CORPORATE SECURITIES FRAUD: AN ECONOMIC ANALYSIS

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Abstract: This paper analyzes a firm's propensity to commit securities fraud and the real consequences of fraud. The theory shows that fraud has real economic cost, as investment distortions can arise from fraud-induced market misvaluation and management's ability to influence the firm's litigation risk through investment. The cost of inefficiency is borne by not only shareholders of fraudulent firms but also those of honest firms. The theory also characterizes a firm's equilibrium supply of fraud. The firm's fraud propensity and the magnitude of fraud are shown to depend on the nature of the firm's assets, growth potential, and the quality of corporate governance. The theory provides testable implications for cross-sectional variations in firms' fraud propensities and for firms' investment incentives in the presence of fraud. It also sheds light on the potential effectiveness of legislative initiatives and regulatory changes that deal with fraud.

Keywords: securities fraud, financial misreporting, growth potential, external financing cost, investment efficiency, corporate governance, fraud detection likelihood.

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In recent years, a string of high profile corporate scandals like those of Global Crossing, Enron, Tyco, and Worldcom has brought securities fraud and corporate governance to the forefront of public attention and policy debate. The magnitude of the alleged securities fraud is stunning. According to Stanford Securities Class Action Clearinghouse and Cornerstone Research, 224 securities lawsuits in 2002 in the United States were associated with a total $206 billion loss of market capitalization in the defendant firms.[1] The governance crisis was followed by rapid and substantial legislative and regulatory changes that aimed to restor investors' confidence in the capital markets. The movement was so fast that nine months after the Enron debacle, President Bush signed the Sarbanes-Oxley bill into law.

Securities fraud is a very serious issue. It undermines a core value in capital markets, the integrity of public companies, which is essential to investor confidence in those markets and the efficient allocation of capital. Furthermore, we also observe inefficient investments and serious value destructions in many fraudulent firms (e.g., Enron, Nortel, eToys), which implies that there could be real economic cost associated with fraud. The wave of corporate scandals and the on-going governance reform call for careful economic reflections on all those happenings, because the exact nature, significance, and consequences of fraud and the economics underlying all the legislative and regulatory changes are still incompletely understood.

This paper develops an economic framework to characterize the determinants and consequences of securities fraud. I define fraud as deliberate and material misrepresentation of corporate performance, and thus use fraud and misreporting interchangeably. This theory builds on Gary Becker's (1968) economic analysis of crime. Following Becker's approach, one can view fraudulent behavior as an economic activity, whose equilibrium supply depends on the expected benefits and costs from engaging in it. Different firms have different propensities to commit fraud because they face different cost-benefit tradeoffs. In this paper, the benefit from fraud is that fraud can create (or sustain) short-term market overvaluation of the firm. The cost of fraud is litigation risk. With some positive probability, fraudulent activities will be uncovered, resulting in a penalty (which includes both explicit monetary fines and other implicit costs, such as loss of reputation). The probability of fraud detection is endogenously determined in the model. Two fraud detection mechanisms are considered. One is detection by capital markets who observe and draw inferences about misreporting from the firm's cash

[1] Cornerstone Research, "Securities Class Action Case Filings 2002: A Year in Review."

flows. The other is detection through corporate governance. Within this framework, the firm's propensity for fraud, the magnitude of fraud, and the firm's investment incentives are analyzed.

The theory demonstrates an interesting link between the firm's financial disclosure and its real investment decision. First, financial misreporting can affect the short-term market valuation of the firm and allow the firm to invest using cheap outside capital. Second, once fraud is committed, the firm has incentive to disguise fraud. Such incentive can motivate the firm to strategically use investment to mask fraud and reduce its litigation risk. The basic intuition is that stochastic cash flows from a new investment can decrease the precision of the firm's total cash flow and create inference problems for the market. In sum, investment can affect both the firm's ex ante benefit from committing fraud and its ex post probability of being detected. The investment distortion can lead to serious value destructions in the firm, which is the real economic cost of fraud. The model predicts that fraudulent firms tend to overinvest in the sense that they would undertake some negative NPV projects that destroy shareholder value. In particular, fraud can induce a managerial preference for risky (in terms of high return volatility) or uncorrelated projects (uncorrelated with the cash flow from existing assets), because thess types of investment can better disguise fraud than others. Inefficient investments, however, can lead to long-term underperformance of fraudulent firms. Furthermore, the cost of inefficiency is borne by not only shareholders of fraudulent firms but also those of honest firms, because the market cannot perfectly distinguish between the two types of firms.

The theory also characterizes the firm's equilibrium disclosure strategy. The model shows that the firm will honestly reveal performance if its performance is very good or if it is desperately bad. The former case is associated with low benefit from fraud, and the latter is associated with high litigation risk. The firm's propensity to commit fraud and the magnitude of fraud depend on the nature of the firm's assets and growth opportunities. The model predicts that fraudulent firms tend to have high growth potential but experience negative profitability shocks. Growth potential can positively influence the firm's payoff from fraud and negatively influence its litigation risk. In addition, litigation events tend to cluster in certain industries during some specific time period, because firms' cost-benefit tradeoffs of fraud are correlated within an industry.

Finally, the theory demonstrates the crucial effect of the endogenous detection risk on the cross-sectional variations in firms' fraud propensities. While the penalty for fraud (at least the explicit liability provisions) is largely determined by securities laws and thus is exogenous to the firm, the probability of detection can be influenced by the firm's endogenous actions (e.g., investment, disclosure) as well as firm-specific attributes. This endogeneity implies that the detection risk is more important in determining cross-sectional variations in firms' fraud propensities than are penalty provisions. Therefore, without increasing the probability of detection, enhanced liability standards alone may achieve only limited deterrence, because firms can undo some effects of tightened penalty by adjusting their probability of getting caught. More important, the theory shows that fraudulent firms' incentive to decrease their likelihood of being detected is a potential source of value destruction and a real danger associated with over-regulation.

The economics of corporate misreporting is examined in the accounting disclosure literature. Dye (1988) analyzes two conditions under which earnings management may exist in equilibrium. First, the cost-minimizing contract that induces preferred action from the manager may not prevent earnings management, which leads to the internal demand for earnings management. Second, incumbent shareholders may attempt to alter the perceptions of prospective investors through managed earnings, which creates the external demand for earnings management. In line with Dye's notion of internal demand for earnings management, Lacker and Weinberg (1989) and Goldman and Slezak (2003) show that the optimal incentive contract between the principal and the agent may not prevent (and may even encourage) the agent from misreporting. Several other papers together with my paper are consistent with Dye's notion of external demand for earnings management. Stein (1989) argues that capital market pressure can induce the management to inflate current profitability at the expense of forgoing future cash flows. Bebchuk and Bar-Gill (2003) present a model in which firms' needs for external financing and insiders' benefit from informed trading can motivate management to misreport corporate performance. Jensen (2004) argues that corporate fraud can result from a dramatic form of capital market pressure. When the market substantially overvalues a firm's equity, the firm may feel forced to defraud investors in order to defend such overvaluation, and this can lead to serious value destructions in the firm. I show that overvaluation can result from the firm's endogenous choice, and an important source of value destruction is the fraud-induced investment distortion. Finally, Povel, Singh and Winton (2003) examine the effect of business cycles on investors' monitoring incentives and firms' incentives to commit fraud. In their model, the cost and benefit of fraud hinge heavily on investors' prior beliefs about the overall economic conditions and their monitoring cost, while the present model emphasizes the effect of firm-specific factors in determining the tradeoff.

The proposed theory also complements some empirical research on earnings management and corporate fraud. The earnings management literature provides evidence that managers have incentives to manipulate earnings in an attempt to influence short-term stock price performance before major capital market activities (see, e.g., Teoh, Welch and Wong (1998a,b) on public equity offers; Erickson and Wang (1998) on stock-financed acquisitions). Efendi, Srivastava and Swanson (2004) find that the likelihood of an earnings restatement is significantly higher for firms that make one or more sizable acquisitions. Several studies have examined the relation between corporate governance characteristics and the incidences of corporate fraud or accounting restatements, and provide evidence that the quality of corporate governance significantly influences the likelihood of fraud (see, e.g., Alexander and Cohen (1999) on insider ownership; Beasley (1996) and Agrawal and Chadha (2004) on board structure; Johnson, Ryan, and Tian (2003), Peng and Röell (2003), and Burns and Kedia (2003) on equity compensation). The present theory has implications that are consistent with the above findings, and proposes new testable predictions, such as predictions about the relation between investment and fraud, and about the economics of fraud detection.

The rest of the paper is organized as follows. Section 1 introduces the model framework and assumptions. Section 2 characterizes the firm's cost-benefit tradeoff of committing fraud. Section 3 examines the firm's investment incentives in the presence of fraud. Section 4 derives the firm's equilibrium disclosure strategy. Section 5 discusses model implications and possible extensions. Section 6 concludes.

1 Model Framework

1.1 The Firm

Consider a typical public firm whose market value consists of both its assets in place and growth opportunities. The asset value is normally distributed, $\widetilde{A} \sim N(\overline{A}, \sigma_A^2)$.[2] The growth

[2] I can always choose reasonable values for $\widetilde{A}$ and σ_A such that negative asset values are associated with probabilities close to zero.

opportunity takes the form of a possible new investment project in the future whose value is also normally distributed, $\widetilde{G} \sim N(\overline{G}, \sigma_G^2)$. The market knows the distributions of $\widetilde{A}$ and $\widetilde{G}$, but does not observe the realizations of each component. The market value of the firm is the expected discounted future cash flows. For simplicity, I assume that investors are risk neutral, and the discount rate is zero. Therefore, the firm value is simply $E(V) = \overline{A} + \overline{G}$.

The firm is operated by a manager who owns a fraction $0 < \alpha < 1$ of the firm. I assume that the manager holds restricted stock and thus is not allowed to trade any of her own equity shares. This simplifying assumption allows abstraction from the incentive and signalling effects of insider trading. It also implies that the manager maximizes the wealth of long-term shareholders.[3]

The accounting and auditing literature has provided evidence that both capital market activities (see the citations in the introduction) and profits from informed trading (e.g., Summers and Sweeney (1998)) can motivate fraudulent reporting. Wang (2004a) studies private securities class action litigation against US public companies between 1996 and 2002, and documents that about 68% of the securities lawsuits involved misreporting surrounding major capital market activities (external financing or externally-financed investment), and about 29% of the cases involved allegations of illegal insider trading and insider personal gains. This paper focuses on fraud and firm investment, and thus analyzes the former scenario. I will show that even when the manager's interest is perfectly aligned with that of the incumbent shareholders, fraud can still emerge in equilibrium. Adding managerial agency problem could, of course, exacerbate the manager's fraud incentives.

1.2 Time Line and Assumptions

There are four periods in this model, $t = 0, 1, 2, 3$. The sequence of events is described below (also see Figure 1 at the end of the paper for an outline).

Time 0: Institutional Arrangements At time 0, the institutional arrangement of the firm is established. The strength of the firm's internal corporate governance is indicated by $p \in [0, 1]$. Higher p represents better governance and also higher likelihood of internal detection of fraud.[4]

[3] I assume that there is no opportunity for perquisite consumption. This type of agency problem is not the focus of this paper.

[4] Section 5 will discuss the possibility of endogenizing this parameter.

Time 1: Disclosure of Earnings At time 1, the manager privately observes the realization of the intermediate earnings generated by the firm's assets.[5] The earnings realization is drawn from the following process.

$$\widetilde{e} = q\widetilde{A} + \widetilde{u}. \tag{1}$$

q indicates the average productivity of the firm's assets in place, of which the market is aware. $\widetilde{u}$ is a white noise term, $\widetilde{u} \sim N(0, \sigma_u^2)$. Equation (1) shows that the realized intermediate earnings (e) contain useful information about the value of the firm's assets. Let the signal-to-noise ratio be $\delta \equiv \frac{q\sigma_A^2}{q^2\sigma_A^2+\sigma_u^2}$. Then the expected value of the assets conditional on the earnings realization e is $E(\tilde{A}|e) = \overline{A} + \delta(e - \overline{e})$.

After observing the intermediate earnings, the manager makes a disclosure decision,

$$y(e) = e + \eta. \tag{2}$$

η represents the amount of distortion in the reported earnings. $\eta = 0$ means that the manager chooses to truthfully reveal the earnings. $\eta > 0$ implies that the manager inflates earnings. η is assumed to be nonnegative. That is, this paper focuses on *overreporting* of earnings. It is possible that managers may intentionally understate earnings (e.g., for income smoothing purposes). Empirical studies on earnings management as well as SEC accounting and auditing enforcement actions, however, indicate that accounting overstatement is much more frequently observed than understatement (see, e.g., Feroz, Park, and Pastena (1991); Rezaee (2002)), and thus is a more interesting subject for research.

Once the earnings disclosure is made, the market prices the firm's equity based on the *reported* earnings $y(e)$, but the market does not have to take the earnings announcement at face value. Investors are generally aware of the possibility of misreporting. The market's prior belief about the firm's likelihood of misreporting is $\pi_0 \in [0, 1]$, and the expected amount of misreporting is $\overline{\eta}$. Then the time 1 market value of the firm's assets is $V_1 = E_{\pi_0}[\tilde{A}|y(e)]$, where the expectation incorporates the market's prior belief about fraud.

Time 2: Investment Decision In this period, a new investment opportunity arrives with probability λ, requires an initial outlay of $\$I$, and will generate a gross return $\widetilde{R}$, $\widetilde{R} \sim N(\overline{R}, \sigma_R^2)$. For simplicity, I set $\overline{R} = 1$, which allows me to parameterize the profitability of the

[5] The intermediate information does not have to be earnings. It can be any valuable piece of accounting information, or even more general information about the firm's overall financial condition, operational condition, or business prospects.

new investment in a straightforward way. Once the new investment opportunity arrives, the manager observes the gross return as r, the realization of $\widetilde{R}$. The market does not observe this but knows the return distribution (i.e., the mean and variance of $\widetilde{R}$).

The manager makes an investment decision: whether to take the new project or not. If she decides to take it, the firm needs to raise $\$I$ as the initial capital. I assume that new equity shares are issued. I will discuss the robustness of the model results with respect to this assumption in section 2.2.

Time 3: Liquidation At time 3, the firm has a liquidating cash flow $\widetilde{V}$. If the firm invests at time 2,

$$\widetilde{V} = \widetilde{A} + I\widetilde{R} = \frac{1}{q}\widetilde{e} + I\widetilde{R} - \frac{1}{q}\widetilde{u}. \tag{3}$$

If the firm does not invest,

$$\widetilde{V} = \widetilde{A} = \frac{1}{q}\widetilde{e} - \frac{1}{q}\widetilde{u}. \tag{4}$$

The market is able to observe this final cash flow and can use this information to update its belief about the probability of fraud at time 1. How the market interprets a particular final cash flow realization depends on the market's expectation about $\widetilde{V}$. The following table lists four distributions of $\widetilde{V}$: the perceived distribution (conditional on $y(e)$), the true distribution (conditional on e), the distribution given that the firm invests (I), and the one given not (N).

	Investment (I)	**No Investment (N)**
True	$E(\widetilde{V}\|I,e) = E(\widetilde{A} + I\widetilde{R}\|I,e)$ $Var(\widetilde{V}\|I,e) = Var(\widetilde{V}\|I)$	$E(\widetilde{V}\|N,e) = E(\widetilde{A}\|e)$ $Var(\widetilde{V}\|N,e) = Var(\widetilde{V}\|N)$
Perceived	$E(\widetilde{V}\|I,y) = E(\widetilde{A} + I\widetilde{R}\|I,y)$ $Var(\widetilde{V}\|I,y) = Var(\widetilde{V}\|I)$	$E(\widetilde{V}\|N,y) = E(\widetilde{A}\|y)$ $Var(\widetilde{V}\|N,y) = Var(\widetilde{V}\|N)$

$Var(\widetilde{V}|I) = \sigma_e^2/q^2 + (I\sigma_R)^2 + 2\rho I\sigma_R\sigma_e/q + \sigma_u^2/q^2$, where ρ is the correlation between $\widetilde{e}$ and $\widetilde{R}$. $Var(\widetilde{V}|N) = \sigma_e^2/q^2 + \sigma_u^2/q^2$. We can see that misreporting only distorts the expected value of the firm's final cash flow, not the variance of it.

2 Cost and Benefit of Fraud

This section characterizes the cost-benefit tradeoff of committing fraud. The firm's litigation risk is derived in section 2.1. The benefit from fraud and the manager's optimization problem are presented in section 2.2.

2.1 Litigation Risk

At time 3, after the realization of the final cash flow, the market may unearth the manager's misreporting at time 1 with some probability. Once fraud is detected, the firm will be subject to a penalty. The expected cost of committing fraud is simply the product of the detection likelihood and the penalty after detection.

2.1.1 Probability of Fraud Detection

This model considers two fraud detection mechanisms: detection through cash flow and detection through internal corporate governance. At time 3, after observing the firm's final cash flow, the market rationally chooses an investigation strategy that maximizes its payoff from litigation.[6] More specifically, the market chooses a threshold $\underline{v}$ such that it will investigate the manager's time 1 disclosure whenever the final cash flow realization V falls below this threshold. I assume that any misreporting, if it exists, will be discovered upon investigation (i.e., the conditional probability of fraud detection upon investigation is one). Thus, I will use the probability of fraud investigation and the probability of fraud detection interchangeably. I call the region $\{V : V \leq \underline{v}\}$ the *cash flow detection region.* If this region is not reached (i.e., $V > \underline{v}$), no external investigation will be triggered, but detection of fraud is still possible. In this situation, the probability of fraud detection solely depends on the firm's quality of corporate governance (p). That is, p indicates the likelihood of an internal investigation on fraud when the cash flow realization does not automatically reveal fraud. In sum, the likelihood of detection conditional on $V \leq \underline{v}$ is one, and the likelihood conditional on $V > \underline{v}$ is p. Then the effective probability of fraud detection is

$$P = Prob.(V > \underline{v}) \times p + Prob.(V \leq \underline{v}) \times 1. \tag{5}$$

Probability of Cash Flow Detection At time 3, if the market investigates the firm, the expected payoff from the effort is $fE(\eta|V) - C$, where $C > 0$ is the investigation cost. Therefore, the market will examine the firm's disclosure practice if and only if $fE(\eta|V) - C \geq 0$, or

$$E(\eta|V) = y - E(e|V) \geq \frac{C}{f}. \tag{6}$$

[6]Here the market can be interpreted as the firm's outside (and uninformed) investors or as the regulators such as the SEC who represent the interests of the general investing public. Therefore, this fraud detection mechanism indicates the strength of capital market monitoring.

Define $\delta_V = \frac{cov(e,V)}{Var(V)}$. Then under the perceived cash flow distribution (the one based on $y(e)$), we have

$$E(e|V) = \overline{e} + \delta_V[V - E(V|y)]. \tag{7}$$

Substituting this expression into equation (6), we can see that an external investigation will be triggered if and only if

$$V \leq \underline{v} = E(V|y) - \frac{\overline{e} + C/f - y}{\delta_V}. \tag{8}$$

This condition implies that when the final cash flow realization is sufficiently below the market expectation ($E(V|y)$), outside investors will rationally think they have been misled and will start an investigation. Define

$$v_c = \frac{\underline{v} - E(V|y)}{\sqrt{Var(V)}},$$

and let Φ denote the standard normal cumulative distribution function. Then the firm's probability of facing an outside investigation under the perceived distribution is[7]

$$Prob.[V \leq \underline{v}|y] = \Phi(v_c). \tag{9}$$

Yet, the firm's *true* probability of having an external investigation is not simply $\Phi(v_c)$. Let $\nu = \frac{1}{\sqrt{Var(V)}}$ be the precision of the firm's final cash flow. Then, under the true cash flow distribution (the one based on e), we have

$$Prob.[V \leq \underline{v}|e] = \Phi(v_c + K), \tag{10}$$

where $K = [E(V|y) - E(V|e)]\nu$. We can see that when K is positive, the firm's actual probability of cash flow detection is strictly greater than $\Phi(v_c)$. In other words, the more the manager can raise the market's expectation about V by false disclosure ($E(V|y) > E(V|e)$), the more likely is an outside investigation of fraud (see Figure 2 for an illustration). This implies that the benefit and cost of fraud are endogenously related, and there exists an optimal size of fraud within the firm.

In sum, the essence underlying the cash flow detection mechanism is that the final cash flow realization V is a function of the true earnings realization e, not the reported earnings $y(e)$ (see equations (3) and (4)). Therefore, investors can update their belief about the probability

[7] Since $\Phi(v_c)$ is not necessarily zero, even an honest firm may face an outside investigation. However, if the firm has not misreported, the investigation will not lead to discovery of fraud. Thus the honest firm will not be punished even if it may face an outside investigation.

of misreporting after observing V, whose realization the manager cannot fully control. This implies that fraud can be partially self-revealing, which is supported by securities litigation in the United States. Table 2 at the end of the paper lists the corporate events or entities that precipitated the federal private securities class action lawsuits filed in 1996 and 1997 in the United States. Among the 187 lawsuits, at least 132 cases (or 70.6% of the total) were filed after some unexpected disappointing performance realizations.

Expected Probability of Fraud Detection At time 1, when the manager makes the disclosure decision $y(e)$, what matters is her expected probability of fraud detection P. Essentially, P tells the manager how risky it is to commit fraud.

Let Φ_I (Φ_N) be the probability of cash flow detection if the firm invests (does not invest).

$$\Phi_I = \Phi(v_{c,I} + K_I), \tag{11}$$

$$\Phi_N = \Phi(v_{c,N} + K_N), \tag{12}$$

$$v_{c,I} = -\frac{\overline{e} + C/f - y}{\delta_{V,I}}\nu_I, \tag{13}$$

$$v_{c,N} = -\frac{\overline{e} + C/f - y}{\delta_{V,N}}\nu_N, \tag{14}$$

$$K_I = [E(V|y) - E(V|e)]\nu_I, \tag{15}$$

$$K_N = [E(V|y) - E(V|e)]\nu_N, \tag{16}$$

where $\nu_I = \frac{1}{\sqrt{Var(V|I)}}$ and $\nu_N = \frac{1}{\sqrt{Var(V|N)}}$. Let P_I (P_N) denote the effective probability of fraud detection, given that the firm invests (does not invest) at time 2. Then according to equation (5). We have

$$P_I = (1 - \Phi_I)p + \Phi_I, \tag{17}$$

$$P_N = (1 - \Phi_N)p + \Phi_N. \tag{18}$$

These two equations imply that the probability of fraud detection depends on firm-specific attributes, such as the quality of corporate governance and the nature of cash flows. More important, it also depends on the manager's disclosure strategy ($y(e)$) and the market's response ($E[V|y(e)]$). If P_I does not always equal P_N, then it means that investment also influences the firm's detection risk. In sum, the model shows that litigation risk is endogenously related to the manager's decision making.

At time 1, the manager's expected probability of fraud detection (P) is simply a weighted average of P_I and P_N. Let x be the probability that the firm will undertake a newly arrived investment project (x will be endogenously determined in section 3). Then λx is the probability that the firm will exercise a growth option at time 2. We have

$$P = \lambda x P_I + (1 - \lambda x) P_N. \tag{19}$$

2.1.2 Penalty to Fraud

Once fraud is discovered, the firm is subject to a legal fine of $f\eta$. That is, the penalty is assumed to be proportional to the amount of earnings misstatement. The fine is paid out of the company's final cash flow V. Monetary settlement is a prevailing means of fraud punishment. Of course, there are other consequences of fraud such as the negative price response to securities litigation (Griffin, Grundfest and Perino (2003)), loss of the firm's reputation, persistent increase in the cost of capital (Dechow, Sloan, and Sweeney (1996)), and long-run poor firm performance (Baucus and Baucus (1997)). I incorporate all the explicit and implicit fraud consequences in the marginal penalty parameter f and measure them in terms of money.

In order to understand the nature of securities fraud and the role of securities litigation (or fraud detection), it is important to know who bears the litigation cost of fraud. There are two major types of securities litigation, the SEC enforcement actions and the private class action litigation. In a SEC enforcement action, the SEC is the plaintiff who receives the fine. In a private class action litigation, the plaintiff (or class members) is a group of the firm's security holders (e.g., equity or debt holders) who purchase the firm's public securities during some specific time (class period). Once the lawsuit is settled, the defendant firm pays the settlement to the plaintiff investors. In this model, if the firm invests at time 2, then the class period would start at time 1 if the manager makes false disclosure and end at time 3 if fraud is uncovered. The class members would be the new (and uninformed) shareholders who finance the firm's project at time 2. If the firm does not invest at time 2, there are no clear class members, and the litigation can be viewed as a SEC enforcement action. In either case, it is the defendant firm (or its existing shareholders) who bears the litigation cost.

2.2 Fraud Incentives

If a new investment opportunity arrives at time 2 and the firm takes it, the market value of the firm based on its earnings disclosure and investment decision is $E(V|I, y)$, while the true value of the firm is $E(V|I,e)$. The difference between $E(V|I,y)$ and $E(V|I,e)$ results from misreporting of earnings at time 1.

In order to undertake the new investment, the firm needs to raise \$$I$ by issuing a fraction

$$\beta(y) = \frac{I}{E(V|I,y)}$$

of new equity. β is the percentage ownership of the new shareholders. The expected value to existing shareholders at time 3 is thus $(1-\beta)E(V|I,e)$. The value of β indicates the cost of external financing. A high β means that the incumbent shareholders need to sacrifice a large fraction of the final cash flows in order to raise \$$I$, or a high cost of external capital. We can see that β is a function of the reported earnings $y(e)$. If $E(V|I,y)$ increases in $y(e)$, then β decreases in $y(e)$. This implies that a potential benefit of committing fraud is that financial misreporting creates (or sustains) short-term market overvaluation of the firm and reduces the firm's cost of external financing.[8] A deeper implication is that fraud can result from the conflict of interests between incumbent shareholders and prospective investors of the firm.

Misreporting also comes with a cost: the expected litigation liability. Both the probability of detection and the penalty are functions of $\eta = y(e) - e$. The cost-benefit tradeoff leads to the following maximization problem for the manager at time 1.

$$\begin{aligned} \max_{\eta \geq 0} \Pi &= \lambda x[1-\beta(y)]E(V|I,e) + (1-\lambda x)E(V|N,e) - P(\eta)f\eta \\ &= E(V|N,e) + \lambda x[\beta_0 - \beta(y)]E(V|I,e) - P(\eta)f\eta, \end{aligned} \tag{20}$$

where $P(\eta) = \lambda x P_I + (1-\lambda x)P_N$, and $\beta_0 = I/E(V|I,e)$ is the firm's external financing cost in the absence of fraud. The solution to this problem, η^*, is the optimal amount of misreporting.

3 Securities Fraud and Investment Incentives

In order to solve the manager's optimization problem in equation (20), I need to derive the manager's investment incentive x in the presence of fraud. Recall that x is the probability that the manager will undertake a newly arrived investment project at time 2. Section 3.1 derives

[8] I assume that the firm has to finance the new project by raising new equity. Since the benefit of fraud derives from the effect of financial misreporting on the short-term market valuation of the firm, the insight of the model will not change if the firm can use debt financing. In the debt context, there is also an external financing cost, which is the interest rate the firm pays.

the firm's investment incentive at time 2, given its disclosure strategy at time 1. Section 3.2 presents a numerical illustration.

3.1 Investment Distortions

Suppose that a new investment opportunity does arrive at time 2. The manager privately observes the gross return to the new project as r. If the firm issues new equity and invests, the market value of the firm is[9]

$$E(V|I,y) = E(\widetilde{A}|y) + IE(\widetilde{R}). \tag{21}$$

The true value of the firm is, however, $E(\widetilde{A}|e) + Ir$. In order to invest, the firm needs to issue a fraction β of new equity. The firm also faces the potential litigation liability $P_I f\eta$, if $\eta \neq 0$. Then the expected final payoff to existing shareholders is $(1-\beta)[E(\widetilde{A}|e) + Ir] - P_I f\eta$ if the firm invests, and $E(\widetilde{A}|e) - P_N f\eta$ if the firm does not issue and invest. Therefore, for the firm to issue and invest, we need

$$(1-\beta)[E(\widetilde{A}|e) + Ir] - P_I f\eta > E(\widetilde{A}|e) - P_N f\eta. \tag{22}$$

A cutoff investment profitability r_c can be derived such that the above condition is satisfied when $r > r_c$. In other words, the firm will invest if and only if the return to the new investment exceeds some threshold level r_c. $r_c = 1$ means that the firm follows the positive NPV rule when making new investment. $r_c > 1$ implies that the firm tends to underinvest in the sense that it will pass up some positive NPV projects. $r_c < 1$ implies that the firm tends to overinvest in the sense that it will undertake some negative NPV projects. Therefore, the manager's investment incentive is reflected in her choice of the cutoff profitability to new investments. The model results about the manager's investment decision are presented in the following propositions. Detailed proofs are provided in the appendix.

Proposition 1 *Financial misreporting affects the firm's investment incentives. Specifically, the firm's cutoff profitability to new investments (r_c^*) depends on its magnitude of fraud (η).*

$$r_c^* = \frac{E(\widetilde{A}|e)}{E(\widetilde{A}|y)} - \frac{(P_N - P_I)f\eta}{(1-\beta)I}. \tag{23}$$

[9] In this model, the market does not update its expectation on the investment return based on the firm's investment announcement. That is, $E(\widetilde{R}|I) = E(\widetilde{R})$. In an earlier version of the paper, I allowed for the update of expectation. The qualitative implications of the model were virtually the same as they are in this version, but the derivations in the model were more complex.

The derivation of r_c^* is straightforward using the inequality (22). Given the manager's misreporting strategy η at time 1, the probability that the firm will undertake a newly arrived investment opportunity at time 2 is

$$x = Prob.[r > r_c^*(\eta)] = 1 - \Phi[z_c^*(\eta)], \tag{24}$$

where $z_c^* = (r_c^* - \overline{R})/\sigma_R$. The lower the cutoff investment profitability, the more likely is the firm to exercise its growth option at time 2.

Proposition 2 *Making a new investment decreases the firm's probability of being investigated at time 3 if the firm can boost its market value by overstating earnings, and either the cash flow from the new investment is volatile enough or the correlation between such cash flow and that from the existing assets is in a neighborhood around zero. Specifically, $P_I < P_N$ if $E[V|y(e)] > E[V|e]$ when $\eta > 0$ and one of the following conditions is satisfied:*

(1) $I\sigma_R > \overline{I\sigma_R}$, and $\max(-1, -\frac{\sigma_e}{qI\sigma_R}) < \rho < \overline{\rho} \leq 1$;

(2) $\rho \in [-\epsilon, \epsilon]$, where ϵ is an arbitrary small positive number, and $I\sigma_R > 0$.

Proposition 3 *If the firm can boost its market value by overstating earnings, then the firm has an incentive to overinvest. That is, if $E[V|y(e)] > E(V|e)$ when $\eta > 0$, then $r_c^* < 1$. The larger the magnitude of fraud, the lower is the fraudulent firm's threshold return to new investments,*

$$\frac{\partial r_c^*}{\partial \eta} < 0. \tag{25}$$

The essential message in these propositions is that there is an interesting linkage between the firm's financial disclosure and its real investment decision. The interaction is twofold. First, if a low-earnings firm overstates its earnings ($y(e) > e$) to pool with a high-earnings firm, and if the market cannot fully distinguish between the two types, then we have $E(\widetilde{A}|y) > E(\widetilde{A}|e)$ for the low-earnings and dishonest firm. This implies that the market will on average overvalue the equity of the fraudulent firm. This overvaluation lowers the firm's external financing cost and thus gives the firm a larger incentive to raise money and invest, resulting in overinvestment. This effect is reflected in the first term on the right-hand side of equation (23). The high-earnings firm, however, will suffer from some market undervaluation due to the cross-subsidization between the good firm and the fraudulent firm. The good firm cannot finance the new investment on reasonable terms and therefore has less incentive to issue and invest. This is consistent with the underinvestment argument in Myers and Majluf (1984).

Second, financial misreporting can also affect the firm's investment decision through the effect of investment on the firm's litigation risk. The second term on the right-hand side of equation (23) represents the change in the expected litigation cost per investment dollar if the firm invests rather than not. If this change is negative, then the reduction in litigation risk will push the fraudulent firm's profitability threshold r_c^* further down below one. This means that the potential negative effect of making a new investment on the firm's litigation risk will exacerbate the investment distortion. Given any $\eta > 0$, Proposition 2 states that $P_I < P_N$ if the investment is uncorrelated with the firm's existing assets or if the investment is risky enough. The basic intuition is as follows. The market observes the combined cash flow from the firm's assets in place and from the new investment, and draws inference about possible misreporting of asset value based on the total cash flow. On one hand, given the level of cash flow volatility, the inference problem will be most difficult for the market when the investment cash flow is not correlated with the cash flow from the existing assets. On the other hand, given the level of correlation, high cash flow volatility from the new investment will decrease the valuation precision of the firm's total cash flow and make it harder for the outsiders to detect fraud. Therefore, the manager's incentive to disguise fraud will give her a preference for risky or uncorrelated projects, because these types of investment can mask fraud better than others. In the following analysis, I will focus on the case in which $P_I < P_N$.

In sum, the key insight in Propositions 1 to 3 is that securities fraud can lead to real value losses. The distorted investment incentive can arise from both the fraud-induced market misvaluation ($E[A|y(e)] \neq E[A|e]$) and the effect of investment on the firm's litigation risk ($P_I \neq P_N$). Securities fraud can lead to overinvestment by fraudulent firms and underinvestment by good and honest firms. Furthermore, fraud also induces a preference for risk.

3.2 A Numerical Illustration

This section presents a numerical example to illustrate the relation between fraud and investment incentives. Two levels of earnings realization are considered: e_L and e_H, $e_L < e_H$. The firm can be one of the following three types:

LH firm: low earnings ($e = e_L$) are honestly revealed ($y = e_L$);

HH firm: high earnings ($e = e_H$) are honestly revealed ($y = e_H$);

LD firm: low earnings ($e = e_L$) are reported as high earnings ($y = e_H$).

Table 1 : A Numerical Illustration of Investment Incentives

This table shows the firm's threshold investment profitability r_c^* and its likelihood of making a new investment x (in parentheses) at time 2. I assume the following parameter values. The value of the firm's assets in place is normally distributed with expectation $\overline{A} = 100$ and volatility $\sigma_A = 30$. The average return on assets is $q = 0.16$. The earnings noise u is normally distributed with zero mean and volatility $\sigma_u = 4$. The expected earnings is $\overline{e} = q\overline{A} = 16$, and volatility is $\sigma_e = \sqrt{q^2\sigma_A^2 + \sigma_u^2} = 6.25$. The size of the new investment is $I = 25$. The volatility of investment return is $I\sigma_R = 25 * 0.3 = 7.5$. The correlation coefficient between $\widetilde{R}$ and $\widetilde{e}$ is $\rho = 0.3$. The market's prior belief about the probability of fraud is $\pi_0 = 0.5$. The marginal penalty is $f = 1.5$. The institutional efficiency is $p = 0.3$. The cost of investigation is $C = E(f\eta) = f\eta$. In panel A, I set $e_L = \overline{e} - \sigma_e = 9.75$. I consider two levels of e_H: $e_H = \overline{e} = 16$, which means that $\eta = 6.25$, and $e_H = \overline{e} + \sigma_e = 22.25$, which means that $\eta = 12.5$. In panels B-C, $\eta = 12.5$.

Panel A: Fraud Magnitude and Investment Bias

	$\eta = 6.25$	$\eta = 12.5$
LD	0.87 (67%)	0.77 (78%)
LH	1.00 (50%)	1.00 (50%)
HH	1.13 (33%)	1.23 (22%)

Panel B: Investment Volatility and Investment Bias

	$I = 25$		$I = 75$	
	$\sigma_R = 0.3$	$\sigma_R = 0.4$	$\sigma_R = 0.3$	$\sigma_R = 0.4$
LD	0.77 (78%)	0.76 (72%)	0.75 (79%)	0.74 (74%)
LH	1.00 (50%)	1.00 (50%)	1.00 (50%)	1.00 (50%)
HH	1.23 (22%)	1.23 (22%)	1.23 (22%)	1.23 (22%)

Panel C: Asset Volatility, Correlation, and Investment Bias

	$\sigma_A = 30$	$\sigma_A = 40$
LD	0.77 (78%)	0.58 (92%)
LH	1.00 (50%)	1.00 (50%)
HH	1.23 (22%)	1.41 (9%)

	$\rho = -0.5$	$\rho = 0$	$\rho = 0.5$
LD	0.79 (76%)	0.77 (78%)	0.76 (79%)
LH	1.00 (50%)	1.00 (50%)	1.00 (50%)
LH	1.23 (22%)	1.23 (22%)	1.23 (22%)

Table I reveals the following patterns with respect to the firm's investment incentives in the presence of fraud.

(1) The HH firm tends to underinvest ($r_c^* > 1$), and the LD firm tends to overinvest ($r_c^* < 1$).

(2) Holding other parameters constant, increasing the magnitude of fraud (η) worsens both the underinvestment problem of the HH firm and the overinvestment problem of the LD firm (as shown in panel A). This clearly demonstrates the investment distortion spillover between fraudulent and honest firms.

(3) Holding other parameters constant, larger investment volatility ($I\sigma_R$) and non-negative correlation between investment and existing assets exacerbate the overinvestment problem of the LD firm (as shown in panel B). This is because the two characteristics of the new investment magnifies the market's inference problem.

(4) Holding other parameters constant, larger asset volatility (σ_A) exacerbates both the underinvestment problem of the HH firm and the overinvestment problem of the LD firm (as shown in panel C). The intuition is that high asset volatility implies less valuation precision of the firm's cash flows, which amplifies both the misvaluation fraud can induce and the effect of investment on the litigation risk.

In sum, the numerical illustrations demonstrate that fraud can distort investment decisions in both fraudulent and honest firms. The degree of distortion depends on the magnitude of fraud as well as the characteristics of the firm's assets and growth options.

4 Disclosure Strategy

Section 3 shows that the manager's investment incentive (r_c^* or x) can be influenced by financial misreporting (η). Now I move back to time 1 and examine the manager's disclosure strategy $y(e)$, taking into consideration her investment incentives at time 2.

At time 1, the manager privately observes the earnings (e) generated by the firm's assets and makes an earnings announcement $y(e) = e+\eta(e)$. That is, given any earnings realization e, the manager optimally chooses the amount of misstatement η such that the expected value to long-term shareholders at time 3 is maximized. The manager's objective function is specified in equation (20) in section 2.2. Now I substitute equation (24) into (20) and rewrite the manager's maximization problem as follows.

$$\max_{\eta\geq 0}\ \Pi = E(V|N,e) + \lambda[1-\Phi(z_c^*)][\beta_0-\beta(y)]E(V|I,e) - P(\eta)f\eta, \tag{26}$$

where $z_c^* \equiv [r_c^*(\eta) - \overline{R}]/\sigma_R$. In sum, misreporting affects the manager's objective function in three ways. First, it directly affects the firm's external financing cost $\beta(y)$. Second, it indirectly influences the long-term performance of the firm V through the endogenous investment decision $r_c^*(\eta)$. Third, misreporting brings a potential litigation liability $P(\eta)f\eta$. The optimal strategy balances the benefit of misreporting and the cost of it.

I adopt the Perfect Bayesian equilibrium concept to study the manager's equilibrium misreporting strategy. A Perfect Bayesian equilibrium has two requirements. First, the market forms expectations on the firm value $[E(V|y)]$ using Bayes's rule whenever possible. Second, given the market's beliefs, the manager's disclosure strategy $y(e)$ maximizes her objective function.

Proposition 4 *An equilibrium disclosure strategy involves partitioning the earnings space into a fraud region and two nonfraud regions. Specifically, there are three cutoff earnings realizations $-\infty < e_l < e_c < e_h < +\infty$, and the manager's earnings disclosure strategy is as follows.*

$y^*(e) = e$, *if* $e \geq e_c$,

$y^*(e) = e + \eta^*(e) > e_c$, *if* $e_l \leq e < e_c$,

$y^*(e) = e$, *if* $e < e_l$.

Let e' *denote the earnings the market infers from* $y(e)$. *Then the market value of the firm's assets after the earnings announcement is*

$V_1(y) = E(\tilde{A}|e', e' = y)$, *if* $y > e_h$,

$V_1(y) = (1-\pi_1)E(\tilde{A}|e', e' = y) + \pi_1 E[\tilde{A}|e', e' = y_1^{-1}(e)]$, *if* $e_c \leq y \leq e_h$,

$V_1(y) = E[\tilde{A}|e', e' = y_2^{-1}(e)]$, *if* $e_l \leq y < e_c$,

$V_1(y) = E(\tilde{A}|e', e' = y)$, *if* $y < e_l$,

where $\pi_1 \equiv Prob.(misreporting|e_c \leq y \leq e_h)$, $y_1^{-1}(e) = y(e) - \overline{\eta}_1(e)$, *and* $y_2^{-1}(e) = y(e) - \overline{\eta}_2(e)$. $\overline{\eta}_1$ *and* $\overline{\eta}_2$ *are the market's expected amount of misreporting when* $e_c \leq y \leq e_h$ *and when* $e_l \leq y < e_c$, *respectively.*

Detailed proof of this proposition is provided in the appendix. Here I discuss the implications. Proposition 4 implies that the manager will honestly reveal the earnings when the true earnings realization is very good or desperately bad. The manager has an incentive to overstate earnings when the earnings realization is mediocre or fairly disappointing. The intuition is as follows. When the firm is in good shape ($e > e_c$), the manager does not need to overreport earnings at the cost of incurring future litigation liability. When the firm is in a shaky condition ($e_l \leq e < e_c$) but faces some possible future growth opportunities, the manager will rationally want to take the chance and dress up short-term firm appearance so that future growth options can be exercised on favorable terms. When the earnings happens to be stunningly bad ($e < e_l$), however, moderate overreporting will not change the picture much. In this case, in order to mimic a high-earnings firm, the low-earnings firm has to engage in substantial amount of overstatement, which implies large litigation risk. When the expected cost of fraud exceeds the benefit, the firm is better off by honestly revealing the earnings.

Proposition 4 shows that the market will rationally discount the firm's earnings announcement if $e_l \leq y \leq e_h$. When $e_c \leq y \leq e_h$, the fraudulent firm pools with high-earnings firms. The market value of the firm's assets reflects a weighted average of the two types. When $e_l \leq y < e_c$, the market fully discounts the reported earnings because the firm has an incentive to overreport when its true earnings realization is in this region. Proposition 4 implies, however, that $e_l \leq y < e_c$ will not be observed in equilibrium. So $V_1(y) = E[\tilde{A}|e', e' = y_2^{-1}(e)]$ if $e_l \leq y < e_c$ is an off-equilibrium specification.

Given any cutoff value e_c and e_l, the firm's probability of committing fraud is

$$Prob.(fraud) = Prob.(e_l \leq e < e_c).$$

The combination of a high e_c and a low e_l implies a high fraud propensity. Different firms can have different cutoff values and thus different likelihoods of misreporting. The fraud region as well as the magnitude of misreporting depend on the structural parameters in the model. The following proposition presents some comparative-static results for η^* and $Prob.(fraud)$ with respect to some important benefit and cost parameters. Proof is provided in the appendix.

Proposition 5 *(1) Growth potential:* $\partial\eta^*/\partial\lambda > 0$, *and* $\partial Prob.(fraud)/\partial\lambda > 0$;

(2) Earnings informativeness: $\partial e_c/\partial\delta > 0$, *but* $\partial\eta^*/\partial\delta$ *and* $\partial Prob.(fraud)/\partial\delta$ *are not clear;*

(3) Corporate governance: $\partial\eta^*/\partial p < 0$, $\quad \partial Prob.(fraud)/\partial p < 0$;

The first result states that both the firm's fraud propensity and the amount of misreporting increase in its growth potential (λ). The intuition is that for a rapidly growing but cash-poor firm, misreporting performance can create a short-term benefit by enabling the firm to raise external capital on favorable terms to support its growth. In addition, growth potential can also decrease the firm's litigation risk ($\frac{\partial P}{\partial \lambda} = -x(P_N - P_I) < 0$) because growth opportunities can decrease the valuation precision of the firm.

The second result states that increasing earnings informativeness has an ambiguous effect on the likelihood of fraud. The reason is that higher earnings informativeness is associated with both larger ex ante benefit from fraud and larger ex post litigation risk. If the intermediate earnings is a very informative signal about the firm's future cash flow, then ex ante this motivates the firm to manipulate the signal, and ex post this increases the likelihood of cash flow detection. Figure 2 makes this tradeoff very clear. Increasing earnings informativeness, however, will unambiguously push the fraud region towards higher earnings realizations, which means that this tends to induce some good firms to commit fraud.

The last result relates the firm's fraud propensity to the quality of corporate governance. Good corporate governance implies more effective monitoring over the management and thus a better chance that any fraudulent activities within the firm will be discovered, $\frac{\partial P}{\partial p} > 0$.

5 Model Implications and Discussion

The cost-benefit analysis of securities fraud provides testable implications for (1) the relation between fraud and investment incentives and (2) the economic determinants of the cross-sectional differences in firms' fraud propensities.

Fraud and Inefficient Investment This theory predicts that fraudulent firms tend to overinvest. Yet, the investment can be inefficient and can lead to serious value destructions. The telecommunications industry is a good illustration. Sidak (2003) offers evidence that the prevailing financial misrepresentations in this industry during the past 7 years (particularly by WorldCom) have led to excessive investment and overbuilding. The Eastern Management Group estimates that a significant percentage of the $90 billion invested in that industry was misallocated because of fraudulent growth projections.[10] Moeller, Schlingemann, and Stulz (2004) document that in the recent merger wave (1998-2001), acquiring firms lost a total of $240 billion surrounding the announcement of acquisitions, and the acquisitions resulted in a

[10]Eastern Management Group, *supra* note 42, at 2 (quoting Joelle Tessler, "WorldCom Spine UUNET is Critical Part of Internet," *San Jose Mercury News*, September 1, 2002).

net synergy loss of $134 billion (compared to a net synergy gain of $11.5 billion in the 1980s). This implies that the market did not see those investments as value-increasing. Interestingly, Wang (2004b) shows that this period appeared to be fraud-prevailing. Jensen (2004) also provides some good examples of bad investments and value destruction in fraudulent firms such as Nortel Networks and eToy.

The theory argues that part of the overinvestment incentives arise from the negative effect of investment on the firm's detection risk. The type of investment that produces the most valuation imprecision will have the strongest effect on detection likelihood. Wang (2004b) investigates the investment expenditures of a sample of U.S. public firms that were subject to private securities class action litigation during 1996 to 2003. Wang finds that investment expenditures around the commencement of fraud have a significant and substantial negative effect on the likelihood of litigation. In addition, R&D expenditures has the strongest negative effect among all the different types of investment expenditures.

The theory also implies there is investment distortion spillover between fraudulent and honest firms. Overinvestment by fraudulent firms can crowd out investment by good and honest firms. This implies that fraud-induced real value losses are borne not only by shareholders of fraudulent firms but also by those of firms that have no intention to misreport.

Fraud Propensity and Firm Attributes The theory shows that firm characteristics can influence the firm's likelihood of engaging in fraud. Specifically, fraudulent firms tend to be those who have good growth prospects and large external financing needs, but experience negative profitability shocks. Growth itself is not a bad thing, but this model shows that it can have a significant effect on the manager's fraud incentives (both on the benefit and cost of fraud). The model predictions are consistent with many findings in the accounting literature on earnings management and corporate fraud. Loebbecke, Eining, and Willingham (1989) study a small sample of managerial frauds and conclude that the most significant "red flags" for fraud are rapid company growth and poor accounting performance. The National Commission on Fraudulent Financial Reporting (1987) states that young public companies have a proportionately greater risk of financial statement fraud. Young firms generally have higher growth potential than mature firms. Wang (2004b) also finds that firms alleged in securities class action litigation during 1996 to 2003 on average have significantly higher growth potential than comparable non-convicted firms. Wang also documents that the most frequently sued industries were high-growth industries (e.g., software and programming, computer and electronic parts, and telecommunications).

Litigation cross Industries The model predicts an industry effect in the cross-sectional distribution of securities fraud. That is, there will be "litigation clustering" in certain industries during a specific time period. This is because both firms' benefit from fraud (such as asset profitability and growth potential) and litigation risk are correlated within an industry, which implies that firms' fraud propensities will be influenced by industry factors.

Effect of Increasing Disclosure The model shows that increasing the informativeness of the earnings has an ambiguous effect on the firm's likelihood of committing fraud. This implies that imposing heavy disclosure requirements on public firms may not produce the expected effects. The reason is that increased disclosure could give the market an illusion of increased transparency, which could actually decrease market vigilance.

Fraud Detection Likelihood This theory shows that while the fraud penalty (f) is largely determined by securities laws and regulations, fraud detection likelihood (P) is substantially influenced by the firm's endogenous actions as well as firm-specific attributes. This implies that the probability of detection is more important than the penalty in determining cross-sectional differences in firms' fraud propensities. The policy implication is that raising litigation liability standards alone will achieve only limited deterrence, because firms may adjust P to offset some effect of increased f on their expected litigation cost. More important, the theory shows that firms may even destroy value in order to decrease their detection risk, which can be an unintended consequence of imposing heavy penalty. Inefficient investment is one example. Leuz, Triantis and Wang (2004) provide possibly another. They document that since the passage of Sarbanes-Oxley Act there has been a dramatic surge in the number of public firms that voluntarily deregistered their common stock and ceased to file regular reports with the SEC (they call this "going dark" transactions). They also document substantial negative abnormal returns and loss of liquidity associated with deregistration and continued drop in the firms' market capitalization after deregistration. Their findings imply that insiders of those companies may have sacrificed shareholders' interest in order to hide from market scrutiny.

Internal Corporate Governance and Extensions This paper shows that even when the manager's interest is perfectly aligned with that of shareholders, fraudulent behavior can still emerge, because incumbent shareholders may find it advantageous to defraud prospective investors. Good corporate governance will not completely prevent fraud if it is under the control of existing shareholders. In fact, Table 2 shows that the likelihood of fraud detection is much lower from within the firm than from outside. Therefore, enhancing other detection forces such as capital market vigilance, responsibility of "gatekeepers" (e.g., auditors and lawyers) and securities regulation is necessary in combating corporate fraud.

In the present model, the quality of internal corporate governance p is exogenously determined, and I focus on detection by capital markets. A more general model can allow shareholders of the company to choose the level of p, and allow the market to incorporate this information into its belief about the likelihood of fraud ($\pi_0 = g(p)$, $g'(p) < 0$). Therefore, a higher p corresponds to a higher ex ante benefit from fraud because it leads to a lower π_0 and thus a smaller discount of the firm's earnings report (the signalling effect). As illustrated by Figure 2, however, a larger difference between $E(V|y)$ and $E(V|e)$ also implies a higher likelihood of cash flow detection. This means that a higher p will increase the likelihood of both internal and external fraud detection (the litigation effect). The optimal quality of internal corporate governance p^* balances the signalling effect with the litigation effect. Since in this paper the manager represents the interests of incumbent long-term shareholders, the extension is equivalent to having a model in which the manager chooses η and p at the same time (i.e., time 0 and time 1 are combined). The manager's optimization problem can be as follows.

$$\max_{\eta\geq 0, 0\leq p\leq 1} \Pi = E(V|N,e) + \lambda[1-\Phi(z_c^*)][\beta_0 - \beta(y,p)]E(V|I,e) - P(\eta,p)f\eta - h(p), \tag{27}$$

where $h(p)$ is the cost of building the quality of internal corporate governance. p^* depends on the functional form of $g(p)$ and $h(p)$. For example, if the market is not sensitive to corporate governance (at least for some range of p realizations), then the firm will choose a p as low as possible, regardless of its fraud propensity. If the market values good corporate governance but it is very costly to build up the quality, then the firm may still lean towards a low p. If the market values good governance and the cost of establishing good governance is reasonable, then the choice of p will depend on the firm's ex ante fraud incentives.

6 Conclusion

This study analyzes corporate securities fraud and its real consequences. The theory shows that fraud can lead to investment distortions in both fraudulent firms and honest firms. The investment distortion is twofold. On one hand, fraud may inflate short-term firm value and encourage the firm to invest using cheap outside capital. On the other hand, once committed fraud, the firm has incentive to strategically use investment to mask fraud. The incentive to disguise fraud can induce not only overinvestment incentives but also a preference for risk.

The theory also characterizes the endogenous cost-benefit tradeoff of committing fraud and derives the firm's equilibrium disclosure strategy. The model shows that the cost and benefit of fraud are endogenously related, which determines the firm's optimal size of fraud and its fraud propensity. The theory also demonstrates the important role of the endogenous detection risk in determining the cross-sectional variations in firms' fraud incentives. Furthermore, the theory shows that firms may even destroy value in order to decrease their probability of being detected, which is a real danger of imposing heavy litigation liability.

APPENDIX: PROOFS OF PROPOSITIONS

Proof of Proposition 2

$P_I < P_N$ if and only if $\Phi_I < \Phi_N$, or equivalently $v_{c,I} + K_I < v_{c,N} + K_N$. $(v_{c,I} + K_I)$ is a function of $I\sigma_R$ and ρ, while $(v_{c,N} + K_N)$ is not. Define $\rho_I = cov(e, V|I)/(\sigma e\sqrt{Var(V|I)})$, and $\rho_N = cov(e, V|N)/(\sigma e\sqrt{Var(V|N)})$. Then $v_{c,I} = -\frac{M}{\sigma_e \rho_I}$, and $v_{c,N} = -\frac{M}{\sigma_e \rho_N}$. $K_I = [E(V|I, y) - E(V|I, e)]\nu_I$ and $K_N = [E(V|N, y) - E(V|N, e)]\nu_N$.

First, let $\rho = 0$. It is easy to see that $v_{c,I} + K_I < v_{c,N} + K_N$ as long as $I\sigma_R > 0$. Since $v_{c,I} + K_I$ is a continuous function of ρ, then there exists a neighborhood around zero such that as long as ρ is in the neighborhood, $v_{c,I} + K_I < v_{c,N} + K_N$.

Let $M = \overline{e} + C/f - y$. Take the derivative of $(v_{c,I} + K_I)$ with respect to $I\sigma_R$.

$$\frac{\partial(v_{c,I} + K_I)}{\partial(I\sigma_R)} = \frac{\partial v_{c,I}}{\partial(I\sigma_R)} + \frac{\partial K_I}{\partial(I\sigma_R)} \tag{28}$$

$$= \frac{M}{\sigma_e \rho_I^2}\frac{\partial \rho_I}{\partial(I\sigma_R)} + [E(V|I, y) - E(V|I, e)]\frac{\partial \nu_I}{\partial(I\sigma_R)}. \tag{29}$$

If $\max(-1, -\frac{\sigma_e}{qI\sigma_R}) < \rho < \frac{\sqrt{\sigma_u^4 + (2q\sigma_e I\sigma_R)^2} - \sigma_u^2}{2q\sigma_e I\sigma_R} < 1$, then $\frac{\partial \nu_I}{\partial(I\sigma_R)} < 0$ and $\frac{\partial \rho_I}{\partial(I\sigma_R)} < 0$, and therefore $\frac{\partial(v_{c,I}+K_I)}{\partial(I\sigma_R)} < 0$. If $\frac{\sqrt{\sigma_u^4 + (2q\sigma_e I\sigma_R)^2} - \sigma_u^2}{2q\sigma_e I\sigma_R} \leq \rho \leq 1$, then $\frac{\partial \nu_I}{\partial(I\sigma_R)} > 0$ but $\frac{\partial \rho_I}{\partial(I\sigma_R)} < 0$. Therefore, there exists $\overline{\rho} \in [\frac{\sqrt{\sigma_u^4 + (2q\sigma_e I\sigma_R)^2} - \sigma_u^2}{2q\sigma_e I\sigma_R}, 1]$ such that when $\max(-1, -\frac{\sigma_e}{qI\sigma_R}) < \rho < \overline{\rho}$, $\frac{\partial(v_{c,I}+K_I)}{\partial(I\sigma_R)} < 0$. Since $(v_{c,N} + K_N)$ does not depend on $I\sigma_R$ and $v_{c,I} + K_I$ decreases with $I\sigma_R$, there exists a cutoff value $\overline{I\sigma_R}$, such that when $I\sigma_R \geq \overline{I\sigma_R}$, $v_{c,I} + K_I \leq v_{c,N} + K_N$.

Proof of Proposition 3

Note that $E(A|y) = E(V|I,y) - I\overline{R} = E(V|I,y) - I$. Let us take derivative with respect to η on both sides of equation (23).

$$\begin{aligned} \frac{\partial r_c}{\partial \eta} &= -\frac{E(A|e)}{[E(V|I,y)-I]^2}\frac{\partial E(V|I,y)}{\partial \eta} - \frac{(P_N' - P_I')f\eta + (P_N - P_I)f}{(1-\beta)I} \\ &- \frac{(P_N - P_I)f\eta(-\partial\beta/\partial\eta)}{(1-\beta)^2 I}. \end{aligned} \tag{30}$$

$$P_N' - P_I' = \frac{\partial P_N}{\partial \eta} - \frac{\partial P_I}{\partial \eta} = (1-p)(\phi_N \nu_N - \phi_I \nu_I)\frac{\partial E(V|I,y)}{\partial \eta},$$

where $\phi = \partial\Phi(s)/\partial s$.

$\beta = \frac{I}{E(V|I,y)}$ is the fractional ownership of the new shareholders. $E(V|I,y)$ does not directly depend on η, since the market does not observe η. From the manager's point of view, however, what is important is how much $E(V|I,y)$ will be different from $E(V|I,e)$ if the manager reports one more unit of earnings above the true realization e. So let us define

$$\frac{\partial E(V|I,y)}{\partial \eta} = \lim_{(y-e)\to 0} \frac{E(V|I,y) - E(V|I,e)}{y-e}. \tag{31}$$

Then

$$\frac{\partial \beta}{\partial \eta} = \frac{I}{E(V|I,y)^2}\left(-\frac{\partial E(V|I,y)}{\partial \eta}\right). \tag{32}$$

If $y(e) \neq e$ does not generate any effect on the market valuation (i.e., $E(V|I,y) = E(V|I,e)$), then $\partial\beta/\partial\eta = 0$.

As long as misreporting can increase the market value of the firm's assets, i.e., $\frac{\partial E(V|I,y)}{\partial \eta} \geq 0$, then $\partial\beta/\partial\eta < 0$. Substitute these relations into (30), and we have $\frac{\partial r_c}{\partial \eta} < 0$.

Proof of Proposition 4

The first-order condition for the maximization problem (20) is

$$\frac{\partial \Pi}{\partial \eta} + g = 0; \tag{33}$$

$$g\eta = 0, \tag{34}$$

where g is the Lagrange multiplier for the nonnegativity constraint on η.

$$\begin{aligned} \frac{\partial \Pi}{\partial \eta} &= \lambda\left(-\frac{\phi_z}{\sigma_R}\frac{\partial r_c}{\partial \eta}\right)(1-\beta)I + \lambda[1-\Phi(z_c)]\left(-\frac{\partial \beta}{\partial \eta}\right)E(V|I,e) \\ &- \left\{\lambda\frac{\phi_z}{\sigma_R}\frac{\partial r_c}{\partial \eta}(P_N - P_I) + \lambda[1-\Phi(z_c)]P_I' + (1-\lambda[1-\Phi(z_c)])P_N'\right\}f\eta - Pf. \end{aligned}$$

The following steps derives the equilibrium strategy specified in Proposition 4.

Step 1: A Conjecture. Suppose that there exists a cutoff earnings realization e_c such that the manager will honestly reveal the earnings if the true earnings realization is above e_c, and the manager will overreport earnings if the true realization is below e_c. That is,

$$y(e) = e \text{ or } \eta(e) = 0, \quad \text{if } e \geq e_c;$$
$$y(e) > e \text{ or } \eta(e) > 0, \quad \text{if } e < e_c.$$

Given the above conjecture, the market's reaction to an earnings announcement can be as follows. When investors observe the announced earnings $y(e)$, they rationally infer $e' = y(e) - \overline{\eta}$, using their prior belief about the probability of misreporting π_0. $\overline{\eta}$ is the market's expected amount of misreporting. The time 1 conditional probability of fraud is $\pi_1 = Prob.(misreporting|y \geq e_c)$. Therefore, whenever $y \geq e_c$, investors believe that $e' = y > e_c$ with probability $(1 - \pi_1)$, and $e' = y - \overline{\eta} < e_c$ with probability π_1. When investors observe $y < e_c$, they rationally discount the earnings announcement, and $e' = y - \overline{\eta}$. Then the market value of the firm's assets in place after the earnings announcement is

$$E(V|y \geq e_c) = (1 - \pi_1)E(\widetilde{A}|e' = y) + \pi_1 E(\widetilde{A}|e' = y - \overline{\eta}); \tag{35}$$
$$E(V|y < e_c) = E(\widetilde{A}|e' = y - \overline{\eta}). \tag{36}$$

$\eta \geq 0$ and the structure of litigation cost of fraud naturally leads to a conjecture that $\eta(e)$ is monotonic in e in each different region specified above. This does not imply, however, that $y(e)$ is always monotonic in e (due to possible pooling between the low-earnings and dishonest firm and the high-earnings firm). Then in each of the two scenarios (fraud or honest) there is a one-for-one mapping between e and $y(e)$. This implies that under each scenario, $e' = y(e) - \overline{\eta}$ is still normally distributed. Therefore, given the true realization of earnings e, when $y \geq e_c$,

$$\frac{\partial E(V|I, y)}{\partial \eta} = \delta(1 - \pi_1) > 0. \tag{37}$$

When $y < e_c$,

$$\frac{\partial E(V|I, y)}{\partial \eta} = 0. \tag{38}$$

Step 2: Deriving e_c. Let us plug equation (37) and (38) into (35) and differentiate with respect to η on both sides. Then use the following relationships:

$$\frac{\partial r_c}{\partial \eta} < 0;$$

$$
\begin{aligned}
P_N' &= (1-p)\delta(1-\pi_1)\phi_N\nu_N > 0; \\
P_N'' &= (1-p)\delta(1-\pi_1)\phi_N|v_{c,N} + K_N|\nu_N > 0; \\
P_I' &= (1-p)\delta(1-\pi_1)\phi_I\nu_I > 0; \\
P_I'' &= (1-p)\delta(1-\pi_1)\phi_I|v_{c,I} + K_I|\nu_I > 0,
\end{aligned}
$$

we can find that

$$\frac{\partial^2\Pi}{\partial\eta^2} < 0.$$

This means that the objective function is globally concave. There exists a unique maximizer η^*. The concavity and the nonnegative η constraint imply that

$$\frac{\partial\Pi}{\partial\eta}|_{\eta=0} > 0 \Rightarrow \eta^* > 0,$$

$$\frac{\partial\Pi}{\partial\eta}|_{\eta=0} \leq 0 \Rightarrow \eta^* = 0.$$

I define the following notations. $\beta_0 = \beta(y = e) = I/E(V|I,e)$, $r_{c,0} = r_c(\eta = 0) = 1$, $z_{c,0} = (r_{c,0} - \overline{R})/\sigma_R = 0$, $\phi_0 = \phi(0)$, $\Phi_0 = \Phi(0) = 0.5$. Then plug $\eta = 0$ into equation (35), and we have

$$\frac{\partial\Pi}{\partial\eta}|_{\eta=0} = \lambda\delta(1-\pi_1)\beta_0(\frac{\phi_0}{\sigma_R} + 0.5) - [p + (1-p)(0.5\lambda P_I + (1-0.5\lambda)P_N]f. \tag{39}$$

As e increases, the first term on the right-hand side of equation (39) decreases, while the second term increases. Therefore, we can find a cutoff e_c, such that $\frac{\partial\Pi}{\partial\eta}|_{\eta=0} > 0$ if $e < e_c$, and $\frac{\partial\Pi}{\partial\eta}|_{\eta=0} \leq 0$ if $e \geq e_c$. e_c is the solution to

$$\frac{\partial\Pi}{\partial\eta}|_{\eta=0} = 0.$$

Step 3: Deriving e_l. To facilitate the analysis below, I decompose $\frac{\partial\Pi}{\partial\eta}$ into a marginal benefit of fraud term and a marginal cost of fraud term. Let

$$
\begin{aligned}
MB &= \lambda(-\frac{\phi_z}{\sigma_R}\frac{\partial r_c}{\partial\eta})(1-\beta)I + \lambda[1-\Phi(z_c)](-\frac{\partial\beta}{\partial\eta})E(V|I,e); \qquad (40)\\
MC &= \{\lambda\frac{\phi_z}{\sigma_R}\frac{\partial r_c}{\partial\eta}(P_N - P_I) + \lambda[1-\Phi(z_c)]\frac{\partial P_I}{\partial\eta} + (1-\lambda[1-\Phi(z_c)])\frac{\partial P_N}{\partial\eta}\}f\eta + Pf.
\end{aligned}
$$

Then let us take the first and the second derivatives of both MB and MC with respect to e. We can find that

$\frac{\partial MB}{\partial e} < 0, \quad \frac{\partial^2 MB}{\partial e^2} < 0; \quad \frac{\partial MC}{\partial e} > 0, \quad \frac{\partial^2 MC}{\partial e^2} > 0.$

The relations about the first derivatives mean that when the true earnings is low, the marginal benefit of fraud is high, while the marginal cost of fraud is low. This implies that

$$\frac{\partial \eta^*}{\partial e} < 0.$$

The relations about the second derivatives imply that

$$\frac{\partial^2 \eta^*}{\partial e^2} < 0.$$

Given that $\eta_1^*(e)$ is a decreasing and concave function of e, there exists a lower bound e_l such that when $e < e_l$, $y(e) = e + \eta^*(e) < e_c$, and when $e_l \leq e < e_c$, $y(e) = e + \eta^*(e) \geq e_c$. e_l is the solution to the following equation:

$$MB[\eta(e_l)] = MC[\eta(e_l)],$$

where $\eta(e_l) = e_c - e_l$.

When the firm announces $y < e_c$, however, the market reaction changes, because now the low-earnings firm is not pooled with the high-earnings firm. In this case, $\frac{\partial E(V|I,y)}{\partial \eta} = 0$, if $y < e_c$. Substitute $\frac{\partial E(V|I,y)}{\partial \eta} = 0$ into $\frac{\partial \Pi}{\partial \eta}$ and evaluate the derivative at $\eta = 0$, we can see that $\frac{\partial \Pi}{\partial \eta}|_{\eta=0} \leq 0$, which means that $\eta^* = 0$.

Step 4: Deriving e_h. Similarly, given that $\eta^*(e)$ is a decreasing and concave function of e, there exists

$$e_h \equiv \max_{e<e_c} [e + \eta^*(e)].$$

This means that if the firm overreports earnings, there is an upper limit for the magnitude of misstatement. Then if the market observes $y > e_h$, it rationally believes that $y = e$.

Step 5: Possibility of $\eta(e)$ as a nonmonotonic function of e. Let us also consider whether there exists an equilibrium in which $\eta_2(e)$ is a nonmonotonic function of e. Since $\eta \geq 0$ (i.e., $y(e) \geq e$), and the litigation cost is an increasing and monotonic function of η, I can make the following conjecture about $\eta_2(e)$. I can partition the earnings space $\{e : e < e_l\}$ into many intervals, $[e_1, e_l)$, $[e_2, e_1)$, $[e_3, e_2)$.... In each earnings interval, $y(e)$ equals the upper bound of that interval. The lower bound of each interval is determined, such that the earnings at the lower bound plus the optimal amount of misreporting equals the upper bound earnings value. Take the first interval $[e_1, e_l)$ for an example. If the true earnings is in this interval, then the manager announces $y(e) = e_l$. The market rationally infers that $e' = E(e|e_1 \leq e < e_l)$

and uses e' to price the firm's assets in place. It is easy to see that firms with $e' < e < e_l$ get worse off by reporting $y(e) = e_l$ than reporting $y(e) = e$, because the firm's asset value is underpriced by the market, and the firm faces potential litigation cost. Then these firms would rather honestly reveal their earnings, and the conjectured equilibrium collapses. This happens to any nonmonotonic $\eta_2(e)$.

Proof of Proposition 5

1. λ

$$\frac{\partial MB}{\partial \lambda} = \frac{\phi_z}{\sigma_R}(-\frac{\partial r_c}{\partial \eta})(1-\beta)I + [1-\Phi(z_c)](-\frac{\partial \beta}{\partial \eta})E(V|I,e) > 0; \quad (41)$$

$$\frac{\partial MC}{\partial \lambda} = \{\frac{\phi_z}{\sigma_R}\frac{\partial r_c}{\partial \eta}(P_N - P_I) + [1-\Phi(z_c)](P_I' - P_N')\} f\eta < 0. \quad (42)$$

Since the marginal benefit of fraud increases in λ and the marginal cost decreases in λ, $\eta^*(e)$ increases in λ for any given e. This also implies that $\frac{\partial e_l}{\partial \lambda} < 0$.

$$\frac{\partial MB|_{\eta=0}}{\partial \lambda} = \delta(1-\pi_1)\beta_0(\frac{\phi_0}{\sigma_R} + 0.5) > 0;$$

$$\frac{\partial MC|_{\eta=0}}{\partial \lambda} = 0. \quad (43)$$

This implies that $\frac{\partial e_c}{\partial \lambda} > 0$. Higher e_c and lower e_l lead to higher $P(fraud)$.

2. δ

$$\frac{\partial MB|_{\eta=0}}{\partial \delta} = \lambda(1-\pi_1)\beta_0(\frac{\phi_0}{\sigma_R} + 0.5) > 0;$$

$$\frac{\partial MC|_{\eta=0}}{\partial \delta} = 0. \quad (44)$$

This implies that $\frac{\partial e_c}{\partial \delta} > 0$. $\frac{\partial \beta}{\partial \delta} < 0$, $\frac{\partial (P_N - P_I)}{\partial \delta} > 0$, and $\frac{\partial (P_N' - P_I')}{\partial \delta} > 0$ imply that $\frac{\partial MB}{\partial \delta} > 0$ and $\frac{\partial MC}{\partial \delta} > 0$. Therefore, the effects of δ on e_l and thus $P(fraud)$ depend on the structural parameters.

3. p

$$\frac{\partial MB}{\partial p} = 0; \quad (45)$$

$$\begin{aligned} \frac{\partial MC}{\partial p} &= (1-p)\lambda\frac{\phi_z}{\sigma_R}\frac{[\Phi_N - \Phi_I]^2 f\eta}{(1-\beta)I} \\ &+ \lambda(1-\Phi(z_c))[1-\Phi_I] + [1-\lambda(1-\Phi(z_c))][1-\Phi_N] \\ &> 0. \end{aligned} \quad (46)$$

This implies that $\frac{\partial \eta_1^*}{\partial p} < 0$ and $\frac{\partial e_l}{\partial p} > 0$. Similarly, $\frac{\partial MB|_{\eta=0}}{\partial p} = 0$ and $\frac{\partial MC|_{\eta=0}}{\partial p} = f > 0$ imply that $\frac{\partial e_c}{\partial p} < 0$.

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Table 2: Fraud Discovery (1996-1997)

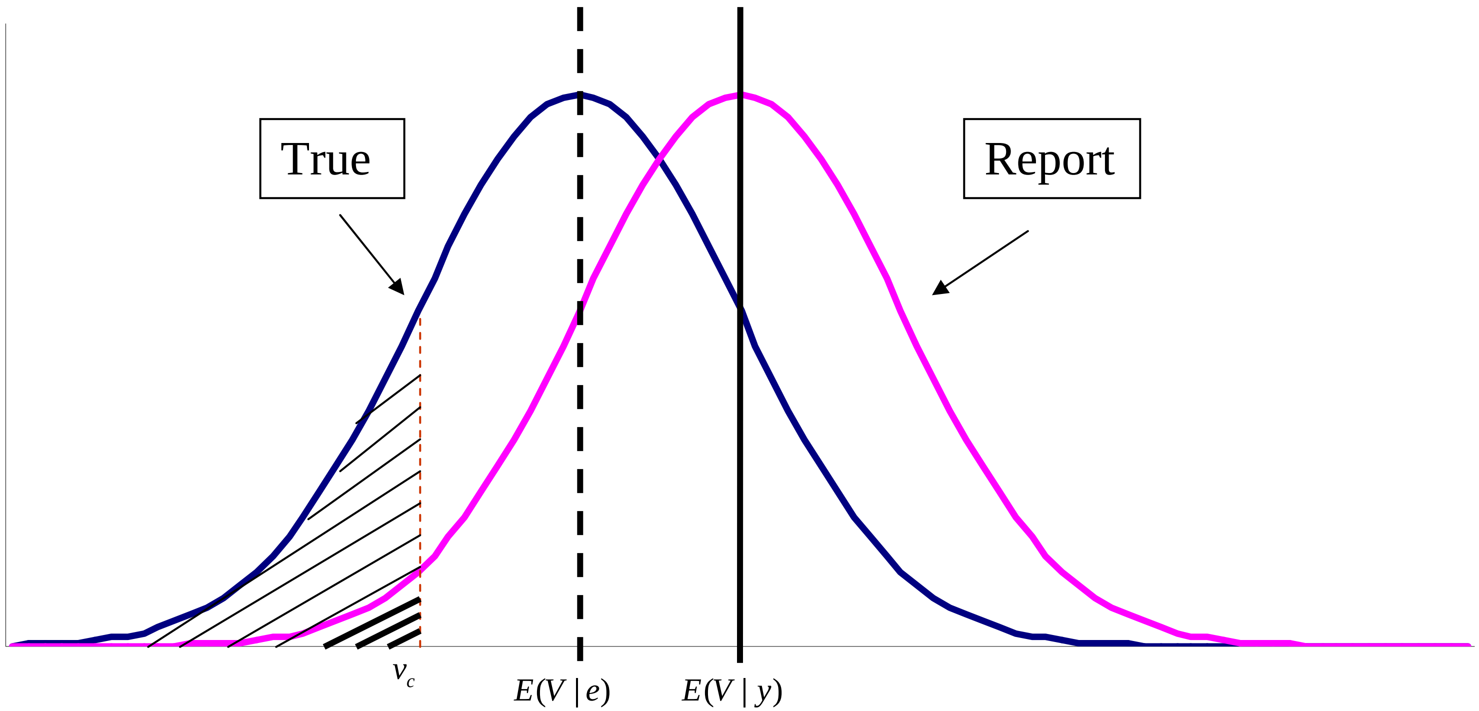
Precipitator	1996	1997	Total	% of Total
Number of observation	93	94	187	
Devastating news announcement	63	69	132	70.59
Regulators (mostly SEC)	6	6	12	6.42
Independent auditors	10	7	17	9.09
Business journal articles	7	5	12	6.42
Board/internal investigation	7	4	11	5.88
Securities analysts	1	3	4	2.14
Shareholder/Investor	3	4	7	3.74
Stock Exchanges/credit rating services	0	1	1	0.53
Management turnover	2	1	3	1.60

This table lists the various corporate events or entities that precipitated the 187 federal securities class action lawsuits during 1996 and 1997. The litigation information is retrieved from Stanford Securities Class Action Clearinghouse. Information about the triggering events of each lawsuit is extracted from the relevant case documents (i.e., the case complaints, the press releases, and the court decisions). The first column of the table lists the event or entity that precipitated or initiated the securities lawsuits. The triggering events can overlap in some lawsuits.

Figure 1: Model Time Line

0	1	2	3
Quality of governance $0 \leqslant \mathbf{p} \leqslant 1$ is set, which later determines the prob. of internal fraud detection.	The manager privately observes the intermediate earnings **e** from existing assets **A**. The manager makes a disclosure decision $\mathbf{y(e)} = \mathbf{e} + \eta$.	A new investment opportunity comes with probability λ, requires an initial cost of $**I**, and generates gross return **R**. The manager observes the realization of R as **r**, and makes the investment and financing decisions.	The firm generates a liquidating cash flow **V**. Misreporting is detected with prob. **P**. A penalty $f\eta$ is imposed upon detection.

Figure 2: Probability of Fraud Detection



Note: In this figure, the shaded area represents the probability of cash flow detection.