	0.13	-0.22%	-0.34
July 1st 2002 - Xerox holders, SEC target KPMG (Source: WSJ)						
(-1,-1)	0.52%	0.98	0.71%	1.50	-0.19%	-0.64
(-1,0)	-0.37%	-0.48	0.11%	0.16	-0.48%	-1.13
(0,0)	-0.89%	-1.67	-0.60%	-1.27	-0.29%	-1.00
(0,+1)	-2.05%	-2.68	-1.46%	-2.15	-0.59%	-1.41
(-1,+1)	-1.53%	-1.75	-0.75%	-0.94	-0.78%	-1.50
(-1,+2)	-2.09%	-2.11	-1.00%	-1.06	-1.09%	-1.80
July 8th 2002 - Merck booked billions it never collected; as a PwC's client						
(-1,-1)	-0.10%	-0.21	-0.31%	-0.61	0.21%	-0.41
(-1,0)	-0.85%	-1.26	-0.74%	-1.03	-0.10%	-1.05
(0,0)	-0.75%	-1.60	-0.44%	-0.88	-0.31%	-1.01
(0,+1)	-0.65%	-0.97	-0.41%	-0.57	-0.24%	0.13
(-1,+1)	-0.75%	-0.91	-0.72%	-0.86	-0.03%	-0.15
(-1,+2)	-0.09%	-0.09	0.27%	0.28	-0.36%	-0.02
July 8th 2002 - Merck booked billions it never collected; as an Andersen's client						
(-1,-1)	0.06%	0.10	-0.31%	-0.61	0.36%	-0.05
(-1,0)	0.09%	0.11	-0.74%	-1.03	0.83%	0.34
(0,0)	0.03%	0.06	-0.44%	-0.88	0.47%	0.53
(0,+1)	-0.15%	-0.19	-0.41%	-0.57	0.26%	-0.29
(-1,+1)	-0.09%	-0.10	-0.72%	-0.86	0.62%	-0.26
(-1,+2)	0.44%	0.42	0.27%	0.28	0.17%	-0.79
July 13th 2002 - El Paso admits federal probes into round-trip trades (Source: FT); PwC's client						
(-1,-1)	0.09%	0.20	0.10%	0.21	-0.01%	-0.03
(-1,0)	0.72%	1.07	0.77%	1.09	-0.04%	-0.14
(0,0)	0.63%	1.34	0.66%	1.37	-0.04%	-0.15
(0,+1)	0.69%	1.03	0.91%	1.30	-0.22%	-0.67
(-1,+1)	0.79%	0.96	1.01%	1.25	-0.23%	-0.58
(-1,+2)	2.10%	2.16	2.03%	2.17	0.08%	0.17
July 13th 2002 - Duke Ener.admits federal probes into round-trip trades (Source: FT); Deloitte's client						
(-1,-1)	-0.45%	-0.86	0.20%	0.43	-0.65%	-1.94
(-1,0)	-0.10%	-0.14	0.92%	1.33	-1.02%	-2.13
(0,0)	0.34%	0.66	0.71%	1.50	-0.37%	-1.11
(0,+1)	0.67%	0.89	0.89%	1.29	-0.22%	-0.46
(-1,+1)	0.22%	0.24	1.09%	1.36	-0.87%	-1.54
(-1,+2)	1.04%	0.97	2.24%	2.41	-1.20%	-1.87

Table 1.a: OLS market model (S&P 500)- cont.

	Cumulative Average Abnormal Returns					
Window	**Auditor Clients' CAAR**		**Auditor Non-Clients CAAR**		**Clients - Non Clients CAAR**	
July 19th 2002 - Worldcom to file Chpt.11; as a Andersen's client						
(-1,-1)	0.51%	0.93	0.30%	0.63	0.21%	0.60
(-1,0)	0.87%	1.11	1.46%	2.12	-0.59%	-1.17
(0,0)	0.36%	0.65	1.16%	2.44	-0.80%	-2.24
(0,+1)	0.98%	1.25	2.05%	2.97	-1.06%	-2.11
(-1,+1)	1.49%	1.62	2.35%	2.85	-0.85%	-1.35
(-1,+2)	0.42%	0.40	2.24%	2.32	-1.82%	-2.55
July 19th 2002 - Worldcom to file Chpt.11; as a KPMG's client						
(-1,-1)	0.20%	0.37	0.30%	0.63	-0.10%	-0.36
(-1,0)	0.92%	1.20	1.46%	2.12	-0.54%	-1.30
(0,0)	0.72%	1.36	1.16%	2.44	-0.44%	-1.53
(0,+1)	1.11%	1.45	2.05%	2.97	-0.93%	-2.25
(-1,+1)	1.31%	1.49	2.35%	2.85	-1.04%	-2.00
(-1,+2)	1.18%	1.20	2.24%	2.32	-1.05%	-1.73
July 25th 2002 - AOL admits to SEC accounts investigation (Source: FT); Ernest Young's client						
(-1,-1)	-1.75%	-3.02	-0.99%	-2.20	-0.76%	-2.51
(-1,0)	-2.62%	-3.18	-1.87%	-2.87	-0.76%	-1.93
(0,0)	-0.87%	-1.51	-0.88%	-1.94	0.00%	0.01
(0,+1)	-2.17%	-2.64	-2.15%	-3.30	-0.02%	-0.06
(-1,+1)	-3.92%	-4.16	-3.14%	-4.06	-0.78%	-1.78
(-1,+2)	-4.51%	-4.20	-3.11%	-3.45	-1.40%	-3.00
Average of Andersen 's Events - Average CAARs						
(-1,-1)	-0.29%	-1.29	-0.24%	-1.26	-0.05%	-0.31
(-1,0)	-0.61%	-1.92	-0.28%	-1.00	-0.33%	-1.62
(0,0)	-0.32%	-1.44	-0.04%	-0.18	-0.29%	-1.98
(0,+1)	-0.47%	-1.46	-0.02%	-0.07	-0.45%	-2.18
(-1,+1)	-0.76%	-2.01	-0.26%	-0.80	-0.49%	-1.92
(-1,+2)	-0.80%	-1.85	0.08%	0.22	-0.88%	-3.04
Average of Deloitte's Events - Average CAARs						
(-1,-1)	-0.29%	-0.80	-0.18%	-0.54	-0.11%	-0.48
(-1,0)	-0.61%	-1.15	0.08%	0.17	-0.69%	-2.05
(0,0)	-0.32%	-0.87	0.26%	0.78	-0.58%	-2.46
(0,+1)	-0.20%	-0.39	0.22%	0.44	-0.42%	-1.24
(-1,+1)	-0.50%	-0.78	0.03%	0.06	-0.53%	-1.34
(-1,+2)	0.47%	0.63	0.91%	1.38	-0.43%	-0.95
Average of KPMG's Events - Average CAARs						
(-1,-1)	0.13%	0.44	0.17%	0.63	-0.04%	-0.23
(-1,0)	-0.22%	-0.50	0.24%	0.61	-0.46%	-1.89
(0,0)	-0.35%	-1.16	0.07%	0.25	-0.42%	-2.52
(0,+1)	-0.79%	-1.78	-0.01%	-0.02	-0.78%	-3.22
(-1,+1)	-0.65%	-1.29	0.17%	0.36	-0.82%	-2.73
(-1,+2)	-0.71%	-1.24	0.22%	0.41	-0.93%	-2.65

Table 1.a: OLS market model (S&P 500)- cont.

Cumulative Average Abnormal Returns						
Window	**Auditor Clients' CAAR**		**Auditor Non-Clients CAAR**		**Clients - Non Clients CAAR**	
	Average of PwC's Events - Average CAARs					
(-1,-1)	-0.14%	-0.53	-0.15%	-0.53	0.01%	0.04
(-1,0)	-0.09%	-0.24	0.16%	0.39	-0.25%	-1.31
(0,0)	0.05%	0.19	0.31%	1.09	-0.25%	-1.78
(0,+1)	0.06%	0.16	0.21%	0.52	-0.15%	-0.77
(-1,+1)	-0.08%	-0.17	0.06%	0.13	-0.14%	-0.63
(-1,+2)	0.45%	0.80	0.51%	0.95	-0.07%	-0.25
	Average of EY's Events - Average CAARs					
(-1,-1)	-1.75%	-3.02	-0.99%	-2.20	-0.76%	-2.51
(-1,0)	-2.62%	-3.18	-1.87%	-2.87	-0.76%	-1.93
(0,0)	-0.87%	-1.51	-0.88%	-1.94	0.00%	0.01
(0,+1)	-2.17%	-2.64	-2.15%	-3.36	-0.02%	-0.06
(-1,+1)	-3.92%	-4.16	-3.14%	-4.06	-0.78%	-1.78
(-1,+2)	-4.51%	-4.20	-3.11%	-3.45	-1.40%	-3.00
	*Events' Average CAAR **					
(-1,-1)	-0.33%	-1.94	-0.14%	-0.97	-0.19%	-1.78
(-1,0)	-0.61%	-2.48	-0.18%	-0.81	-0.43%	-2.91
(0,0)	-0.27%	-1.60	-0.03%	-0.21	-0.24%	-2.30
(0,+1)	-0.57%	-2.32	-0.19%	-0.89	-0.37%	-2.53
(-1,+1)	-0.90%	-3.12	-0.34%	-1.32	-0.56%	-3.09
(-1,+2)	-0.82%	-2.50	0.07%	0.22	-0.89%	-4.33
	*Events' Average CAAR ***					
(-1,-1)	-0.26%	-1.59	-0.16%	-1.06	-0.10%	-1.09
(-1,0)	-0.65%	-2.75	-0.16%	-0.73	-0.49%	-3.72
(0,0)	-0.39%	-2.37	0.00%	0.00	-0.39%	-4.13
(0,+1)	-0.60%	-2.56	-0.18%	-0.85	-0.42%	-3.19
(-1,+1)	-0.86%	-3.11	-0.34%	-1.35	-0.52%	-3.30
(-1,+2)	-0.56%	-1.75	0.02%	0.06	-0.58%	-3.20

Notes: (*) Classifying as clients the companies which had their last financial statements signed by the firm; (**) Classifying as clients the companies which were in the auditing firm's portifolio at the time of the event.

Table 1.b: OLS market model (S&P 500)

	Cumulative Average Abnormal Returns					
Window	**Auditor Clients' CAAR**		**Auditor Non-Clients CAAR**		**Clients - Non Clients CAAR**	
	CAAR Andersen - August 15th 2002					
(-1,-1)	-1.37%	-2.48	-0.77%	-1.63	-0.59%	-1.66
(-1,0)	-0.76%	-0.97	-0.41%	-0.60	-0.35%	-0.70
(0,0)	0.60%	1.10	0.36%	0.76	0.24%	0.68
(0,+1)	0.59%	0.75	1.15%	1.68	-0.57%	-1.12
(-1,+1)	-0.78%	-0.84	0.38%	0.47	-1.16%	-1.84
(-1,+2)	-1.20%	-1.14	-0.19%	-0.20	-1.01%	-1.43
	CAAR Deloitte - August 15th 2002					
(-1,-1)	-0.42%	-0.81	-0.95%	-2.00	0.53%	1.59
(-1,0)	0.28%	0.38	-0.61%	-0.89	0.90%	1.87
(0,0)	0.70%	1.36	0.34%	0.71	0.36%	1.09
(0,+1)	0.75%	1.00	1.12%	1.63	-0.37%	-0.78
(-1,+1)	0.33%	0.36	0.17%	0.21	0.16%	0.29
(-1,+2)	0.21%	0.20	-0.46%	-0.50	0.68%	1.05
	CAAR KPMG - August 15 th 2002					
(-1,-1)	-0.42%	-0.79	-0.95%	-2.01	0.53%	1.83
(-1,0)	-0.12%	-0.15	-0.53%	-0.78	0.41%	0.98
(0,0)	0.30%	0.56	0.42%	0.89	-0.12%	-0.41
(0,+1)	1.37%	1.80	1.01%	1.48	0.37%	0.87
(-1,+1)	0.96%	1.09	0.06%	0.08	0.90%	1.72
(-1,+2)	0.05%	0.05	-0.42%	-0.45	0.47%	0.78
	CAAR PwC - August 15th 2002					
(-1,-1)	-1.02%	-2.19	-0.81%	-1.66	-0.21%	-0.86
(-1,0)	-0.77%	-1.15	-0.35%	-0.50	-0.42%	-1.28
(0,0)	0.25%	0.53	0.46%	0.94	-0.21%	-0.84
(0,+1)	1.19%	1.77	1.02%	1.45	0.17%	0.52
(-1,+1)	0.17%	0.20	0.21%	0.26	-0.04%	-0.11
(-1,+2)	-0.27%	-0.27	-0.39%	-0.41	0.12%	0.27
	CAAR EY - August 15th 2002					
(-1,-1)	-0.98%	-1.69	-0.83%	-1.84	-0.15%	-0.49
(-1,0)	-0.73%	-0.89	-0.38%	-0.59	-0.35%	-0.88
(0,0)	0.25%	0.43	0.45%	0.99	-0.20%	-0.66
(0,+1)	1.24%	1.51	1.01%	1.57	0.24%	0.60
(-1,+1)	0.26%	0.28	0.17%	0.23	0.09%	0.20
(-1,+2)	-0.57%	-0.54	-0.28%	-0.31	-0.29%	-0.63

Table 2: Average Abnormal Returns - OLS market model (S&P 500)

	Average Abnormal Returns									
Date	**AA**	**N~AA**	**Deloitte**	**N~Deloitte**	**KPMG**	**N~KPMG**	**PwC**	**N~PwC**	**EY**	**N~EY**
24/mai	0,44%	0,42%	0,94%	0,32%	0,89%	0,34%	0,21%	0,50%	0,01%	0,55%
28/mai	0,41%	0,35%	-0,09%	0,45%	0,18%	0,39%	0,58%	0,27%	0,52%	0,31%
29/mai	-0,31%	-0,19%	0,02%	-0,26%	-0,04%	-0,24%	-0,39%	-0,14%	-0,16%	-0,23%
30/mai	-0,33%	0,00%	-0,13%	-0,04%	-0,22%	-0,02%	-0,11%	-0,03%	0,36%	-0,18%
31/mai	0,34%	-0,32%	-0,33%	-0,19%	-0,23%	-0,21%	-0,21%	-0,21%	-0,50%	-0,12%
3/jun	-0,47%	-0,08%	-0,04%	-0,16%	-0,17%	-0,14%	-0,18%	-0,13%	0,09%	-0,22%
4/jun	-0,49%	-0,26%	-0,27%	-0,31%	-0,58%	-0,25%	0,00%	-0,41%	-0,35%	-0,28%
5/jun	-0,20%	-0,43%	-0,94% *	-0,29%	-0,31%	-0,41%	-0,68%	-0,28%	0,08%	-0,54%
6/jun	0,18%	0,12%	0,00%	0,16%	-0,19%	0,19%	0,29%	0,07%	0,23%	0,10%
7/jun	0,72%	0,39%	0,51%	0,43%	0,41%	0,45%	0,35%	0,48%	0,34%	0,48%
10/jun	-0,22%	-0,18%	0,03%	-0,23%	-0,27%	-0,18%	-0,14%	-0,21%	-0,34%	-0,14%
11/jun	-0,23%	-0,29%	-0,04%	-0,33%	-0,24%	-0,29%	-0,43%	-0,23%	-0,33%	-0,27%
12/jun	-1,43% **	-0,77%	-0,68%	-0,92% *	-1,10% *	-0,84% *	-0,68%	-0,95% *	-0,73%	-0,93% *
13/jun	0,17%	0,02%	0,05%	0,05%	-0,07%	0,07%	0,15%	0,01%	-0,05%	0,08%
14/jun	0,23%	0,29%	0,23%	0,30%	0,22%	0,30%	0,28%	0,29%	0,40%	0,25%
17/jun	-0,19%	-0,05%	-0,32%	-0,03%	-0,03%	-0,08%	-0,07%	-0,08%	0,11%	-0,13%
18/jun	-0,25%	-0,48%	-0,54%	-0,43%	-0,55%	-0,43%	-0,37%	-0,47%	-0,52%	-0,42%
19/jun	0,69%	0,09%	0,38%	0,15%	0,30%	0,17%	-0,13%	0,31%	0,05%	0,23%
20/jun	-0,33%	-0,34%	-0,19%	-0,37%	-0,41%	-0,33%	-0,43%	-0,31%	-0,29%	-0,36%
21/jun	0,75%	0,47%	0,52%	0,51%	0,65%	0,49%	0,28%	0,60%	0,58%	0,49%
24/jun	-0,80%	-0,42%	-1,01% *	-0,38%	-0,83%	-0,42%	-0,13%	-0,62%	-0,09%	-0,61%
25/jun	-0,85%	-0,41%	-0,14%	-0,55%	-0,21%	-0,53%	-0,39%	-0,51%	-0,75%	-0,40%
26/jun	-0,81%	-0,22%	-0,98% *	-0,19%	-0,92% *	-0,21%	0,23%	-0,53%	0,23%	-0,49%
27/jun	-0,34%	-0,23%	-0,10%	-0,28%	-0,56%	-0,19%	-0,22%	-0,26%	-0,17%	-0,27%
28/jun	0,43%	0,73%	1,13% *	0,59%	0,58%	0,70%	0,72%	0,66%	0,55%	0,72%
1/jul	-0,55%	-0,65%	-0,43%	-0,67%	-0,89% *	-0,59%	-0,71%	-0,61%	-0,59%	-0,65%
2/jul	-1,09% *	-0,87% *	-0,76%	-0,93% *	-1,10% *	-0,87% *	-0,84% *	-0,92% *	-0,80%	-0,94% *
3/jul	-0,20%	-0,31%	-0,68%	-0,22%	-0,57%	-0,24%	-0,19%	-0,33%	0,03%	-0,39%
5/jul	0,05%	-0,25%	-1,11% *	-0,03%	-0,02%	-0,23%	-0,10%	-0,24%	-0,05%	-0,25%
8/jul	0,04%	-0,54%	-0,14%	-0,51%	-0,55%	-0,43%	-0,75%	-0,34%	-0,60%	-0,40%
9/jul	-0,20%	0,06%	-0,01%	0,02%	-0,42%	0,09%	0,10%	-0,01%	0,40%	-0,10%
10/jul	0,51%	0,89%	0,89%	0,81% *	0,82%	0,83% *	0,66%	0,89% *	1,24% *	0,69%

Table 2: Average Abnormal Returns - OLS market model (S&P 500) - cont.

	Average Abnormal Returns									
Date	**AA**	**N~AA**	**Deloitte**	**N~Deloitte**	**KPMG**	**N~KPMG**	**PwC**	**N~PwC**	**EY**	**N~EY**
11/jul	0,40%	0,04%	-0,45%	0,20%	0,16%	0,09%	0,09%	0,10%	0,29%	0,03%
12/jul	0,93%	0,60%	0,34%	0,71%	0,80%	0,63%	0,63%	0,66%	0,64%	0,66%
15/jul	-0,36%	0,31%	0,32%	0,18%	0,17%	0,21%	0,07%	0,26%	0,68%	0,05%
16/jul	0,60%	1,18% **	0,82%	1,14% *	1,64% **	0,99% *	1,32% **	1,00% *	1,06% *	1,10% **
17/jul	-0,37%	-0,41%	-0,45%	-0,40%	-0,46%	-0,39%	-0,44%	-0,39%	-0,34%	-0,43%
18/jul	0,50%	0,28%	0,08%	0,36%	0,19%	0,34%	0,13%	0,39%	0,69%	0,20%
19/jul	-0,11%	1,09% *	1,27% **	0,83% *	0,77%	0,92% *	0,85% *	0,92% *	1,53% **	0,69%
22/jul	0,64%	0,81% *	0,52%	0,84% *	0,47%	0,84% *	0,94% *	0,73%	1,13% *	0,67%
23/jul	-1,07% *	-0,11%	-0,64%	-0,19%	-0,09%	-0,29%	-0,29%	-0,25%	0,42%	-0,48%
24/jul	-0,43%	-1,33% **	-0,65%	-1,29% **	-1,36% **	-1,15% **	-1,47% **	-1,08% *	-1,75% **	-1,00% *
25/jul	0,00%	-1,06% **	-0,68%	-0,93% *	-1,14% *	-0,84% *	-1,47% **	-0,67%	-0,87%	-0,89% *
26/jul	-1,78% **	-1,18% **	-1,20% **	-1,29% **	-0,51%	-1,41% **	-1,50% **	-1,19% **	-1,30% **	-1,27% **
29/jul	0,27%	-0,22%	0,13%	-0,19%	-0,11%	-0,14%	-0,24%	-0,10%	-0,58%	0,00%
30/jul	0,38%	-0,19%	-0,22%	-0,07%	-0,93% *	0,05%	0,33%	-0,26%	0,15%	-0,18%
31/jul	-1,29% **	-1,92% **	-2,26% **	-1,74% **	-2,59% **	-1,68% **	-1,41% **	-1,98% **	-1,95% **	-1,78% **
1/ago	0,99% *	0,54%	0,02%	0,72%	0,77%	0,58%	0,60%	0,61%	0,65%	0,60%
2/ago	-0,32%	-0,46%	-0,91% *	-0,34%	0,32%	-0,57%	-0,47%	-0,42%	-0,56%	-0,40%
5/ago	-0,30%	0,12%	0,63%	-0,06%	-0,15%	0,09%	-0,14%	0,13%	0,32%	-0,03%
6/ago	0,36%	0,45%	0,35%	0,45%	0,68%	0,39%	0,53%	0,40%	0,29%	0,48%
7/ago	-1,21% **	-1,31% **	-1,11% *	-1,33% **	-1,65% **	-1,23% **	-1,16% **	-1,35% **	-1,42% **	-1,26% **
8/ago	-0,37%	-0,98% *	-1,23% **	-0,82% *	-1,24% *	-0,82% *	-0,83% *	-0,90% *	-0,86%	-0,89% *
9/ago	0,17%	-0,29%	-0,21%	-0,22%	-0,45%	-0,18%	-0,20%	-0,22%	-0,37%	-0,17%
12/ago	0,26%	0,14%	0,32%	0,12%	0,07%	0,17%	0,10%	0,17%	0,08%	0,18%
13/ago	0,01%	-0,07%	-0,16%	-0,04%	0,05%	-0,08%	-0,08%	-0,05%	-0,09%	-0,05%
14/ago	-1,35% **	-0,80% *	-0,42%	-0,98% **	-0,60%	-0,94% *	-1,02% *	-0,84% *	-0,98% *	-0,86% *
15/ago	0,62%	0,36%	0,70%	0,35%	0,33%	0,42%	0,25%	0,47%	0,25%	0,46%
16/ago	-0,02%	0,84%	0,05%	0,83% *	1,34% **	0,59%	0,94% *	0,61%	0,99% *	0,61%
19/ago	-0,38%	-0,58%	-0,12%	-0,63%	-0,95% *	-0,48%	-0,43%	-0,59%	-0,84%	-0,45%
20/ago	0,58%	0,30%	0,76%	0,26%	0,45%	0,32%	0,04%	0,46%	0,21%	0,39%
CAAR	-6,96%	-7,33%	-8,65%	-7,01%	-10,4%	-6,71%	-7,65%	-7,13%	-3,62%	-8,44%
SCAAR	-1,33	-1,65	-1,84	-1,55	-2,16	-1,53	-1,72	-1,58	-0,71	-1,94

Notes: (*) means significant at 95% confidence level, and (**) means significant at 99% confidence level.

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