Financial Statements Insurance

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Abstract: The fact that auditors are paid by the companies they audit creates an inherent conflict of interest with investors who rely on the audit report in their capital allocation decisions. We analyze how the provision of financial statement insurance could eliminate this conflict of interest and properly aligns the incentives of auditors with those of shareholders. We first show that when the benefits to obtaining funding are sufficiently large, the existing legal and regulatory regime governing financial reporting (and auditing) results in low quality financial statements. Consequently, the cash flows from firms are improperly identified and firms which yield a low rate of return (low fundamental value) are over-funded relative to firms characterized by a high rate of return (high fundamental value). We present a mechanism whereby companies would purchase financial statement insurance that provides coverage to investors against losses suffered as a result of misrepresentation in financial reports. The insurance coverage that the companies are able to obtain is publicized, as are the premiums paid for that coverage. The insurers would appoint and pay the auditors who attest to the accuracy of the financial statements of the prospective insurance clients. Firms announcing higher limits of coverage and smaller premiums would distinguish themselves in the eyes of the investors as companies with higher quality financial statements. In contrast, those with smaller or no coverage or higher premiums will reveal themselves as those with lower quality financial statements. Every company will be eager to get higher coverage and pay smaller premiums lest it be identified as the latter. A sort of Gresham's law would be set in operation, resulting in a flight to quality. As a result, when financial statement insurance is available, capital is generally provided to the most efficient firms.

1 Introduction

The largest corporate bankruptcy filed in the U.S., that of Enron in 2001, was preceded by a string of disclosures about audit failures, and errors in financial statements.[1] The presence of such errors highlights the fact that market participants face two inter-related problems when pricing securities based on financial statements. First, they must assess the quality of the information contained in the financial statements. Second, they must make projections about future cash flows and fold these projections back into an appropriate value for the security. Even if one assumes that accurate models are available for projecting cash flows and valuing securities, uncertainty about the quality of the financial statements can lead to pricing distortions and inefficient market allocations of capital. The objective of this paper is to develop a market-based mechanism that can lead to a timely disclosure of financial statement quality, and thereby, a more efficient allocation of capital.

The cascade of recent audit failures has given rise to a regulatory initiative, the Sarbanes-Oxley Act of 2002 (the Act), and to an ever growing commentary on "corporate governance."A major theme of this literature is the role of "gatekeepers "and, in particular, the failure of auditors to fulfill their role as independent gatekeepers.[2] Indeed, the issue of auditor independence (or its absence) has occupied a major place in the debate over the failure of corporate governance and is the focus of much attention in the Sarbanes-Oxley Act.[3] The Act seeks to address the problem by increased regulation and penalties, empowerment of

[1]As catastrophic as this event may have been, it proved to be only the beginning of a series of stunning revelations of accounting irregularities by major corporations that were the darlings of Wall Street: Worldcom, AOL, Metromedia Fiber Networks, Qwest Communications; the list goes on and on. The number of restatements keeps rising, from 50 a year in the early 1990s to well over 200 a year in 2001.

[2]For example, Arthur Levitt (2002, page 116) complains: "More and more, it became clear that the auditors didn't want to do anything to rock the boat with clients, potentially jeopardizing their chief source of income. Consulting Contracts were turning accounting firms into extensions of management - even cheerleaders at times. Some firms even paid their auditors on how many non-audit services they sold to their clients."

[3]The empirical literature on the relation between auditor independence and the quality of audits is contradictory and inconclusive. The major shortcoming in the literature is the absence of convincing empirical proxies for either independence or audit quality. Typically, discretionary accounting accruals or restatements are used as proxies for the inverse of quality. However, discretionary accruals need not be a bad thing: they may be used to signal truthfully the private information of managers. In the same vein, restatements can be seen as a corrective mechanism that "cleanses" the financial statements, and hence associated with higher quality audit as compared with instances in which errors go undetected by the auditor with no consequent restatement. For an extensive review of this literature, see Romano, 2004.

audit committees, and reduction of the auditor's involvement with the client.[4] But the Act does not untie the auditor/management knot: auditors continue to be hired and paid by the firms they audit.

Without joining the debate about the effectiveness of the Act,[5] and as an alternative to or supplement to its mandates, this paper introduces a market-based financial statement insurance scheme[6] designed to eliminate conflicts of interest that inhere in the auditor-client relationship and, at the same time, to credibly signal the quality of financial statements. The model developed in this paper shows that such a scheme would result in security prices that reflect the differential qualities of financial statements and thus become better guides to resource allocation.

The social value of ex-ante self reporting has been recognized in the literature (Kaplow and Shavell [1994]). In essence, the FSI mechanism involves induced truthful "self reporting" through the auditor's attestation of the quality of the financial statements even when such quality is poor and expected to trigger market sanctions when made public.[7] In contrast, the current structure of incentives driving auditors' behavior may not elicit unbiased reports. Auditors are paid by the companies they audit which creates an inherent conflict of interest that is endemic to the relation between the manager (the principal) and the auditor (the agent). We analyze, first, the financial statement quality equilibrium under the existing legal and regulatory regime governing auditing when managers obtain significant benefits both direct and indirect when they successfully raise capital. Defining quality as the inverse of the probability of overstatement in financial statements, we show that the natural equilibrium

[4] Romano (2004), having reviewed an extensive body of literature concludes that the Act's mandates were seriously misconceived as they are not likely to improve audit quality or otherwise enhance firm performance and benefit investors as Congress intended.

[5] A strong critique of the Sarbanes Oxley Act may be found in Butler and Ribstein (2006) who observe that "[..one of its consequences is] the placing of significant new burdens and risks on auditors, thereby forcing additional inefficient risk-bearing that makes it even harder for smaller and riskier firms to enter the public markets;"

[6] The idea of financial statement insurance was first floated in a short opinion piece for popular audience in the New York Times (March 8, 2002) by Joshua Ronen, A Market Solution to the Accounting Crisis. On July 10, 2002, a commentary by Susan Lee, A Market Remedy for Our Nasty Accounting Virus, re-exposed the idea in the Wall Street Journal.

[7] Lacker and Weinberg [1989] study the characterization of optimal no-falsification contracts from a general perspective. A considerable body of literature argues that injuries associated with purchased products would be more efficiently handled under contracts rather than mandated regulations or torts.

is one where a bottom quality of financial statements is chosen (with a high probability of overstatement in the financial reports). Under these circumstances, firms that potentially yield low rate of return (low fundamental value) cannot be identified easily and are over funded relative to firms characterized by a high rate of return (high fundamental value). We show analytically that the introduction of financial statement insurance can lead to a better assessment of financial statement quality resulting in a much more accurate identification of low value firms.

The basic structure of Financial Statement Insurance (FSI) can be described as follows (details may be found in Appendix 2, based on Ronen (2002).[8] Instead of appointing and paying auditors, companies would purchase financial statement insurance that provides coverage to investors against losses suffered as a result of misrepresentation in financial reports. The insurance coverage that the companies are able to obtain is publicized, as are the premiums paid for that coverage. The insurance carriers would then appoint and pay the auditors, who attest to the accuracy of the financial statements of the prospective insurance clients. Those firms announcing higher limits of coverage and smaller premiums would distinguish themselves in the eyes of the investors as companies with higher quality financial statements. In contrast, those with smaller or no coverage or higher premiums will reveal themselves as firms with lower quality financial statements. Every company will be eager to get higher coverage and pay smaller premiums lest it be identified as the latter. A sort of Gresham's law would be set in operation, resulting in a flight to quality.

According to sound principles of corporate governance, auditors are supposed to be the agents of the shareholders, but in practice, although shareholders vote on management's recommendation of which auditor to hire. It is the management of the company that engages the auditor and ultimately pays for the services. The fact that CEO's and CFO's control the fees paid for auditing and consulting services allows them to elicit actions, including opinions and assurances, that it desires from the auditor. The risk of losing fees from a long-term audit engagement - even in light of the limitations on non-audit services imposed by the

[8] Cunningham (2004a) [1] provides a comprehensive discussion of the legal and institutional implications and ramifications of the FSI idea presented in this paper. Furthermore, Cunningham (2004b) [2] proposes a model legislative Act of the FSI scheme.

Sarbanes-Oxley Act of 2002 - may secure auditor compliance with management's objectives. We argue that the imperfect alignment of interests between managers and shareholders and the intractable conflict of interest imposed on auditors can be rectified through an agency relationship between the auditor and an appropriate principal, whose economic interests are aligned with the goal of promoting the quality of the financial statement. [9] Within a free market mechanism, insurers can serve the role of such an intermediary.

The critical features of the FSI scheme underlying this study are: (i) the effect of publicizing the premium charged to different firms; and (ii) the shift of control over the auditor's compensation and, hence, incentive structure from management to the insurer. We seek to formalize these two features and to demonstrate that FSI, when linked with appropriate disclosure provisions, leads firms to improve the quality of their disclosures voluntarily. Section 2 develops the formal details concerning the informational structure of the market and the trading strategies of investors (technical details in Appendix 1). After developing this structure, we present the economic decision problem faced by the firm in determining financial statement quality. We lay out four programs corresponding to different economic settings where financial satement insurance could play a beneficial role. The timelines for each of these programs is given in Figure 1. Section 3 provides the main results with Propositions 1-4 stating the equilibrium that derives in each of these programs. Section 5 provides the conclusions while Appendix 2 provides more details about how FSI may operate in practice.

2 Model

We develop a model in which firms try to attract capital through their financial reports. The firm's management benefits from obtaining capital, but there is a social waste if firms with

[9] Such a principal (intermediary) should not benefit from the price at which securities are traded. A realignment of interests along these lines would contribute to restoring the "complete fidelity to the public's trust" that Chief Justice Burger insisted on in a celebrated opinion: "By certifying the public reports that collectively depict a corporation's financial status, the independent auditor assumes a public responsibility transcending any employment relationship with the client. The independent public accountant performing this special function owes ultimate allegiance to the corporation's creditors and stockholders, as well as to the investing public. This "public watchdog" function demands that the accountant maintain total independence from the client at all times and requires complete fidelity to the public trust" [465 U.S. 805, 818].

low rates-of return are funded.[10] We consider an economy with N firms, where each firm is associated with return r_i, which we also refer to as the firm's type. The type of each firm f is drawn randomly by nature at the start of the period and is independent of other firms. The firms then issue financial reports and try to attract capital.

The strategic tool for obtaining capital is an audited financial report that is issued to investors. Although this report may not be directly falsified, it can be manipulated indirectly through a reduction in the quality of the statements.[11] At the start, the managers of firm f are assumed to obtain a private signal, ω_l, about their firm's type where $l \in \{1, 2, \ldots, L\}$ represents the set of L possible signals observable by the firm. We denote by $P(i|\omega_l)$ the probability that the end-of-period rate of return will be r_i for a firm f that receives a private signal, ω_l. Based on his private signal, the firm's manager chooses accounting policies that may increase or decrease their *financial statement quality (FSQ)*. FSQ is determined both by the firms choice of internal quality, q, and the auditor's input, e; the overall quality written as x is given by a function $\Lambda(q, e)$. After the firm f's rate of return is realized, a financial report θ_f is disseminated to investors. Associated with each report θ_f is some value r_{θ_f}, which we shall refer to as firm f's implied by θ_f rate-of-return. r_{θ_j} may be different from the actual rate-of-return of firm f, r_i. However, investors will not blindly accept this value, $r_{\theta f}$; instead, they will use this implied rate as well as their perceptions about audit quality to "infer" a probability distribution over possible rates-of-return for firm f.

Investors observe the report θ_f and the associated (implied) rate-of-return, $r_{\theta f}$, but they cannot observe the FSQ choice q, e or x. Therefore, investors make conjectures about FSQ and use these *beliefs* to infer a rate-of-return based on θ_f. Denoting investor beliefs about the FSQ of firm f by ν_f, we write $P(i|j, \nu_f)$ for the posterior probability assigned by investors to the event that the true rate-of-return is r_i given that the implied rate-of-return is $r_{\theta f}$.[12]The

[10]More generally, it is possible to consider a multi-period consumption-investment model where investing in some of the projects reduces overall welfare calculated across several periods.

[11]A typical example may be the choice of classifying a capital lease as an operating lease by using a higher than warranted discount rate.

[12]Hereafter, whenever the context does not lead to confusion, we may write $\theta = J$ to mean $r_{\theta_f} = r_j$

expected rate-of-return associated with this posterior probability distribution is denoted $\hat{r}_f$:

$$\hat{r}_f \quad = \quad E[r|\theta_f = j, \nu_f] \quad = \quad \sum_{i=1}^{L} r_i P(i|j, \nu_f). \tag{1}$$

We assume that there is a minimum threshold rate, r^*, such that funding firms with rates of return less than r^* results in a social loss. r^* is a random variable with a distribution $F(r^*)$ that represents the social cost of capital. r^* is assumed to be independent of firm's rates of return. In the first-best scenario, in which the true rate-of-return is perfectly observed, only firms with rates of return higher than r^* will obtain capital. In a second-best scenario in which investors do not know each firm's type, they analyze the report, θ_f, and fund firm f if the inferred rate-of-return, $\hat{r}_f$, is greater than the threshold rate r^*.

If the value $\hat{r}_f \geq r^*$, investors contribute one unit of capital to the firm.[13] The managers of a firm typically benefit in both pecuniary and non-pecuniary ways from capital inflows.[14] We represent the (portion) of the value of the firm appropriated by management by B (for benefits). In other words, by ensuring a capital inflow, the firm's management generates both a return which is passed back to shareholders and a benefit B for themselves. In this setting, low quality financial statements that misdirect capital lead to two basic types of losses.

The two types of loss are described below from the perspective of an investor considering whether to fund firm f. Let k denote the true type of this firm. A unit of capital invested in f earns a return r_k. However, the decision to invest in the firm is based on the inferred rate of return (or equivalently inferred type), $\hat{r}_f$. If $\hat{r}_f > r^*$ but $r_k < r^*$, investors suffer a loss of $1 \times (r^* - r_k)$ (recall that the investment involves one unit of capital). While this type of loss is straightforward, there is a second type of loss that also results from inferior accounting quality. Because investors are unable to distinguish the high quality firms from

[13] We use the term "capital inflow" and henceforth also "funding" in a broad sense to include any purchases of the firm's stock by investors - whether in a public offering or in secondary trading. In the latter case, the purchase of stock exerts an upward pressure on its price thereby decreasing the firm's cost of capital. The firm would be able to finance investment projects that it could not afford without the price increase (price inflation in the case of misrepresentation). For example it can do so by selling treasury stock at the higher price, obtaining debt financing at lower cost due to a lower debt-equity ratio, etc.; management, as well, benefits through the increased value of stock and options holdings.

[14] Managers may use the capital infusion to either enlarge their own firm or takeover other firms. This is widely reported in the financial literature as "empire-building" or as "Hubris".

low quality firms, some high quality firms may not be funded. So, if a firm of high quality, r_k is not funded, investors lose the amount $1 \times (r_k - r^*)$. The total cost of misinvestment is a sum of these two losses (see the Example below for a complete calculation).That is, an inflated financial statement not only draws capital towards an inferior firm, it also indirectly starves superior firms (whose "honest" reports are discounted in the same way as "dishonest reports) leading to both an actual loss and an opportunity loss.

2.1 Information Structure and Investor Beliefs

In this section, we develop the structure underlying the investor's determination of an expected rate-of-return for firm f after observing the report θ_f. This process leading to Equation 2, is built on two economic features:

1. The joint relationship of true underlying type and reported type for each level of FSQ; and

2. The (Bayesian) inference process of investors based on the relationship in (1) above and on their perceptions about the choice of FSQ.

We parameterize FSQ using two vectors, $q \in \mathbf{Q} \subset \Re^{\mathbf{A}}$ and $e \in \mathbf{E} \subset \Re^{\mathbf{B}}$ where $\mathbf{Q}$ and $\mathbf{E}$ are closed bounded cubes in some arbitrary dimensional real vector spaces,$\Re^A$ and $\Re^B$. We make the natural assumption that the auditor's effort level choice, $e \in \mathbf{E}$is perfectly observed by the firm that hired the auditor. Hence, e is chosen at a *first best* level in response to a forcing contract designed by the firm.

q represents the internal quality and is chosen by the firm; e represents the quality of the auditor and is chosen in response to the incentives provided by the firm. Associated with any pair (q, e) is the FSQ x, i.e, $x = \Lambda(q, e)$ for some vector-valued continuous function Λ which is increasing in (each component of) q and e, that is, Λ preserves the co-ordinate wise partial order. For each x, the set $\{(q, e)|\Lambda(q, e) \geq x\}$ is a bounded convex set (in some arbitrary real vector space). Let i denote the type of the firm and j the financial report. Then for each level of FSQ, x, we have a joint distribution denoted by $P(j, i|x)$. We assume that the level of FSQ x has no productive effects, that is, it does not affect the (unconditional) distribution of true types, $P(i)$, so $P(j, i|x) = P(j|i, x)P(i)$. The parameter set, $\mathbf{X} = \{\Lambda(q, e)|(q, e) \in \mathbf{Q} \times \mathbf{E}\}$, representing FSQ has a natural component-wise partial order; that is, for $x, \mathbf{y} \in \mathbf{X}$, $\mathbf{y} \preceq x$ if and only if every component of x is at least as great as the corresponding component of $\mathbf{y}$. The next assumption develops a systematic ordering relationship between $P(j, i|x)$ and $P(j, i|\mathbf{y})$ consistent with the partial order of $\mathbf{y}$ being lower FSQ than x whenever $\mathbf{y} \preceq x$.

Lower FSQ (in the natural co-ordinate partial order) ought to "increase" the probability of overstatement; in addition, higher FSQ should make it easier to separate out true types. To capture these two features, we first assume that all errors in the financial report are overstatements; that is, a firm f of type i only receives reports $\theta_f = j \geq i$.[15] Then we make the following assumption (further details are given in Appendix 1):

Assumption 1 (A Formalization of FSQ)

(1) For a given quality x, firms of higher true type are more likely to be get high reports, that is, whenever $i \geq k$, the relative likelihood of being reported as type j, $\dfrac{P(j|i,x)}{P(j|k,x)}$ increases in j (i.e., for fixed quality, higher signals are "good news" in the sense of Milgrom [9]).

(2) For a given type i, the reported type increases (in the sense of First Degree Stochastic Dominance) as quality is lowered, that is, for quality levels $\mathbf{y} \preceq x$, $P(\cdot|i, \mathbf{y})$ FDSD's $P(\cdot|i, x)$.

Assumption 1 sets up a structure for formally analyzing FSQ. The structure is intuitive. The first part of the assumption says that for fixed quality, higher reports imply better rates-of-return. In contrast, the second part asserts that for fixed type, lower FSQ increases the probability of overstatement.

Investor beliefs regarding FSQ are represented by $\vec{\nu} = \{\nu_1, \nu_2, \ldots, \nu_L\}$ where ν_l denotes the beliefs regarding the (strategically optimal) level of FSQ implemented by a firm with private signal ω_l.[16] Then the inferred return for firm f upon observing a report $\theta_f = j$ under

[15] Recall that at the time of the report, firms know their true rate of return. The idea is that firms will correct any downside error by providing correct information about their type but will allow overstatements to proceed uncorrected.

[16] Given our assumption that firm types are drawn independently, all firms with the same private signal ω_l face identical decision problems regarding the optimal implementation of quality. We simplify the belief structure by assuming that each firm

beliefs $\vec{\nu}$ is given by (see Appendix 1 for the details):[17]

$$E[r|\theta_f = j, \vec{\nu}] = \sum_i r_i P(i|j, \vec{\nu}) = \sum_{l=1}^{L} \left\{ \frac{\sum_{i=1}^{j} r_i P(j, i|\nu_l)}{\sum_{i=1}^{j} P(j|\nu_l)} \right\} P(\omega_l)$$
$$= \sum_{l=1}^{L} \left\{ \frac{\sum_{i=1}^{j} r_i P(j|i, \nu_l) P(i|\omega_l)}{\sum_{i=1}^{j} P(j|i, \nu_l) P(i|\omega_l)} \right\} P(\omega_l) \quad (2)$$

It is worth noting that the expression in Equation (2) depends only on the *beliefs* regarding the FSQ, ν_l, chosen by the firm with private signal ω_l rather than their actual choice x_l^*. The basic theme underlying our model is that firms can mislead investors by setting $x_l^* < \nu_l$; however, rational expectations requires that *in equilibrium*, the actual choice of FSQ and market conjectures have to coincide. The equilibrium we derive takes both these economic requirements into account. We return to this analysis after developing the liability structure that counteracts firms desires to set low levels of FSQ.

2.2 Liability Structure

Both firms and auditors face penalties under provisions of the 1933 and 1934 Securities Acts and other statutory and case law when they issue financial reports that expost are found to be misleading. Additionally, low effort and low quality financial statements may impose additional penalties on the auditor in the form of reputation loss. Our goal is to show that the allocative efficiency of capital increases with the provision of FSI. To make this point clearly, we fix the total recoveries obtainable through the legal system while varying the mechanism by which these recoveries are collected by investors. The firm's expected liability is denoted by $\mathcal{L}_f(x)$. We denote the auditor's expected liability and liability loss as $\mathcal{L}_a(x, e)$ to emphasize the fact that the auditor sets the level of e and is separately responsible for any errors in the audit process. The structure that we impose on the expected liability is:

(1) $\mathcal{L}_f(x)$ decreases in x (under the usual partial order on x) and $\mathcal{L}_a(x, e)$ decreases in both x and e. Notice that $\mathcal{L}_a(x, e)$ may be equivalently written as $\mathcal{L}_a(\Lambda(q, e), e)$ where the

with a given private signal ω_l has a single quality choice assigned to it. A more general formulation would set the perceived quality ν_l to be a probability measure over possible levels of FSQ.

[17] The summation in the last expression over i only extends up to j because all errors are over statements – $P(j|i, \nu_l) = 0$ for $i > j$.

composite function is decreasing in both q and e.[18]

2.3 Funding and Managerial Benefits

The managers of the firms choose the level of FSQ to maximize their own benefits. These benefits derive from a successful ability to raise capital. The manager's ultimate payoff depends both on firm value and success in raising new capital. Firm value depends on the return on investment less any potential damages that may have to be paid to (pre-existing shareholders) for inflated financial reports. In addition, managers derive a direct benefit, B, whenever they are successful in raising capital.[19] We assume, for simplicity, that all firms have an investment, I, absent any new capital or the amount $I + 1$ if new capital is raised. Managers may appropriate a portion B of the new capital as direct benefits.[20] In this setting, denoting the probability of funding firm f by FP_f, the Expected firm value when a private signal ω_l is observed, FSQ x is implemented, and audit fee F is paid may be written as:

$$(1 + E(r|\omega_l))(I + FP_f(x|\omega_l, \vec{\nu})(1 - B)) - \mathcal{L}_f(x) - F \tag{3}$$

Assuming that the managers own α of the firm and divert some portion of the funding, B, towards direct benefits, the managers payoff function becomes:

$$\alpha \left[(1 + E(r|\omega_l)) \left(I + FP_f(x|\omega_l, \vec{\nu})(1 - B) \right) - \mathcal{L}_f(x) - F \right] + BFP_f(x|\omega_l, \vec{\nu}) \tag{4}$$

We shall assume that the manager benefits more from direct consumption than he looses in firm value as a result of his consumption. That is,

$$BFP_f(x|\omega_l, \vec{\nu}) - \alpha B(1 + E(r|\omega_l))FP_f(x|\omega_l, \vec{\nu}) > 0 \quad \Longleftrightarrow \quad 1 > \alpha(1 + E(r|\omega_l)) \tag{5}$$

[18] We are realistically mindful of the fact that liability for erroneous disclosures exists even when the firm does not attract additional capital. Indeed, as long as the firm's securities are publicly traded, it faces potential liability under the 1934 Securities Act.

[19] Baker, Jensen and Murphy, (1988) note that (there is an) ... observed relationship between compensation and company size. In other words, what starts out as a simple empirical correlation between size of firm and size of remuneration for top level managers is turned into a causal mechanism that rewards managers for increasing the size of the firms they lead even though they may destroy value in doing so.

[20] An implicit assumption is that a firm of higher type ex-ante will also earn higher returns ex-post even after management-appropriated benefits, B are deducted. In other words, the perquisites appropriated, B, are "small" relative to firm returns.

If FSI is available with an associated premium π_f, then the managers' payoff may be written as:[21]

$$\alpha[(1 + E(r|\omega_l))(I + FP_f(x|\omega_l, \vec{\nu})(1 - B)) - \pi_f] + BFP_f(x|\omega_l, \vec{\nu}) \tag{6}$$

After receiving a private signal ω_l, the managers choose FSQ x so as to maximize the payoff in Equation 4 or 6 depending on whether FSI is available.

The last part of our model development concerns the role of the auditor.

2.4 Auditor Incentives and decisions

The auditor is the principal informational intermediary in the trading of seasoned equities. In our model, we take as a given that the auditor must supply information to investors but that the quality of this information depends on the incentives provided by the auditor's employer (either the firm or the insurer). Our goal is to study firm-investor interactions and not audit contracts or auditor behavior. To this end, we focus the incentive problem for auditors solely on whether the true FSQ is revealed to the insurer.

The auditor is assumed to be risk-neutral and faces a cost of effort denoted by $C(\mathbf{e})$. Let $F(x, e)$ denote the fee that ensures that the auditor breaks-even, that is,

$$F(x, e) \quad = \quad C(e) + \mathcal{L}_a(x, e) \tag{7}$$

We assume that the fee $F(x, e)$ will induce the auditor to exert the effort level e whenever the firm has implemented FSQ q and $x = \Lambda(q, e)$. The ability to impose ex-post penalties, such as adjustment of fees or refusal to renew the auditors contract will force the auditor to implement the level of effort e desired by the firm as long as $F(x, e)$ is large enough to cover both direct and indirect costs. [22] We will also assume that for a given level of overall quality,

[21] A minor difference between the insurance and non-insurance situation should be noted. If managers "pump and dump", they will be able to sell before the legal penalty $\mathcal{L}_f(x)$ is imposed whereas the insurance premium π_f is unavoidable as it is paid ex-ante. However, in the interest of keeping the comparison across the different settings as "clean" as possible, we assume that the managers will have to face the reduction in share value associated with low quality choices either as higher premia or as a higher litigation payout.

[22] Note that in our setting the entity hiring the auditor observes the latter's effort and so it is able to enforce a "first best" effort consistent with the hiring entity's objective. Thus, in the case of the auditee hiring the auditor, the former's objective, and the corresponding desired "first best" effort, may not be necessarily beneficial from the standpoint of shareholders or society as a whole. For example, the hiring entity may design a hiring contract that induces a low-quality financial statements

x, there are choices $q(x)$ and $e(x)$ that minimize the total cost $\mathcal{L}_f(x) + F(x, e)$; [23] a typical case where this requirement is satisfied is when $\mathcal{L}_f(x) + F(x, e)$ is convex as a function of e on the convex set $\{(q, e)|\Lambda(q, e) \geq x\}$.

When FSI is available, a further consideration enters the picture – the report to the insurer about the choice of FSQ. We denote this report by $\hat{x}$ and write $F(\hat{x}, x, e)$ for the fees when the auditor is incentivized to report $\hat{x}$ while the implemented quality of the firm is x. We assume that the report to the insurer is private and does not increase the auditor's exposure to investor litigation. However, the insurer can demand an ex-post adjustment (either in the insurance payout or through increased future premia) if $\hat{x} \neq x$. We denote this adjustment by $\sigma(\hat{x}, x)$. The adjustment will be paid by the firm when the insurer's contract is with the firm whereas the transfer can be imposed on the auditor if the auditor is hired by the insurer. In addition, when the auditor is hired by the insurer, the auditor's liability will be paid by the insurer and the (initial) audit fee will be unaffected by the quality level x. Gathering all these points together, the audit fee $F(\hat{x}, x, e)$ has the following structure:

$$\begin{aligned} &\text{(auditor hired by firm)} \quad & F(\hat{x}, x, e) &= F(x, e) = C(e) + \mathcal{L}_a(x, e) \\ &\text{(FSI : auditor hired by insurer)} \quad & F(\hat{x}, x, e) &= F(\hat{x}, e) = C(e) \end{aligned} \tag{8}$$

We note that under FSI, the total payoff of the auditor is $C(e) - \sigma(\hat{x}, x)$ which does depend on $\hat{x}, x$ and e so the strategy of revealing x truthfully can be implemented. To sum up, when the firm hires the auditor, the auditor can be costlessly induced to report the quality level favored by the firm (see also Proposition 3) whereas when the insurer hires the auditor, the ex-ante audit fees are independent of the reported quality but auditors face an ex-post transfer if they have misrepresented the quality level implemented by the firm.

which may be beneficial to the hiring entity but injurious to shareholders or to society as a whole. The hazard of the auditor misrepresenting the quality of the disclosure is present when the auditor is hired by the auditee and not by the insurer. Other than complicating the analysis, introducing moral hazard with respect to the auditor's effort would not qualitatively change the results.

[23] This assumption simplifies the belief structure in that any beliefs about x translate to unique beliefs about q and e.

2.5 Formalization

We now state the formal programs for the strategic choice of financial statement quality for a firm f receiving a private signal ω_l under several different economic regimes. There are two basic aspects of FSI that we need to examine:

(1) The effects of the public disclosure of FSI premia

(2) The economic rationale for allowing the insurer to control the auditor's contract

While both these features are part of FSI, they are driven by different incentive problems. The first incentive problem relates to the fact that the client-firm increases its likelihood of acquiring capital by implementing low FSQ. The second relates to the fact that the client-firm would prefer, irrespective of the choice of FSQ, that the auditor reports a high FSQ implementation. While both incentive problems arise from the desire of the client-firm to acquire funding, the mechanisms required to mitigate the two problems are distinct. To clarify this point, we analyze four distinct programs (the time lines for each of these programs are shown in Figure 1):

(I) The current regime where information about FSQ is unavailable prior to the funding decision and investors base their decisions on (ex-ante) beliefs. The auditor is hired and paid by the client-firm and may not be truly independent.

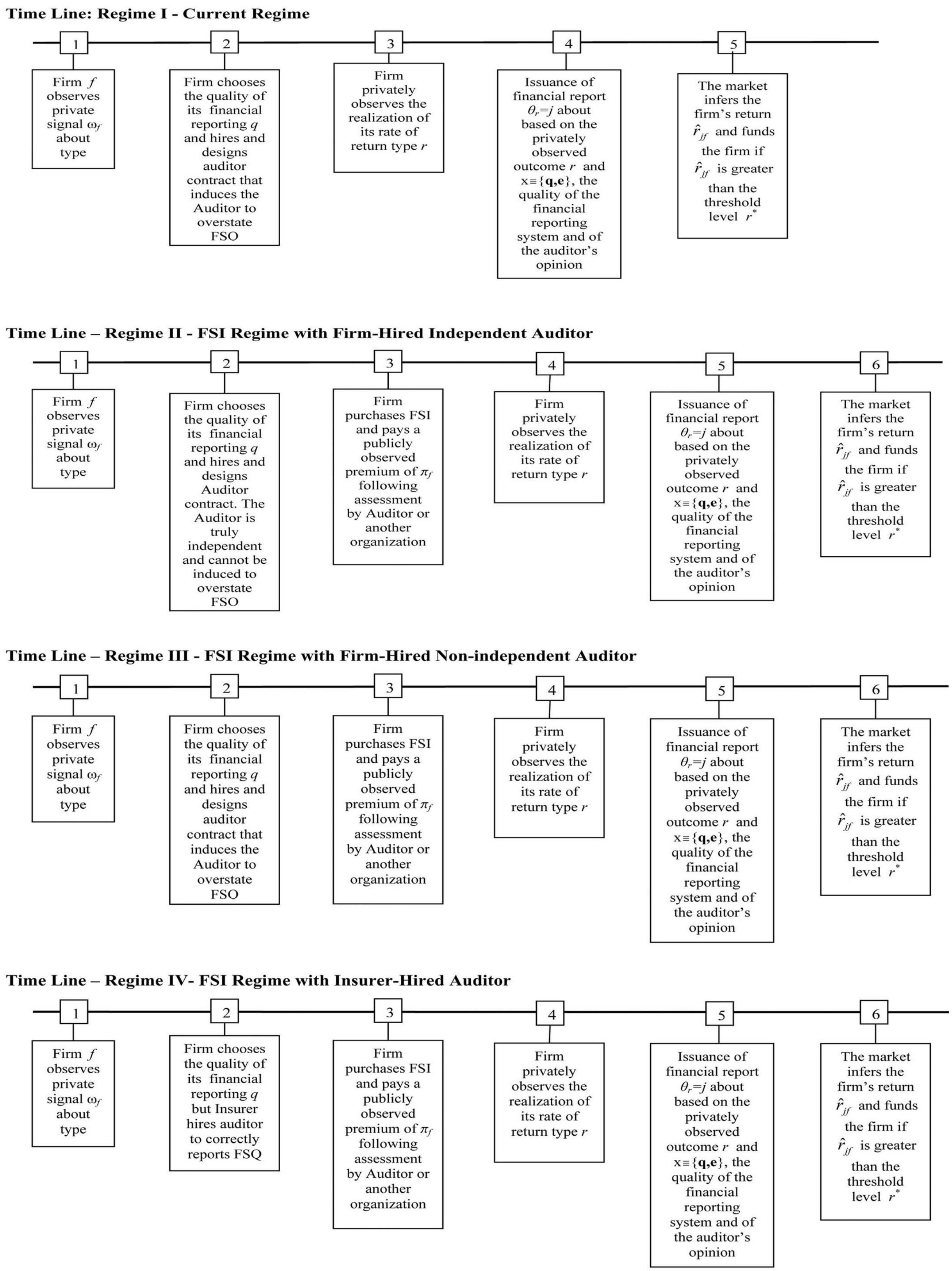
(II) FSI is available, auditors are hired by the client-firm and are truly independent; that is, auditors cannot be induced to overstate FSQ (although they can be induced to lower audit effort). Investors update their beliefs about FSQ after observing the FSI premium.

(III) FSI is available auditors are hired by the client-firm and can be induced by the client-firm to overstate FSQ. Investors update their beliefs about FSQ after observing the FSI premium.

(IV) FSI is available, premia are disclosed and the auditor is hired by the insurer. Investors update their beliefs about FSQ after observing the FSI premium.

As the programs are stated, we will highlight features that distinguish each of the programs. The time lines for the four programs are shown in Figure 1 on the next page. Denote

Figure 1: Time Lines For Programs 1-4



the observed profile of insurance premiums by $\vec{\pi}$, where π_f is the premium charged to firm f. Let $E[r_f|\theta_f, \pi_f]$ represent the inferred return expected by investors from firm f after observing the report θ_f and an insurance premium π_f. Let $FP_f(x, e|\omega_k, \vec{\pi})$ denote the funding probability expected by a firm f that receives a private signal ω_k and implements FSQ x under a premium profile $\vec{\pi}$, that is, under beliefs that a firm receiving private signal ω_l implements FSQ $\vec{\nu}_l$ and is offered a premium π_l. The objective function for firm f is to implement FSQ level and audit effort $\{x^*, e^*\}$ and secure a favorable insurance premium, π_f, so as to maximize the probability of funding.

The insurer is assumed to break-even through a suitable choice of ex-ante premium, π_f, and an ex-post adjustment. This assumption of ex-post break-even is common in the insurance literature and represents the ability to impose costs on the insured in the form of higher future premia. In our context, we assume that the insurer sets an initial premium $\pi_f(\hat{x})$ based on the auditor's report regarding the quality of the financial statements and imposes an ex-post adjustment $\sigma(\hat{x}, x)$ (on firm or auditor depending on the context) that allows the insurer to break-even. However, the insurer does not wish to depend on this ex-post adjustment and tries to make it as small as possible. Lastly, we assume that the audit fee, $F(x, e)$ in Programs I & II, and $F(\hat{x}, e)$ in Programs III & IV, implements the audit effort e and report $\hat{x}$ by the auditor.

Program I: Current Regime

$$\max_{x,e,F} \quad BFP_f(x|\omega_l, \vec{\nu}) + \alpha\left[(1 + E(r|\omega_l))(I + FP_f(x|\omega_l, \vec{\nu})(1 - B)) - \mathcal{L}_f(q) - F(q, e)\right]$$

subject to

$$F(x, e) = C(e) + \mathcal{L}_a(x, e) \tag{AF}$$

$$FP_f(x|\omega_l, \vec{\nu}) = Probability\,\{E[r_f|\omega_l, \vec{\nu}] \geq \hat{r}*\} \tag{FD}$$

$$\nu_i = x^*(\omega_i) = (q^*(\omega_i), e^*(\omega_i)) \tag{RE}$$

Program II: Premia Disclosed with auditor hired by the client-firm and reports $\hat{x} = x$

$$\max_{x,e,F} \quad BFP_f(x|\omega_l, \vec{\nu})$$
$$+\alpha\left[(1+E(r|\omega_l))(I + FP_f(x|\omega_l,\vec{\nu})(1-B)) - \pi_f - F(q,e)\right]$$

subject to

$$F(x,e) = C(e) + \mathcal{L}_a(q,e) \quad \text{(AF)}$$
$$FP_f(x|\omega_l,\vec{\nu}) = Probability\{E[r_f|\omega_l,\vec{\nu}] \geq \hat{r}*\} \quad \text{(FD)}$$
$$\pi_f = \mathcal{L}_f(x) \quad \text{(BE)}$$
$$\nu_i = x^*(\omega_i) = (q^*(\omega_i), e^*(\omega_i)) \quad \text{(RE)}$$

Program III: Premia Disclosed with a (non-independent) auditor hired by client-firm

$$\max_{\hat{q},q,e} \quad BFP_f(x|\omega_l, \vec{\nu})$$
$$+\alpha\left[(1+E(r|\omega_l))(I + FP_f(x|\omega_l,\vec{\nu})(1-B)) - F(\hat{x},e) - \pi_f\right]$$

subject to

$$F(\hat{x},x,e) = C(e) + \mathcal{L}_a(x,e) \quad \text{(AF)}$$
$$FP_f(x|\omega_l,\vec{\nu}) = Probability\{E[r_f|\omega_l,\vec{\nu}] \geq \hat{r}*\} \quad \text{(FD)}$$
$$\pi_f = \mathcal{L}_f(\hat{x}) \quad \text{(IP)}$$
$$\pi_f \leq \mathcal{L}_f(x) \quad \text{(CO)}$$
$$\sigma(\hat{x},x) = [\mathcal{L}_f(x) - \mathcal{L}_f(\hat{x})] \quad \text{(BE)}$$
$$\nu_i = x^*(\omega_i) = (q^*(\omega_i), e^*(\omega_i)) \quad \text{(RE)}$$

Program IV : FSI

$$\max_{x} \quad BFP_f(x|\omega_l, \vec{\nu})$$
$$+\alpha\left[(1+E(r|\omega_l))(I + FP_f(x|\omega_l,\vec{\nu})(1-B)) - \pi_f\right]$$

subject to

$$\max_{\hat{x}} F(\hat{x},e) - \sigma(\hat{x},x) \quad \text{(AF)}$$
$$FP_f(x|\omega_l,\vec{\nu}) = Probability\{E[r_f|\omega_l,\vec{\nu}] \geq \hat{r}*\} \quad \text{(FD)}$$
$$\pi_f = \min_{\hat{x},e} \mathcal{L}_f(\hat{x}) + \mathcal{L}_a(\hat{x},e) + F(\hat{x},e) \quad \text{(IP)}$$
$$\pi_f \leq \mathcal{L}_f(x) + \mathcal{L}_a(x,e) + F(x,e) \quad \text{(CO)}$$
$$\sigma(\hat{x},x) = [\mathcal{L}_f(x) - \mathcal{L}_f(\hat{x})] \quad \text{(BE)}$$
$$\nu_i = x^*(\omega_i) = (q^*(\omega_i), e^*(\omega_i)) \quad \text{(RE)}$$

The objective function faced by managers in all four programs is to maximize benefits less expenses. Their goal is to maximize their own perquisites by boosting the firm's capital base through their reporting strategies less the expected cost of being over-aggressive. The main differences in this equation across the programs stems from disclosing the insurance premium (absent in Program I and present in all the others) and the nature of the ex-post transfer to the insurer (absent in Program II, made by firm in Program III and by the auditor in Program IV). The insurance premium is revealed to the market in Programs II, III and IV and affects the probability of being funded. However, masking the quality of the financial statement quality (i.e. inducing $\hat{x} \neq x$) results in an ex-post transfer, $\sigma(x, \hat{x})$ from the firm in Program III (and from the auditor in Program IV).

The (IP) equation represents the level of the premium set initially by the insurer based on the FSQ, $\hat{x}$, reported to them by the auditor. This premium is disclosed to investors as a signal on FSQ. To keep the programs comparable, the insurance premium includes the cost of the audit in Program IV. In other words, even when the insurer hires the auditor (under FSI), the costs of the audit are borne by the client-firm.

The (BE) equation represents the break-even condition for insurers. Both this equation and the (CO) condition are motivated by an assumption of perfect competition in the insurance industry. The (CO) condition is based on the logic that the firm can, if it chooses to do so, reveal its true quality to the insurer and obtain a fair premium. However, the insurer is not worried about undercharging on the premium because the insurance contract allows for an ex-post adjustment if the initial assessment of FSQ is erroneous.

In all four settings, the cost to investors of false reporting has a direct component that is remedied (at least partially) through the penalties imposed by the litigation system, and an indirect one measured as misapplied investment. As we are interested only in the relative levels of the indirect cost, we hold the direct costs, i.e., the litigation penalties constant across regimes and ensure that these costs are borne by the client-firm in all settings. In Program I, this cost is paid directly by the client-firm. In Programs (II) - (IV), the expected costs are paid out by the firm as an insurance premium (note that with risk neutrality, the actual uncertain payment is the same, in utility terms, as the expected payout to both client-firm and insurer). In Program II, where the auditor is truly independent, FSQ is assumed to be known by the insurer whereas in Programs III and IV the insurer has to rely either on the firm or the auditor to make an assessment of FSQ.

The critical difference across Programs III and IV lies in the ex-post settlement associated with the (BE) constraint. In Program III, the insurer breaks-even by settling up with the client-firm through a premium adjustment, $\sigma(\hat{x}, x)$ whereas in Program IV, the settling up takes place with the auditor. In fact, the structure ensures that $\hat{x} = x$ in equilibrium in Program IV and ex-post transfers do not take place in equilibrium. [24] In Program III, the true quality of financial statements is identified only *ex-post* through the litigation process and if benefits to funding are large enough, the firm is willing to pay these ex-post transfers (after the true type is revealed) in exchange for the ex-ante benefits of funding.

The (RE) equation expresses the rational expectations constraint that the beliefs about the FSQ implemented by a firm with private signal ω_i, ν_i coincides with the actual equilibrium choices, $\{x_i^*, e_i^*\}$. In contrast, the objective function of the manager is maximized holding beliefs constant. This structure is chosen to incorporate the following two economic features: (1) managers have the ability to set low FSQ's without being detected ex-ante but (2) market beliefs will stabilize *in equilibrium* at FSQ levels that will not be undercut by the manager.

We now turn to our main analysis concerning the equilibrium levels of FSQ that are chosen by firms under each of the Programs, (I) - (IV). In Programs (II)-(IV), the insurance premium is observable by investors. When the firm implements its optimal level of x, it has to take into account the reaction of investors to the financial report that will eventually be issued, and this reaction depends either on prior beliefs regarding FSQ (Program I) or posterior beliefs formed after observing the insurance premium charged to the firm (Programs (II)-(IV)). FSQ is assumed to be observable to the *insurer* in Program II but not observable in Programs (III) - (IV).

[24] Generally, it is in the insurer's interests to force truthful revelation of x as this avoids costly ex-post renegotiation.

3 Results

To explain the dynamics of investor-firm interactions arising from the introduction of FSI, we analyze the equilibrium in all four Programs. Our goal is to show that the implemented level of FSQ is highest when insurance premia are revealed ex-ante to investors and the auditor is an agent of the insurer rather than the firm. We start with the simpler setting where the auditor is truly independent and reports the level of FSQ implemented by the firm to the insurer. Note that this does not affect the quality of the audit or the probability of errors in the financial report. All it does is to ensure that the premium truly reflects the FSQ implemented by the firm. We show that in this case (Program II), a simple disclosure of FSI premium leads to a race to the "top" and all firms implement high FSQ. In contrast, if the firm can induce the auditor to misreport FSQ to the insurer, Program(III), all potential benefits of supplying FSI are lost providing a rationale for the auditor to become an agent of the insurer Program (IV).

We begin with a lemma that lists the basic properties of the inference process. Before stating the lemma, it is useful to summarize some notation about funding probabilities. For any firm f and any beliefs $\vec{\nu}$, denote the probability that a firm f with report $\theta_f = j$ will be funded (under beliefs $\vec{\nu}$) by $FP_f(j|\vec{\nu})$. The total probability of funding (taken across all reports) under FSQ choice x, denoted by $FP_f(x|\vec{\nu})$, is given by:

$$FP_f(x|\vec{\nu}) = \sum_{j=1}^{L} FP_f(j|\vec{\nu})P(j|x).$$

The problem faced by a firm f is to choose the optimal level of FSQ, x, given its private information, ω_l. This decision in turn depends on two factors:

(1) The probability that a firm with private information ω_l implementing some FSQ x will receive funding; and

(2) The expected loss through litigation if the firm implements quality x and consequently inflates the implied rate-of-return.

We develop the funding effects of quality choice in this section and the litigation structure in Section 2.2.

The probability that a firm f observing private information ω_l and implementing quality x when the market holds beliefs $\vec{\nu}$ is written $FP_f(x|\omega_l, \vec{\nu})$. Using Bayes rule:

$$FP_f(x|\omega_l, \vec{\nu}) = \sum_{j=1}^{L} FP_f(j|\vec{\nu})P(j|x, \omega_l). \tag{9}$$

With this notation, we have the following result:

Lemma 1 (Reports, inferences and funding probabilities)
Let $\hat{r}_{jf}$ denote the inferred rate of return of firm f under beliefs $\vec{\nu}$ and observed report $r\theta_j$.

(1) For any beliefs ν_f regarding the FSQ of firm f, a higher implied rate of return implies a (strictly) greater inferred rate of return, that is, $\hat{r}_{jf}$ is increasing in j.

(2) $FP_f(j|\vec{\nu}) = F(\hat{r}_{jf})$ (recall that F is the distribution function of r^* and $F(\hat{r}_{jf})$ is the probability that $r^* \leq \hat{r}_{jf}$.)

(3) Let ω_l denote the private signal observed by firm f. Then

$$FP_f(x|\omega_l, \vec{\nu}) \quad = \quad \sum_{i=1}^{L} \left\{ \sum_{j=i}^{L} F(\hat{r}_{jf})P(j|i, x) \right\} P(i|\omega_l)$$

Proof:

See Appendix 1.

□

The next proposition shows how the probability of funding for firm f changes in the FSQ choices.

Lemma 2 (Funding probability and FSQ choice)
For any firm f and any beliefs $\vec{\nu}$, $FP_f(x|\omega_l, \vec{\nu})$ is a strictly decreasing function of, quality, x. Holding beliefs fixed, a reduction in quality (i.e., an inflation of the expected report) results in a larger probability of funding.

Proof:

Fix any beliefs $\vec{\nu}$. From Lemma (1: (1)), $FP_f(j|\vec{\nu})$ is always increasing in reported type $\theta_f = j$. Therefore by Lemma (1: (3)) and Assumption (1: 2), the ex-ante funding probability, $FP_f(x|\omega_l, \vec{\nu})$, is strictly decreasing in x.

$\square$

The results in the two lemmas above help to derive the equilibria under the current regime when investors only find out ex-post about FSQ through litigation and in the setting where the disclosure of the FSI premium provides ex-ante information to the market

Proposition 1 (Equilibrium in Program I (current regime))

The quality of information is declining in the magnitude of management benefits, B. If the benefits from funding are very large relative to the penalties for overstatement – specifically, if the partial derivatives in each component x_i of FSQ satisfy:

$$B(1-\alpha E(r|\omega_l)) > \left\{\frac{\partial}{\partial x_i}\Big(F(x,e)+\mathcal{L}_f(x)\Big)\right\}\left\{\frac{\partial}{\partial x_i}\Big(FP_f(q,e|\omega_l,\vec{\nu})\Big)\right\}^{-1}$$

Then the equilibrium quality levels are for every firm to set $x_f = \underline{x}$ where $\underline{x}$ is the minimum FSQ. Consequently, as management perquisites increase, capital is allocated to low rate-of-return firms with greater probability.

Proof:

The manager's first-order-condition in FSQ (see Equation 4) is (the left-hand-side is positive by Equation 5):

$$B[1-\alpha((1+E(r|\omega_l))]\left\{\frac{\partial}{\partial x_i}\Big(FP_f(x,e|\omega_l,\vec{\nu})\Big)\right\} = \frac{\partial}{\partial x_i}\Big(F(x,e)+\mathcal{L}_f(x)\Big) \tag{10}$$

$\mathcal{L}$ is convex and decreasing in x, so the level of x is decreasing in B. Under the condition in the hypothesis of this proposition, the maximand in Program 1 increases from reducing FSQ choices x for *any* prior beliefs. It follows that every firm will set the lowest level of FSQ in equilibrium.

$\square$

Proposition 1 shows that if the benefits to funding are large enough, it sets off a "race to the bottom" in terms of FSQ. We now proceed to analyze the effects of introducing FSI. Before presenting that argument, we note that increasing one dimension of FSQ while holding others constant results in a reduction of the associated premiums. In other words, if $\mathbf{y} \preceq x$ then the premium associated with $\mathbf{y}$ is equal to or greater than that associated with x

(with equality only if $\mathbf{y} = x$). This is an immediate consequence of Assumption 2 where the probability of overstatement, and hence the associated liability, decreases as FSQ increases.

Assume that each firm purchases insurance and that the premiums charged to firms are observable. Suppose now that in equilibrium some firm f sets $x_f < x_L$, where x_L is the quality choice of a firm receiving the highest possible private signal ω_L. Then, the premium charged to firm f, π_f, is strictly larger than π_L – and investors will infer that firm f is of some type other than L. Thus, the inferred rate of return conditional on observing π_f will be different from that based on the prior beliefs, $\vec{\nu}$. We will show that the disclosure of π_f and attendant changes in the inferred rate of return lead to an equilibrium where all firms pool at the highest level of quality, $\overline{x}$.

Proposition 2 (Equilibrium with revelation of FSI premia (Program II)) *When FSI is made available and premiums are disclosed, the equilibrium in which all firms set $q_f = \overline{\mathbf{q}}$ and the associated $\overline{\mathbf{e}}$ is a rational expectations equilibrium irrespective of the benefit level B. The association between management benefits (perquisites) and misallocation of capital is negated through the provision of FSI (note, however, that in this program, we assume that the auditor will not misreport q to the insurer).*

Proof:

Let $\overline{x}$ denote the highest quality choice and $\overline{\pi}$ the resulting break-even premium (see Program II). A rational expectations equilibrium is given by the following beliefs:

(1) Whenever $\pi_f = \overline{\pi}$, then $p(\omega_l|\pi_f) = 1/L$ for every l (in-equilibrium beliefs);

(2) Whenever $\pi_f > \overline{\pi}$, then $p(\omega_l|\pi_f) = \begin{cases} 1 & \text{if } l = 1 \\ 0 & \text{if } l > 1 \end{cases}$ (off-equilibrium beliefs);

Under the belief system above, any type paying premium $\pi_f > \overline{\pi}$ is perceived as type 1, and the expected return $E[r_f|\theta_f = j, \pi_f] = E[r_f|\theta_f = j, \omega_1]$ is less than $E[r_f|\theta_f = j, \overline{\pi}]$. Therefore, the funding probability declines for every report j whenever $x_f \preceq \overline{x}$ is selected (resulting in a premium $\pi_f > \overline{\pi}$). Hence, $FP_f(x, e|\pi_f) < FP_f(\overline{x}, \overline{e}|\overline{\pi})$; in addition, $\pi_f > \overline{\pi}$. Deviating to $x < \overline{x}$ makes every firm-type worse off so the equilibrium is for all firms to set $\overline{x}$.

□

The fact that defections from high quality are detected and immediately penalized results in the "flight to quality" documented in Proposition 2. Specifically, high-type firms gain from setting high FSQ. If low-type firms can muddy investor perceptions through low FSQ, high-type firms are also driven to exaggerate their own outcomes, leading to the result in Proposition 1. In contrast, in Proposition 2, by staying with high FSQ, good firms force others to follow suit or be identified as low types. Thus, low-type firms either abandon their quest for capital or accept a much lower probability of being able to mislead investors in equilibrium.

Although Proposition 2 demonstrates that with FSI the best possible quality implementation is an equilibrium, we cannot formally rule out all other equilibria. In general, one can obtain economically unintuitive sequential equilibria by specifying implausible off-equilibrium beliefs. The standard device to rule out "bad equilibria" is to impose restrictions on such off-equilibrium beliefs. In the simple case of two rates of return discussed in the example, a direct proof can be given that "pooling-at-the-top" is the only equilibrium that meets the universal divinity test.

Lemma 3 (Refinement Test)

Suppose $L = 2$ (as in our example). Then, the equilibrium where all firms pool at the highest level of quality x is the only one that meets the universal divinity refinement criterion.

Proof:

See Appendix 1.

□

3.1 Auditor as an agent of the Insurer

In this section, we provide an economic rationale for shifting the responsibility for engaging an auditor from the firm to the insurer. We first discuss the situation where the firm purchases financial statement insurance but continues to hire the auditor (Program III). We emphasize that this is not an implementation of FSI – under FSI, the auditor is an agent of the insurer. Rather, we analyze this situation to highlight why FSI requires that the auditor stop being an agent of the firm. Let $F(\hat{x}, x, e)$ denotes the cost *to the firm* of getting the auditor to exert effort e and report the quality as $\hat{x}$ when the true quality is x. The auditor can be incentivized to report the true FSQ but the firm may not desire the true FSQ to be revealed.[25]

When the auditor continues as an agent of the firm truthful revelation of FSQ may be impossible ex-ante. However, litigation will typically reveal the true FSQ ex-post. The insurer will find it possible to make an adjustment $\sigma(\hat{x}, x)$ with the firm (because the insurer has a contractual relationship only with the firm). The key point is that this transfer is made *ex-post* and will not be known at the time of trading. Hence the firm does not internalize the cost of the low quality, ex-ante.

The initial premium observed by the market (Constraint (IP)) reflects the FSQ reported by the auditor to the insurance company rather than the true FSQ. Under these circumstances, the firm will always have incentives to set low FSQ to increase the probability of funding while incentivizing the auditor to over-report the FSQ. Market participants will anticipate this and set funding strategies based on low FSQ precipitating a "race to the bottom" as shown in the next proposition.

Proposition 3 (Equilibrium with the Auditor as Firm's Agent)
Suppose that the benefits to funding, B, are very large relative to the penalties for overstatement, $\mathcal{L}$. In addition, suppose that the financial statement quality is unobservable and that the auditor is an agent of the firm. Then the equilibrium quality levels are for every firm to set $x_f = \underline{x}$ where $\underline{x}$ is the minimum FSQ level. Consequently, capital is allocated to firms with low rate of return with relatively high probability.

Proof:
We begin by noting that the insurer is indifferent across breaking even *ex-ante* or *ex-post*. From the insurer's perspective, the premium can be set based on the auditor's assessment

[25] Note that the revelation principle cannot be invoked in our setting because the market's funding strategies have to be ex-post rational and any form of precommitment is precluded. In the absence of precommitment to funding schemes, the revelation principle cannot be invoked and the firm will not implement a system where the true FSQ is revealed.

of FSQ, $\hat{x}$, and adjusted later through the transfer $\sigma(\hat{x}, x)$. As explained in the discussion preceding Equation (8), the firm can (with no extra cost) incentivize the auditor to report $\hat{x} = \overline{x}$ by setting fees as follows:

$$F(\hat{x}, x, e) = \begin{cases} F(x, e) & \text{if } \hat{x} = \overline{x} \\ = 0 & \text{Otherwise} \end{cases}$$

Program III is therefore essentially equivalent to Program I: all firms induce the auditor to report $\overline{x}$ (with off-equilibrium beliefs that any firm choosing $x_f < \overline{x}$ received signal ω_1). Therefore, all firms receive the premium corresponding to $\overline{x}$ and hence, investors learn nothing from observing the premium. For this reason, the *ex-ante* beliefs, $\vec{\nu}$, are not updated after observing the client-firm's insurance premium and the equilibrium in Program III then becomes the same as in Program I, that is, one where all firms set the lowest possible level of FSQ. Summarizing, the equilibrium is one where all firms choose the lowest level $\underline{x}$ but obtain premia corresponding to the highest level $\overline{x}$. The equilibrium beliefs of investors is that FSQ is of the lowest type resulting in the same equilibrium as in Program I.

□

In contrast, Program IV leads to the same equilibrium as in Program II where all firms pool at the highest FSQ. The key step again is the updating of beliefs by investors after observing the premium. We assume that the insurer offers a schedule $\pi(\hat{x})$ and sets the auditors transfer function $\sigma(\hat{x}, x)$ in such a way as to ensure that the auditor reveals x truthfully (see details in proposition 4). As a consequence, the equilibrium is the same as in Program II.

Proposition 4 (Equilibrium with the Auditor as the Insurer's Agent)
When FSI is made available and premiums are disclosed, there is an equilibrium where all firms set $x_f = \overline{x}$. In addition, if $L = 2$, this is the only equilibrium meeting the divinity criterion.

Proof:

Given that the auditor bears the cost of misreporting FSQ, they would typically choose to under-report FSQ. However, our assumption (CO) ensures that the firm can always get a fair premium elsewhere and so the insurer does not wish the FSQ to be under-reported. Under these circumstances, the *ex-ante* premium π_f correctly reflects the FSQ chosen by the firm. The inferences drawn from π_f are the same as in Program II resulting in the same equilibrium where all firms pool at the highest level of FSQ.

□

3.2 An Example

We provide an example that demonstrates the effects of FSI in ensuring a "flight to quality." In order to keep the example as simple as possible, we simplify the strategic role of the auditor and assume that the insurer can observe FSQ levels.

We assume that there are N firms each of which can have two possible rates of return, i.e., that there are two types (L=2). In addition, we assume that the quality variable, $q = q$, is one-dimensional and lies in $[0, \overline{q}]$, where $\overline{q} < 1$. Next, we assume that the private information is perfect, and that $\omega_l = 1, 2$ reveals the expected rate of return as r_l. We set $\Lambda(q, e) = q$ (that is, $x = q$) and $P(i|i, q, e) = q$ for $i = 1, 2$. So with FSQ q, the probability that the firm's type is reported correctly is q, and, as there are only two types, the probability of the firm being misclassified is $1 - q$. Let the beliefs of investors be represented by ν_i; the firm that receives a private signal that it's rate of return is r_i is expected to set its FSQ at ν_i. Assuming that each firm-type is equally probable, the inferred rates-of return are as follows:

$$\hat{r}_2 = E[r|\theta_f = 2] = \frac{r_1(1-\nu_1) + r_2}{(1-\nu_1) + 1} = \frac{1-\nu_1}{2-\nu_1} r_1 + \frac{1}{2-\nu_1} r_2 \tag{11}$$

$$\hat{r}_1 = E[r|\theta_f = 1] = r_1 \tag{12}$$

The funding probability from selecting FSQ level q for a firm that receives private signal $\omega_l = 1$ is given by:

$$FP(q, 1) = qF(\hat{r}_1) + (1-q)F(\hat{r}_2,) \tag{13}$$

(recall that F denotes the distribution function of r^*). Because $\hat{r}_2 > \hat{r}_1$, it follows that the funding probability is strictly decreasing in q for every type 1 firm. In contrast, a firm with private signal $\omega_l = 2$ has a realized rate of return 2 and its funding probability is unaffected by the choice of q (because it's type cannot be overstated).

Assuming that the benefits of funding are sufficiently high, the firm with a low private signal will set $q_1^* = 0$. The implied type j of such a firm is always $j = 2$ (i.e., it is invariably misclassified). Thus the only report observable by investors is $\theta_f = 2$ for every firm. It follows that when $r^* \le \frac{r_1+r_2}{2}$ all firms are funded and when $r^* > \frac{r_1+r_2}{2}$ no firm is funded. As there are a total of N firms in the economy, $N/2$ of them (in expectation) are of high-type.

(1) Therefore, when all firms are funded, an expected amount of $(N/2)$ units of capital are wrongly allocated and the associated loss is: $(N/2)\int_{r_1}^{(r_1+r_2)/2}(r^* - r_1)f(r^*)dr^*$

(2) When no firms are funded, a total of $(N/2)$ firms may wrongly be denied capital with associated loss: $\int_{(r_1+r_2)/2}^{r_2}(r_2 - r^*)f(r^*)dr^*$.

The total negative returns associated with the misallocation of capital may then be written as:

$$(N/2)\int_{r_1}^{r_2} \min\{r^* - r_1, r_2 - r^*\}f(r^*)dr^* \tag{14}$$

In contrast, consider the case where the firm's choice of FSQ is known to the insurer who then sets a premium based on the level of coverage. We shall assume that the cost of coverage is strictly decreasing in quality, that is, $\pi(q)$ is decreasing in q. As in Proposition 2, the following is seen to be an equilibrium:

- Both Firm types choose FSQ $q = \overline{q}$, i.e., the highest quality financial statement, and pay the associated (low) insurance premium $\pi(\overline{q})$.
- Any firm that is observed to have a premium $\pi > \pi(\overline{q})$ is classified as a type-1 firm.

To see that this represents an equilibrium, let q_1^* represent the equilibrium FSQ choice of Firm f that has received private signal ω_1; either $q_1^* < \overline{q}$ or $q_1^* = \overline{q}$. If, $q_1^* < \overline{q}$, the premium rate for firm f, $\pi(q_1^*) > \pi(\overline{q})$, and its inferred rate of return is r_1 irrespective of the report. Therefore, it's probability of funding is $F(r_1)$. If, however, Firm f mimics the high private-signal firm and sets $q_1^* = \overline{q}$, the inferred rates of return are given by

$$\begin{aligned}
\overline{r}_2 = E[r|\theta_f = 2] &= \frac{r_1(1-\overline{q}) + r_2}{(1-\overline{q}) + 1} = \left[\frac{1-\overline{q}}{2-\overline{q}}\right] r_1 + \left[\frac{1}{2-\overline{q}}\right] r_2 \\
\overline{r}_1 = E[r|\theta_f = 1] &= r_1
\end{aligned}$$

and the probability of funding increases by $(1-\overline{q})[F(\overline{r}_2)-F(r_1)]$ (i.e., by the higher probability of funding when the firm is reported as "type-2."). Note that the social loss now becomes::

(1) $(N/2)(1-\overline{q})\int_{r_1}^{\overline{r}_2}(r^*-r_1)f(r^*)dr^*$ because low-type firms are funded and

(2) $(N/2)\int_{\overline{r}_2}^{r_2}(r_2-r^*)f(r^*)dr^*$ because high-type firms are not funded.

with attendant social loss:

$$(N/2)\int_{r_1}^{r_2}\min\{(1-\overline{q})(r^*-r_1), r_2-r^*\}f(r^*)dr^* \tag{15}$$

Because $\min\{(1-\overline{q})(r^*-r_1), r_2-r^*\} \leq \min\{(r^*-r_1), r_2-r^*\}$, (14) and (15) shows that the social loss is reduced through the provision of FSI.

Notice in this example that if a firm with private signal $\omega_l = 1$ sets $q_1 < \overline{q}$, then the best response for the firm with the high private signal is to set $q_2 = \overline{q}$ – this separating policy leads to funding with probability $F(r_2)$ at a minimum insurance cost. If, however, the firm with the high private signal sets $q_2 = \overline{q}$, the best strategy for a firm with low private signal is to "mimic" and set $q_1 = \overline{q}$. Mimicry increases the funding probability (and leads to the equilibrium described above). In contrast, when the type-1 firm sets $q_1 = \overline{q}$ and the type-2 firm sets $q_2 < \overline{q}$ the situation is untenable in equilibrium because by increasing q slightly, the type-2 firm reduces insurance costs but still separates itself from the type-1 firm. Thus, $q_1 = \overline{q}$, $q_2 < \overline{q}$ should never be an equilibrium. Hence, the only plausible equilibrium is for both firms to set $q_i = \overline{q}$ (see Lemma 3).

□

This example does not incorporate a role for the auditor, but a little reflection shows that the core intuition survives in a more complex setting where reports are influenced by an auditor acting under moral hazard. In particular, if the income of the auditor is determined by the insurer, sufficient incentives may be provided to elicit truthful revelation regarding the auditor's assessment of the firm's FSQ. Once FSQ is known (perhaps imperfectly) to the insurer, premium levels reveal this information to investors. In particular, when firms defect from the anticipated level of FSQ, that is, if a firm has been charged a higher than anticipated premium π_f, investors find out about this before trading. This allows investors to alter their funding strategies and we are then essentially back in the situation discussed in the example.

The example has the characteristics of a signaling model where firms are separated out through the level of the insurance premium but the cost associated with signals has a special structure that should be clarified. In a standard signaling model, there is a difference in cost for a given signal across types (arising from an exogenous factor related to type). This difference deters the low type from choosing the same signal as the high type. In contrast, in the setting of the example, the cost of financial statement quality is the same for all firms. The differential cost arises because the choice of high quality reveals the firms true type and is thus indirectly more costly for the low-type firm.

Let $\{\nu_1, \nu_2\} = \vec{\nu}$ represent the beliefs of investors. In this example, the expected return on the high report, $\theta = 2$, is some weighted average of r_2 and r_1 with the weights depending on $\vec{\nu}$; in addition, because Firm 2 always issues report $\theta = 2$, the weight on r_2 is strictly positive. In contrast, the report $\theta = 1$ necessarily implies that the rate of return is r_1. Thus, rational investors would fund the report $\theta = 2$ with a greater probability than the report $\theta = 1$. In general, ensuring that higher reports are funded with greater probability requires some form of regularity assumption; in our formulation, this is the role of Assumption 1 (3).

The analysis in this Example assumes that the insurance premium is based on the actual level of FSQ chosen by firms. This was the setting analyzed in Proposition 2. More generally, the insurer relies on the auditor's assessment of FSQ to set the premium. In such a setting, the auditor reports FSQ strategically in order to maximize his own payoffs, and the revelation of the premium to investors does not break the "race to the bottom" with regard to audit quality *so long as the auditor functions as an agent of management* (Proposition 3). That is, firms would prefer to get the auditor to report a higher level of FSQ to the insurance company and thereby to investors than the one that has been chosen. As rational insurers and investors will anticipate this "bias", the equilibrium unravels to the lowest choice of FSQ. In contrast, when the auditor functions as an *agent of the insurer*, the pooling at the highest quality again becomes the rational equilibrium (Proposition 4).

4 Conclusion

Several causes have been advanced in the media for the recent "accounting" meltdown: irrational exuberance, infectious greed, moral turpitude of executives, unethical accountants, and related "ills." We have argued that the inherent conflict of interest in the auditor-client relationship and the unobservability of financial statement quality, coupled with incentives to "cook the books" are among the potential culprits. Financial Statement Insurance, as developed here, provides a market-based solution that acts as an effective check on the issuance of overly biased financial statements. First, the publicization of the insurance coverage and the premium will credibly signal the quality of the insured's financial statements and direct investments toward better projects. Second, by transferring the auditor hiring decision to the insurer, FSI eliminates the auditors'inherent conflict of interest.At the same time, the ability to signal the quality of financial statements will provide companies with incentives to improve the quality of their financial statements. Hence, FSI will result in fewer misrepresentations and smaller shareholder losses.

Under the present regime, auditors' legal liability is not an effective tool for inducing truth telling in financial statements because the costs of such liability are essentially covered by the clients. As mentioned, the FSI scheme effectively eliminates the conflict of interest that came to light in the aftermath of accounting scandals. Yet financial statement insurance has other important benefits: the credible signaling of financial statement quality leads to an improvement of such quality, and consequently, decreases in shareholder losses, and the better channeling of savings to socially desirable projects.

References

[1] Baker, George P., Michael C. Jensen, and Kevin J. Murphy. "Compensation and Incentives: Practice vs. Theory." Journal of Finance 63, no. 3 (July 1988): 593-616.

[2] Butler, Henry N. and Larry E. Ribstein (2006), "The Sarbanes-Oxley Debacle" (2006 AEI Press)

[3] Cunningham, Lawrence A., (2004a) "A Model Financial Statement Insurance Act," *Connecticut Insurance Law Journal*, Vol. 11, 69-106.

[4] Cunningham, Lawrence A., (2004b) "Choosing Gatekeepers: The Financial Statement Insurance Alternative to Auditor Liability," *UCLA Law Review*, Vol. 52, 413-475.

[5] Grossman, S., (1995) "Dynamic Asset Allocation and the Informational Efficiency of Markets," *Journal of Finance*, Vol L, No. 3, 773-787.

[6] Kaplow, Louis and Steven Shavell.,(1994)"Optimal Law Enforcement with Self-Reporting of Behavior," *The Journal of Political Economy*, Vol.102, No. 3, pp. 582-606.

[7] Lacker, Jeffrey M. and John A. Weinberg.,(1989)"Optimal Contracts under Costly State Falsification," *The Journal of Political Economy*, Vol.97 ,No.6, pp.1345-1363.

[8] Levitt, A. 2002a. "Take On the Street." New York: *Pantheon Books.*

[9] Milgrom, Paul., (1981), "Good News and Bad News: Representation Theorems and Applications," *Bell Journal of Economics*, vol. 12, issue 2, pages 380-391.

[10] Romano, Roberta,(2005)"The Sarbanes-Oxley Act and the Making of Quack Corporate Governance", Yale Law Journal Vol 114 1521 (2005)

[11] Ronen J. 8:1, 2002 "Post-Enron Reform: Financial Statement Insurance, and GAAP Re-visited," *Stanford Journal of Law, Business & Finance*, 1-30.

[12] Rubin, P. H., 1999, "Courts and the Tort-Contract Boundary in Product Liability, The Fall and Rise of Freedom of Contract," Frank Buckley, editor, *Duke University Press.*

Appendix 1: Details of the Information Structure

The Bayesian inference process that formalizes the relation between report and hidden type starts with the joint probability distribution of i, ω_l, j at a given level of FSQ, x:

$$P(i, \theta_f = j, \omega_l, x) \quad = \quad P(j|i,x)P(i,\omega_l) \quad = \quad P(j|i,x)P(i|\omega_l)P(\omega_l) \tag{16}$$

Equation (16) states that once the type, i, is realized, the probability of report j is determined by the actual value of i and the FSQ x, and is independent of the earlier imperfect signal ω_l. Built into this equation is the fact that the joint distribution of i and ω_l is unaffected by the choice of x – that is, the financial reporting choice affects only the reported rate of return and not the actual rate of return, r_i. It follows that

$$P(i, j|\omega_l, x) = P(j|i,x)P(i|\omega_l) \tag{17}$$

The next step is to describe how the beliefs $\vec{\nu}$ translate to a joint distribution of types and reports, $P(i, j|\vec{\nu})$. This process involves the following steps:

(1) Firm f receives a private signal ω_l with probability $P(\omega_l)$. A firm receiving private signal ω_l is conjectured to chose FSQ ν_l.

(2) Under this belief, the joint distribution of reports and types for a firm receiving ω_l is $P(i, j|\nu_l, \omega_l)$.

(3) Therefore, the joint distribution of $P(i, j|\vec{\nu}) = \sum_{l=1}^{L} P(i, j|\omega_l, \nu_l)P(\omega_l)$

Using (17) and the inference process above, the expected rate of return for a firm that has reported $\theta_f = j$ is given by (note that the true type i cannot exceed j as errors are always overstatements):

$$E[r|\theta_f = j, \vec{\nu}] \quad = \quad \sum_{l=1}^{L} \left\{ \frac{\sum_{i=1}^{j} r_i P(j|i,\nu_l)P(i|\omega_l)}{\sum_{i=1}^{j} P(j|i,\nu_l)P(i|\omega_l)} \right\} P(\omega_l) \tag{18}$$

At this stage, we make the important qualitative observation that all firms that issue a particular report $\theta_f = j$ are assigned the same inferred expected rate of return. We contrast this with the situation where in addition to a financial report, θ_f, firms also report their insurance premium, π_f.

Denoting the inferred rate of return under beliefs $\vec{\nu}$ conditional on both report $\theta_f = j$ and premium π_f by $E[r|\theta_f = j, \pi_f, \vec{\nu}]$, we obtain:

$$E[r|\theta_f = j, \vec{\nu}, \pi_f] \quad = \quad \sum_{l=1}^{L} \left\{ \frac{\sum_{i=1}^{L} r_i P(j|i, \nu_l) P(i|\omega_l)}{\sum_{i=1}^{L} P(j|i, \nu_l) P(i|\omega_l)} \right\} P(\omega_l|\pi_f, \vec{\nu}) \tag{19}$$

The key difference between (18) and (19) is that the premium reveals something about the FSQ, and this in turn is reflected in the inferred rate of return through *a posterior probability distribution* about the private signal types that will end up with that premium. That is, after observing a premium π_f, investors infer FSQ x_f corresponding to π_f and then use their beliefs $\vec{\nu}$ to estimate the private signal of firm f. To illustrate further, suppose that a firm with the lowest private signal type ω_1 is assumed to choose a low FSQ ν_1 with a resulting premium π_1. Then, conditional on observing that firm f has been offered a low premium $\pi_f < \pi_1$, the probability weight $P(\omega_1|\pi_f, \vec{\nu}) = 0$. In other words, firms will be able to reveal their private signals through their reported premiums and thereby affect the inferred report-contingent rate of return.

The inferred rate of return for firm f depends on beliefs $\vec{\nu}$ and can differ from the actual distribution, $P(i|j, x_f)$. However, we impose the condition that *in-equilibrium*, $\nu_l = x(\omega_l)$ where $x(\omega_l)$ denotes the FSQ implemented by a firm with private information ω_l. This is an important point that needs to be emphasized. Firms have the ability to distort the perceived level of FSQ but this is not a stable "equilibrium" situation. For an equilibrium to be sustainable, it must be optimal for firms and auditors to set FSQ levels that are consistent with investor beliefs.

A Proof of Lemma 1

Suppose that $k > j$. We have to show that a firm s with report $\theta_s = k$ has a higher inferred rate of return than another, t, with report $\theta_t = j$.

From (18):

$$E_s[r|\theta_s = k, \vec{\nu}] \quad = \quad \sum_{l=1}^{L} \left\{ \frac{\sum_{i=1}^{k} r_i P(k|i, \nu_l) P(j|\omega_l)}{\sum_{i=1}^{k} P(k|i, \nu_l) P(i|\omega_l)} \right\} P(\omega_l)$$

$$E_t[r|\theta_t = j, \vec{\nu}] \quad = \quad \sum_{l=1}^{L} \left\{ \frac{\sum_{i=1}^{j} r_i P(j|i, \nu_l) P(j|\omega_l)}{\sum_{i=1}^{j} P(j|i, \nu_l) P(j|\omega_l)} \right\} P(\omega_l) \tag{20}$$

Define for $1 \leq a \leq j-1$:

$$\xi_{al} = \frac{P(k|a, \nu_l) P(a|\omega_l)}{\sum_{i=1}^{k} P(k|i, \nu_l) P(i|\omega_l)}; \quad \psi_{al} = \frac{P(j|a, \nu_l) P(a|\omega_l)}{\sum_{i=1}^{j} P(j|i, \nu_l) P(i|\omega_l)}$$

Define for $a = j$:

$$\xi_{al} = \xi_{jl} = \frac{\sum_{i=j}^{k} P(k|i, \nu_l) P(i|\omega_l)}{\sum_{i=1}^{k} P(k|i, \nu_l) P(i|\omega_l)}; \quad \psi_{al} = \psi_{jl} = \frac{P(j|a, \nu_l) P(i|\omega_l)}{\sum_{i=1}^{j} P(j|i, \nu_l) P(i|\omega_l)}$$

Note that by definition, $\sum_{a=1}^{j} \xi_{al} = \sum_{a=1}^{j} \psi_{al} = 1$, that is, ξ_{al} and ψ_{al} are probability distributions. Now let $w_a = \dfrac{\xi_{al}}{\psi_{al}}$. By Assumption 1 part (1), w_a is a strictly increasing function of a for $a \leq i$. Consequently,

$$\begin{aligned}
E_s[r|\theta_s = k, \vec{\nu}] \quad &= \quad \sum_{l=1}^{L} \left\{ \frac{\sum_{i=1}^{k} r_i P(k|i, \nu_l) P(i|\omega_l)}{\sum_{i=1}^{k} P(k|i, \nu_l) P(i|\omega_l)} \right\} P(\omega_l) \\
&= \quad \sum_{l=1}^{L} \left\{ \sum_{i=1}^{j} r_i \xi_{il} \right\} P(\omega_l) \quad = \quad \sum_{l=1}^{L} \left\{ \sum_{i=1}^{j} r_i w_i \psi_{il} \right\} P(\omega_l) \\
&> \quad \sum_{l=1}^{L} \left\{ \left[\sum_{i=1}^{j} w_i \psi_{il} \right] \times \left[\sum_{i=1}^{j} r_i \psi_{il} \right] \right\} P(\omega_l) \quad = \quad \sum_{l=1}^{L} \left\{ [1] \times \sum_{i=1}^{j} r_i \psi_{il} \right\} P(\omega_l) \\
&= \quad E_t[r|\theta_t = j, \vec{\nu}]
\end{aligned} \tag{21}$$

Equation (21) establishes that $\hat{r}_{jf} = E_f[r|\theta_f = j, \vec{\nu}]$ is increasing in j establishing Lemma 1 (1). Next, investors provide funding whenever $r_{jf} \geq r^*$ establishing Lemma 1 (2). Taking expectations yields Lemma 1(3).

□

B Proof of Lemma 3

Suppose that some firm deviates to some off-equilibrium choice x_f resulting in some premium $\pi_f > \overline{\pi}$ and the off-equilibrium beliefs after observing π_f are such that ω_2 is indifferent between choosing $\overline{\pi}$ or π_f. We will show that ω_1 would then strictly prefer to choose π_f.

Let x_f be the FSQ correponding to π_f. Noting that the lowest report $j = 1$ necessarily implies that the firm's rate of return is the lowest possible, r_1 (as all reporting erors are overstatements), $FP(j=1|\pi_f) = FP(j=1|\overline{\pi}) = F^*(r_1)$. Therefore, denoting the belief about FSQ choice after observing π_f by x_f, the indifference assumption on ω_2 leads to:

$$FP(1|\pi_f)P(1|\omega_2, x_f) + FP(2|\pi_f)P(2|\omega_2, x_f) \quad = \quad FP(1|\overline{\pi})P(1|\omega_2, \overline{x}) + FP(2|\overline{\pi})P(2|\omega_2, \overline{x}) \tag{22}$$

Next, if the true type of the firm is 2, they will always get the report 2. Therefore, $P(2|\omega_i, \mathbf{y}) = P(2|\omega_i) + P(2|1, \mathbf{y})P(1|\omega_i)$ where $P(.|\omega_i)$ represents the probability of the true type and $P(.|., \mathbf{y})$ denotes the conditional probability of the report given true type and FSQ $\mathbf{y}$. Rearranging (22) and using the facts that: (i) $FP(1|\pi_f) = FP(1|\overline{\pi}) = F^*(r_1)$ and (ii) $P(2|\omega_j, \mathbf{y}) = 1 - P(1|\omega_j, \mathbf{y})$ for every FSQ $\mathbf{y}$ we obtain:

$$\begin{aligned}
P(2|\omega_2)\left[FP(2|\pi_f) - FP(2|\overline{\pi})\right] \quad &+ \quad P(1|\omega_2)\left[P(2|1, x_f)FP(2|\pi_f) - P(2|1, \overline{x})FP(2|\overline{\pi})\right] \\
&= \quad P(1|\omega_2)F^*(r_1)\left[P(2|1, x_f) - P(2|1, \overline{x})\right] \\
\left[\frac{P(2|\omega_2)}{P(1|\omega_2)}\right]\left[FP(2|\pi_f) - FP(2|\overline{\pi})\right] \quad &+ \quad \left[P(2|1, x_f)FP(2|\pi_f) - P(2|1, \overline{x})FP(2|\overline{\pi})\right] \\
&= \quad F^*(r_1)\left[P(2|1, x_f) - P(2|1, \overline{x})\right] \qquad (23)
\end{aligned}$$

The Right-Hand-Side of the equation above is negative because the probability of overstatement, $P(2|1, \mathbf{y})$ decreases in FSQ. It follows that $FP(2|\pi_f) - FP(2|\overline{\pi}) < 0$ (otherwise, both terms on the Left-Hand-Side are ≥ 0). Now by the fact that signals are "good news" about type, it follows that:

$$\left[\frac{P(2|\omega_2)}{P(1|\omega_2)}\right] > \left[\frac{P(2|\omega_1)}{P(1|\omega_1)}\right] > 0 \tag{24}$$

Substituting back into (23), the result is that:

$$\begin{aligned}
\left[\frac{P(2|\omega_1)}{P(1|\omega_1)}\right]\left[FP(2|\pi_f) - FP(2|\overline{\pi})\right] \quad &+ \quad \left[P(2|1, x_f)FP(2|\pi_f) - P(2|1, \overline{x})FP(2|\overline{\pi})\right] \\
&< \quad F^*(r_1)\left[P(2|1, x_f) - P(2|1, \overline{x})\right] \qquad (25)
\end{aligned}$$

Reversing the process by which Equation (23) was derived from (22) we obtain:

$$FP(1|\pi_f)P(1|\omega_1, x_f) + FP(2|\pi_f)P(2|\omega_1, x_f) \quad > \quad FP(1|\overline{\pi})P(1|\omega_2, \overline{x}) + FP(2|\overline{\pi})P(2|\omega_2, \overline{x}) \tag{26}$$

that is, the type with private signal ω_1 would then strictly prefer to defect to x_f. Therefore, under the Universal Divinity criterion, only the lowest ω-type actually is believed to be at the off-equilibrium premium π_f, i.e., the equilibrium of Proposition 2 is the only one that meets the divinity off-equilibrium test.

□

When $L \geq 3$, the uniqueness of the equilibrium in meeting the divinity test can be established if the equilibrium funding probabilities have the following characteristic:

Assumption 2 (Inferences and Quality)
Let $\vec{\nu}$, $\vec{\mu}$ denote investor beliefs where $\nu_k > \mu_k$ for every k. That is, under $\vec{\nu}$, investors believe that every firm chooses a higher quality than under $\vec{\mu}$. Then investors are more discriminating under $\vec{\nu}$ than under $\vec{\mu}$ in the following sense: for any two reports $j \geq k$ the inferred returns satisfy:

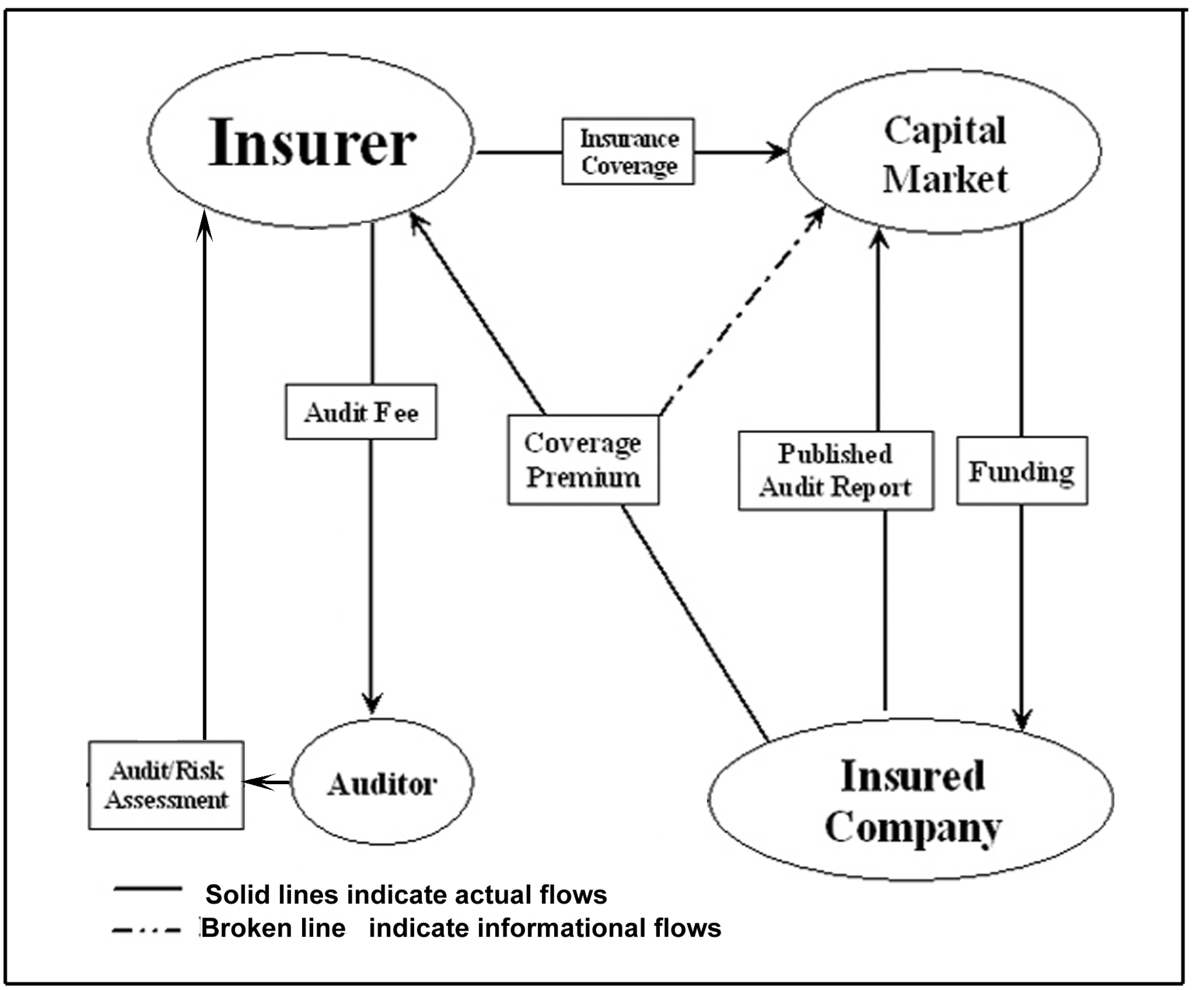
$$E[r|j,\vec{\nu}] - E[r|k,\vec{\nu}] > E[r|j,\vec{\mu}] - E[r|k,\vec{\mu}] \tag{27}$$

The condition in Equation 27 states that under beliefs of uniformly lower quality, the inferred rates of return change less sharply in the report. In other words, if investors believe that FSQ of every firm is lower, they place less reliance on financial reports. This is an intuitive economic condition and ought to hold quite generally. However, the derivation of (27) from the information structure of Assumption 1 presents technical difficulties.

Appendix 2: Description of the FSI Process

Financial statements insurance (FSI) is a market mechanism that can bring about significant changes in the structure and incentives of the auditing profession in such a way as to align auditors' and managers' incentives with those of shareholders and ensure better quality audits and better quality financial statements.

The FSI process begins with companies that choose to purchase financial statement insurance that provide coverage against losses suffered as a result of omissions and misrepresentation (O and M) in the financial reports. Companies desiring such insurance will solicit from insurance carriers in the year prior (year t-1) insurance coverage for their shareholders against losses caused by O and M in financial statements that occur during the covered year (year t). The carriers would engage an underwriting reviewer (that could be either an independent organization or the external auditor) who would assess the risk of O and M by examining the soliciting companies' internal controls, management incentive structures, the competitive environment, the history of past O and M, past earnings surprises and the market's responses to such surprises, etc. Detailed underwriting review reports would be the basis for the carriers' decisions on whether to offer coverage, the maximum amount of such coverage, and the associated required premium, or they may offer a schedule of coverage amounts and premia. The process is depicted in the diagram below.



Based on the insurance offers received, managers would put up in their proxies for shareholders' voting their own recommendation for buying FSI coverage at a given amount and premium (including zero coverage – no insurance). After the vote, the shareholders' approved coverage and premium (including the case of zero coverage) would be publicized, becoming common knowledge. Companies that opt for zero coverage and companies that chose not to solicit FSI coverage would revert to the existing regime under which they would hire an external auditor who opines on their statements. Companies whose shareholders approved insurance coverage would then select an external auditor from a list of audit firms approved by their chosen insurance carrier. The selected external auditor would be hired and paid by the carrier. Audit firms would also be rated by an independent organization (likely the same as the one that conducted the underwriting review). The selected external auditor would coordinate the audit plan with the underwriting reviewer to adopt it to the findings of the review. Eventually, the insurance coverage would become effective only if the auditor issues an unqualified opinion on year ts financial statements (sometime in year $t+1$). If the opinion is not unqualified there would be no coverage, or else, the policy terms would be renegotiated. In either case (no coverage or renegotiated coverage and premium) the renegotiated terms would be publicized. For companies with effective coverage, shareholders' claims for recovery, within the limits of the policies, for losses caused by omissions and misrepresentations that occurred during the covered year would be settled through an expedited judiciary process. A judiciary body, agreed upon in advance by both the insured and the insurer, would submit the claims upon the detection of O and M, hire the necessary experts to estimate the damages, and agree on a settlement within the policy limits with the carrier; the latter may hire its own experts to analyze the damages.