

# Fair Disclosure and Investor Asymmetric Awareness in Stock Markets

Zhen Liu <sup>†</sup>

November 13, 2008

*JEL Classification:* D61, G14, G38, K22, L51, D8, M4

*Keywords:* Regulation Fair Disclosure, Information Disclosure, Fair Disclosure, Conference Call, Selective Disclosure, Unawareness, Asymmetric Awareness

---

<sup>†</sup>Email: [zl24@buffalo.edu](mailto:zl24@buffalo.edu). Telephone: (240) 481-7294. Address: Department of Economics, University at Buffalo, Amherst, Buffalo, NY 14260, USA.

## **Abstract**

The U.S. Security and Exchange Commission implemented Regulation Fair Disclosure in 2000. The regulator aims to reduce information asymmetry among investors, and expects public forums to subsume the forbidden information channel of selective forums. We show that even with cooperative managers and effective technology, current public forums is problematic if participants have asymmetric awareness. Namely, when a participant is aware of more uncertainties than are other participants, with zero incentives to share the insights, he would search information privately rather than raising questions in public forums. This causes inefficient information production compared to “unfair” selective disclosure. Since asymmetric awareness is assumed away in rational expectations models, these models cannot justify the value of insightful questions. Nevertheless, using a standard quote-driven market model, we can compare the effect of the regulation on the price behavior and investors’ welfare when awareness is either symmetric or asymmetric, and derive detailed implications. Empirical predictions are presented and they can match some intriguing empirical findings. Finally, we discuss the regulator’s consideration on investor awareness.

# 1 Introduction

In October 2000, the U.S. Securities and Exchange Commission ratified *Regulation Fair Disclosure* (henceforth *the regulation*), also commonly referred to as Reg FD. This ruling requires that when public companies disclose material information to securities market professionals or shareholders, they must make it available to the general public *simultaneously* (for intentional disclosures), or *promptly* (for non-intentional disclosures). Given effective modern technology, the regulator encourages managers to use public forums to subsume the forbidden information channel of selective forums.

In this paper we consider the regulation as requiring firms only to disclose information at public forums where all investors can participate and make inquiries. This disclosure form is referred to as fair disclosure, in contrast to selective disclosure, where only some professionals participate.

At first glance, fair disclosure seems the best remedy for the information asymmetry caused by selective disclosure, without sacrificing the availability of high quality information. However, practitioners have argued that the regulation has produced some undesirable side effects: 1. The ambiguous definition of material information makes issuers reluctant to provide “immaterial” information in private.<sup>1</sup> 2. Professionals may be unable to obtain information because of ineffective technology utilized in public communications.<sup>2</sup> 3. Professionals “with the most perception, intuition, or experience”<sup>3</sup> are not willing to share their insights with other investors under fair disclosure, so that less information can be revealed.

We explore the third argument more in depth because this argument was less understood and less emphasized in both theory and practice. In particular, the superior knowledge of professionals may imply either that uninformed small investors are just unable to acquire the information and are aware of their ignorance, or that they are totally unaware of such

---

<sup>1</sup>For one detailed example of opinions on this issue, see “Regulation FD - An Enforcement Perspective” - Remarks of Richard H. Walker, Director, Division of Enforcement, before the Compliance & Legal Division of the Securities Industry Association, New York, November 1,2000. Source link: <http://www.sec.gov/news/speech/spch415.htm>.

<sup>2</sup>In August 2000, only 41.5 % of households had Internet access. The SEC has been revising the rule to ease the communications as the use of the Internet is growing.

<sup>3</sup>Words from the comment of the Association for Investment Management and Research to SEC regarding the regulation. Source link: <http://www.cfainstitute.org/centre/issues/comment/2000/00disclosure.html>.

information. The main result of our analysis shows that the two assumptions lead to different implications on the quality and cost of information, the market price, and the welfare of investors. To isolate this argument from the other two arguments, we assume that the issuer has to answer questions equally sincerely under both disclosure forms, and that the technology used in public communications is effective.

The following thought experiment illustrates the main intuition. There is a teacher conducting a question-and-answer review session before an examination. Some students are able to find answers to all possible questions while some others are not. If the latter are aware of the questions, they will ask the teacher for answers. Then the answers will be shared by all the students and no extra effort is needed. However, if they are unaware of some questions, they cannot raise relevant questions. If the able students know this, rather than asking the teacher what the answers are, they would make extra efforts to find the answers privately, in order to retain a competitive advantage.

Similar situations take place at public forums. Stock analysis requires massive information regarding so many uncertainties that, even for experts, a complete risk identification is unrealistic. Investors may thus be different in not only the amount of information they own, but also the uncertainties they are aware of.

Generally, investors are unaware of some information in two ways. First, they may not know of the existence of the information/uncertainty (this is what “unawareness” literally means). Second, they may be unable to incorporate the information into their decision making—for instance, a layman may know a technical term but cannot properly implement it. In this connection, we invite readers to note the following comments of the Financial Accounting Standards Board and the International Accounting Standards Board<sup>4</sup>.

Also, many users may incorporate the available financial reporting information into their decision processes and may not be aware of other pertinent information that financial reports could include. Those users may not be able to determine

---

<sup>4</sup>See Paragraph QC9 in *The Concept Framework of Financial Reporting: Objective of Financial Reporting and Qualitative Characteristics of Decision-Useful Financial Reporting Information*. Source link: [http://www.fasb.org/draft/pv\\_conceptual\\_framework.pdf](http://www.fasb.org/draft/pv_conceptual_framework.pdf)

how, or even whether, such additional information would affect their decisions until the information becomes available and they have had the opportunity to incorporate it into their decision-making processes. Also, some users may have easier access to sources of information outside general purpose financial reports than do others. Accordingly, standard setters cannot rely entirely on users to request or identify all of the information that is capable of making a difference in a decision.

Compared with small investors, financial professionals have significantly more resources and incentives to acquire both information and awareness. Our first major assumption is that small investors are unaware of some relevant uncertainties that professionals are aware of, and professionals know it. This is widely observed and empirically verified by the literature on small investors' behavior.<sup>5</sup> We also assume that at public forums, when professionals ask critical questions, small investors are able to know as much as professionals know. The potential free rider problem certainly reduces the incentives of professionals to ask critical questions.

Before discussing our model, we invite readers to note a comment by one of the professionals six months after the regulation was implemented<sup>6</sup>:

... analysts, even if given an opportunity to ask all of his or her questions in a public forum, will not do so; at least buy side analysts will not do so. And this reflects the fact that the very questions posed by insightful, well-prepared and skilled analysts have value. At times, I would submit, even greater value than any particular answer that a company executive may provide.<sup>7</sup>

We use a quote-driven-market trade model, following Copeland and Galai (1983) and Glosten and Milgrom (1985). There are many small investors, one professional, and many

---

<sup>5</sup>For instance, Malmendier and Shanthikumar (2007) find empirical evidences suggesting that small traders fail to account for the distortion in analyst stock recommendations, while large traders do not.

<sup>6</sup>Comment by Eric Roiter, Sr., VP/General Counsel, Fidelity Management & Research, in Regulation FD Roundtable, on April 24, 2001. Source link: <http://www.sec.gov/news/studies/regfdconf.txt.ds>.

<sup>7</sup>A stock analyst we met at the 2007 American Accounting Association Annual Meeting in Chicago told us that analysts were already very cautious about raising critical questions in the pre-FD period at private forums, and the regulation just made the situation worse.

market makers. Small investors expect to trade upon a potential liquidity shock, while the professional trades on his private information. Market makers set prices and execute orders. Since uninformed market makers are aware of the private information of the professional, their prices reflect the information asymmetry and increase small investors' transaction costs. We allow pre-trade information acquisition. The professional has several means to collect information at various costs. He can always privately acquire information at a fixed cost of information; or, under selective disclosure, he can enter selective forums at another fixed cost; or, under fair disclosure, he can enter public forums at no cost. Small investors can only acquire information under fair disclosure at public forums.

Under selective disclosure, if the professional finds entering selective forums profitable, he will acquire the high quality information at a cost. Because the information is private, the market makers have to use distorted market prices to protect themselves.

When small investors are aware of all relevant questions that the firm is willing to answer, under fair disclosure, they can use public forums to acquire all information. There will be no information asymmetry and the market prices are not distorted. Small investors' losses from trade is zero; so is the professional's profit.

When small investors are not fully aware, under fair disclosure, they can still ask the questions that they are aware of. The professional cannot profit from asking other questions. If the speculative profit is higher than the information cost, he privately acquires information. The market prices will be distorted. The loss of small investors is positive, though it could be reduced as the information asymmetry is lower. If the professional finds it not profitable to privately acquire information, the high quality information will not be produced. The market prices are not distorted by information asymmetry; the loss of small investors is zero.

The reduction of information asymmetry and the improvement of small investors' welfare are true under either awareness assumptions. This supports the primary concern of the regulator. However, the high quality information is only produced at a higher cost or not produced at all, even if the managers are cooperative and the communication technologies are effective. While the regulation could improve the allocative efficiency when small investors

become more confident, it could also worsen the information asymmetry between the firm managers and the stock market as a whole<sup>8</sup>. Understanding the incentives of professionals and how awareness works should contribute to improving the regulation.

We identify three factors for underproduction of high quality information: a high cost of private information production; a low cost of using selective forums; a small number of shares available for the professional to trade. We emphasize that existing models of information disclosure already find that these factors cause low information production, but they do not consider the effect of introducing public forums as a costless information channel.

Then, we find the three factors may explain several interesting empirical findings by Gomes, Gorton and Madureira (2007), Ahmed and Schneible (2007), Jorion, Liu and Shi (2005), and Mohanram and Sunder (2006). They find that the regulation has different impacts on firms different in size, financial information complexity, and number of analyst following in the pre-FD period.

The remainder of this paper is organized as follows. In Section 2 we discuss related literature. In Section 3 we introduce unawareness and main assumptions. In Section 4 we first present the basic model with preliminary results, then analyze the symmetric awareness case and the asymmetric awareness case. In both cases, we analyze selective disclosure before fair disclosure. In Section 5, we discuss the implications on the cost and benefit, the empirical findings, and the policies of the regulation. Conclusions are in Section 6. All proofs are collected in the Appendix.

## 2 Related Literature

The idea of awareness is actually not entirely new in Financial Economics literature. Merton (1987) analyzes a capital market model with an behavioral assumption that, some investors only know a subset of the available securities and these subsets are different across investors.

The investors use only the securities they know to construct their optimal portfolios. Merton

---

<sup>8</sup>Kanodia (2007) suggests that resource allocation is affected more by the information asymmetry between firm managers and the capital market as a whole, than by the information asymmetry among traders or investors in the capital market.

(1987) also assumes that the quality of information about all individual securities are all the same to all investors who know the securities. Therefore, the results of the model essentially depend on asymmetric awareness about the existence of securities rather than asymmetric information about each security. Abreu and Brunnermeier (2003) study a stock market where less sophisticated traders are unaware of the possibility of burst.

The literature on the theory of information disclosure in financial markets is extensive. The standard paradigm assumes fully aware and rational agents (see Verrecchia, 2001; Dye, 2001). Retaining rational agents, we model asymmetric awareness in a way consistent with the standard paradigm. In the literature on information disclosure in auctions, Milgrom and Weber (1982) find the conditions under which the value of information to a bidder when other bidders are aware of the information production, is greater or less than when others are unaware. In addition, this literature usually focuses on the issuer who makes decisions regarding voluntary or mandatory disclosures (Boot and Thakor, 2001). Our paper complements it by emphasizing the incentives of investors in requesting certain information disclosures.

Our modeling of information structure is based on the literature of formal models of unawareness, which include Li (2006), Heifetz et al. (2006), and Heifetz et al. (2007).

Among the research on Reg FD, many papers<sup>9</sup> empirically test the effects of the regulation. Although it is a consensus that in the post-FD period information asymmetry is smaller, the findings are mixed on the overall quality of the information disclosed by public firms. In Section 5, we will discuss cross-sectional findings which are most relevant to this paper. Theoretical analyzes are few. Arya, Glover, Mittendorf and Narayanamoorthy (2005) show that with fair disclosure, certain arrangements of disclosure timing can cause information cascades, which in turn may heighten herding among analysts and leave investors worse off.

---

<sup>9</sup>The following list of these papers is not meant to be complete: Soffer and Zhang (2001), Straser (2002), Sunder (2002), Zitzewitz (2002), Bailey et al. (2003), Heflin et al. (2003a), Irani and Karamanou (2003), Bushee et al. (2004), Carnaghan and Sivakumar (2004), Irani (2004), Gadarowski and Sinha (2005), Griffin et al. (2005), Agrawal et al. (2006), Ferreira and Smith (2006), Francis et al. (2006), Ke et al. (2006), Sidhu et al. (2006), Heflin et al. (2003b).

### 3 Unawareness: General definition and assumptions

Denote the set of the states of the world by  $\mathbf{S}$ . The information technology determines all available or imaginable signals (for example, financial reports, news paper articles, the CFO's tone of voice, etc.), which form a set  $S \equiv \{S_b\}_{b \in B}$ ,  $B$  being the index set of all signals.

When some information is available to an agent, we say the agent receives a message  $\tau$  as a set of signals.<sup>10</sup> At state  $s \in \mathbf{S}$ , the realization of message  $\tau$  is given by  $\tau(s)$ . Essentially, every message  $\tau$  is an information partition of  $\mathbf{S}$ .

Let some agents have limited knowledge about the information technology. Therefore they are only aware of a subset of  $S$ , namely  $S' \equiv \{S_b\}_{b \in B'}$ ,  $B' \subset B$ . For such agents, a message is a subset of  $S'$ . Consequently, their decisions do not depend on any information conveyed by any signal  $S_b$ ,  $b \in B \setminus B'$ , no matter who receives it.

The definition of unawareness is concise and consistent with the definitions in game theory literature. To use it in our particular context, we need three working assumptions. First, observing a message with fewer signals is equivalent to using a coarser information partition. Hence, we assume that if an agent is unaware of some signals available to the other agent, then he believes the other agent is using an information partition coarser than the real one. Second, an agent unaware of some signals cannot phrase inquiries about the realization of such signals. Third, once he hears about the message revealing such signals, he becomes aware and understands the information conveyed.

## 4 A trade model with information production

### 4.1 Time Line

There are a measure one of competitive small investors  $U$ , a professional investor  $I$ , and competitive market makers  $M$ . They are risk neutral and rational. There is also a firm being a passive information provider. For simplicity we assume every small investor is endowed with one share of stock, and the professional is endowed with  $k$  shares, or is able to borrow up to

---

<sup>10</sup>The convention is to use “signal” for information. We can certainly swap “message” with “signal” but that might cause confusion, as in English, “signals” are more primitive than “messages”.

$k$  shares. These facts are common knowledge to all agents.

The game has three periods. In the first period, investors produce information. The professional can privately acquire information from sources other than the firm; he can also use selective forums under selective disclosure, or use public forums under fair disclosure. Small investors can only acquire information at public forums under fair disclosure. Market makers cannot produce private information.

In the second period, investors trade in a quote-driven-market as in Copeland and Galai (1983) and Glosten and Milgrom (1985). Small investors may experience a negative liquidity shock with probability  $q \in (0, 1)$ ; when it happens, they sell their shares at the market price. The professional sells only when he believes that the stock is overvalued. The market makers commit to buy all shares and quote an ask price  $\lambda > 0$  before trade orders are submitted. As trades are anonymous, the professional's information is not revealed to the market makers.

In the last period, the stocks are liquidized and the game ends.

## 4.2 Information structure and information technology

Following the definition of unawareness in Section 3, we use four different partitions of state space  $\mathbf{S}$  to describe the information structure:

- $\bar{\tau}$  represents the finest information that the firm has and the professional and market makers are aware of.
- $\tau^h$  represents the information that the firm is willing to provide in either selective or public forums, and that the professional can privately produce; it is coarser than  $\bar{\tau}$ .
- $\tau^l$  represents the information that small investors are aware of. It is coarser than  $\tau^h$  when small investors have less awareness, otherwise it can be any information partition not coarser than  $\tau^h$ .
- $\tau^0$  represents a null message with no information.

To wit, the firm, the market makers and the professional have full awareness. The firm knows the best information  $\bar{\tau}$ , the professional is aware of it and can produce the high quality

information  $\tau^h$ . Small investors are only aware of the low quality information  $\tau^l$ , and *believe all other agents are also*. As a result, only small investors do not know the real game. This is the asymmetric awareness case. The symmetric awareness case is a special case when all agents know the real game, or when  $\tau^l$  is not coarser than  $\tau^h$ .

Let the underlying uncertainty be governed by a cumulative distribution function,  $F \in \Delta(V \times \mathbf{S})$ , where  $V \subset R_+$  is the set of the stock's liquidation values. Define marginal distribution  $P(s) \equiv F_V(s)$  and assume that at least every high quality message  $\tau^h(s)$  happens with a positive probability. We assume, before trade happens, all agents' posterior beliefs are consistent with  $F$ . Namely, given state  $s$ , when an agent observes message  $\tau(s)$ , his belief is  $F(v|s) = \frac{\int_{\bar{s} \in \tau(s)} dF(v, \bar{s})}{\int_{\bar{s} \in \tau(s)} dP(\bar{s})}$ .<sup>11</sup>

Denote the private information acquired by the professional by  $\tau^I$ , and the public information that small investors and market makers have by  $\tau^U$ . For simplicity, we assume that for the professional to produce information  $\tau^h$  or  $\tau^l$ , there is a fixed cost  $C_s$  associated with selective disclosure (such as the cost of building a relationship with the firm) and a fixed cost  $C_p$  associated with private acquisition. Under fair disclosure, the information provided by the firm is public and free.

### 4.3 Equilibrium in the trading period and comparative statics

The professional's interim expected profit from trade is

$$E_{\tau^I}(\pi_I|s) := r(\lambda(s) - E_{\tau^I}(v|s)), \quad (4.1)$$

where  $r \in [0, k]$  is the size of his order and  $E_{\tau^I}(v|s) = \int_V v dF(v|\tau^I(s))$ . The market price  $\lambda(s)$  is contingent on public information. We have the following fact.

**Fact 1.** *Given  $\lambda(s)$  and  $\tau^I$ , the optimal trade rule of the professional is a function of  $s$ ,  $\lambda(s)$ ,*

---

<sup>11</sup>The common prior assumption separates the effect of asymmetric awareness from the effect of heterogeneous prior beliefs. However, readers shall not use one of the regular interpretations of Bayesian players that agents ex-ante know  $F$  and  $\mathbf{S}$ . This is because to describe them one needs full awareness, which is nonsense if we allow small investors to be unaware.

and  $\tau^I$ .

$$r(s; \lambda(s), \tau^I) = \begin{cases} k & \text{if } E_{\tau^I}(v|s) < \lambda(s), \\ 0 & \text{if else.} \end{cases}$$

Define the probability distribution of the professional's evaluation, conditional on the public information, by

$$G(x|\tau^U(s)) \equiv \Pr(E_{\tau^I}(v|s') \leq x | s' \in \tau^U(s)).$$

Assuming  $G(x|\tau^U(s))$  is differentiable, the professional's interim expected profit conditional on public information  $\tau^U$  is:

$$E_{\tau^U}(\pi_I|s) = k \int_0^{\lambda(s)} [\lambda(s) - x] dG(x|\tau^U(s)).$$

By integration by parts, it can be further simplified as

$$E_{\tau^U}(\pi_I|s) = k \int_0^{\lambda(s)} G(x|\tau^U(s)) dx \tag{4.2}$$

We use this expression to prove the following in the Appendix.

**Lemma 1.** *The following is true for the profit function  $[E_{\tau^U}(\pi_I|s)](\tau^I, \lambda(s))$  for every  $s \in \mathbf{S}$ :*

- i It is continuous and increases in  $\lambda(s)$ .*
- ii It increases in  $k$ .*
- iii It increases when  $\tau^I$  becomes finer.*

At every state, the market makers' expected aggregate profit is:

$$E_{\tau^U}(\pi_M|s) := q[E_{\tau^U}(v|s) - \lambda(s)] - E_{\tau^U}(\pi_I|s). \tag{4.3}$$

Because the market makers are competitive, equilibrium prices are given by the highest ones which satisfy the zero expected profit condition. The optimal pricing rule of the market

makers is given by

$$\lambda(s; \tau^U, \tau^I) = \max \left\{ \lambda \geq 0 \left| q[E_{\tau^U}(v|s) - \lambda] - E_{\tau^U}(\pi_I|s) = 0 \right. \right\}. \quad (4.4)$$

We prove the following Lemma in the Appendix.

**Lemma 2.** *The following is true for the optimal pricing rule  $\lambda(s; \tau^U, \tau^I)$  for every  $s \in \mathbf{S}$ :*

- i It exists and is unique.*
- ii It decreases when  $\tau^I$  becomes finer.*

When public information becomes finer, even if it is still coarser than the professional's private information, the information asymmetry between the professional and other agents is lower. It might cause the professional's gain from trade to drop. We show a sufficient condition under which the finer public information causes the average market price increase and the professional's trade profit decrease.

**Assumption 1.** *Given any public information partition  $\tau$ , and all  $t \in \tau$ , the professional's posterior beliefs conditional on  $t$ ,  $G(\cdot|t)$ , can be ordered by first-order stochastic dominance (FOSD).*

This assumption means that the public's valuation is correlated with the professional's valuation. It further implies the following monotone comparative statics.

**Lemma 3.** *If Assumption 1 holds, when the market makers use information  $\tau$ , the corresponding equilibrium prices are decreasing in  $t \in \tau$  with respect to the order of first order stochastic dominance. That is, if  $G(\cdot|t_1)$  first-order stochastically dominates  $G(\cdot|t_2)$ , then corresponding prices  $\lambda_1 \leq \lambda_2$ .*

The proof is in the Appendix. The next result shows that the average market price increases as public information becomes finer. The proof is also in the Appendix.

**Lemma 4.** *If Assumption 1 holds, when the public information improves so that  $\tau$  is finer than  $\tau'$ , then for all  $t \in \tau$  and  $t' \in \tau'$  the equilibrium market price satisfies the following:*

$$\lambda(t') \leq E(\lambda(t)|t').$$

By Fact 1 and Lemma 2, given information  $\tau^U$  and  $\tau^I$ , in the trading period, a unique pure strategy equilibrium  $(\lambda(s; \tau^U, \tau^I), r(s; \tau^U, \tau^I))_{s \in S}$  exists. The equilibrium *ex ante* expected profit of the professional is

$$\Pi_I(k, \tau^U, \tau^I) = \int_{\mathbf{S}} dP(s) \int_0^{\lambda(s; \tau^U, \tau^I)} kG(x|\tau^U(s))dx. \quad (4.5)$$

We conclude by the below proposition. The proof is in the Appendix.

**Proposition 1.** *The ex ante expected profit of the professional increases in  $k$  and  $\tau^I$ . It decreases when  $\tau^U$  becomes finer if Assumption 1 holds.*

#### 4.4 Symmetric awareness

Small investors are aware of the high quality information. First consider selective disclosure. Because there is no public information, namely  $\tau^U = \tau^0$ , expected profit is constant,  $E_{\tau^U}(\pi_I|s) = \Pi_I$  for all  $s \in S$ ; the stock price is also constant. Denote the price by  $\lambda_1(\tau^I) \equiv [E(\lambda)](\tau^0, \tau^I)$ . Equilibrium condition 4.4 implies that

$$q(E(v) - \lambda_1(\tau^I)) = \Pi_I.$$

By Proposition 1, the professional's profit is maximized when  $\tau^I = \tau^h$ . In the information acquisition period, the professional can produce  $\tau^h$  either through selective forums with cost  $C_s$  or through private acquisition with cost  $C_p$ . This implies the following.

**Proposition 2.** *Under selective disclosure, in equilibrium, if  $q(E(v) - \lambda_1(\tau^h)) > \min\{C_s, C_p\}$ , the professional acquires the high quality information, the market price discounts the expected value of the stock, and the cost of information is  $\min\{C_s, C_p\}$ ; otherwise, the high quality*

information is not produced and the market price equals the expected value of the stock.

Now consider fair disclosure. Small investors' expected profit is

$$\pi_U := qE(\lambda) - qE(v). \quad (4.6)$$

Since small investors have costless access to public forums, by requesting information  $\tau^h$ , small investors can completely eliminate information asymmetry. The market price is then equal to the expected value of the stock and small investors break even. In the Appendix, we prove the following.

**Proposition 3.** *Under fair disclosure, if  $q(E(v) - \lambda_1(\tau^h)) > C_p$ , for small investors, requesting the high quality information dominates any other strategies; otherwise all strategies are equally good.*

*In the equilibria where they use this strategy, the high quality information is made public without cost. Otherwise, no high quality information is produced. In both cases, the cost of information is zero and the market price equals the expected value of the stock.*

By Propositions 2 and 3, we conclude as follows.

**Theorem 1.** *Suppose awareness is symmetric. Implementing fair disclosure reduces the cost of the high quality information for all agents. The market price is less distorted by information asymmetry. The loss of small investors decreases.*

## 4.5 Asymmetric awareness

Small investors are only aware of the low quality information  $\tau^l$ . For small investors, the game is similar to the one in the previous section, except that the professional's information cannot be  $\tau^h$ . Small investors also believe that market makers share the same view.

Given the above, first consider selective disclosure. Small investors anticipate that the expected price is  $\lambda_1(\tau^l)$  as defined before. When he professional acquires information  $\tau^l$ , his speculative profit is  $q(E(v) - \lambda_1(\tau^l))$ . If it is greater than the information cost  $\min\{C_s, C_p\}$ , small investors believe that the professional collects  $\tau^l$  in equilibrium.

**Proposition 4.** *Small investors mistakenly believe the following: if  $q(E(v) - \lambda(\tau^l)) > \min\{C_s, C_p\}$ , the professional acquires information  $\tau^l$ , the market price discounts the expected value of the stock accordingly; otherwise, the high quality information is not produced and the market price equals the expected value of the stock.*

In reality, if  $q(E(v) - \lambda_1(\tau^h)) > \min\{C_s, C_p\}$ , the professional may produce the high quality information in equilibrium. Indeed, under selective disclosure the level of awareness of small investors does not affect the decision of the professional.

**Proposition 5.** *Under selective disclosures, the equilibrium outcome about the professional's information production and the market price are identical to those stated in Proposition 2.*

Suppose fair disclosure is implemented. By an argument similar to the proof of Proposition 3, for small investors, requesting the disclosure of the low quality information is better than or equivalent to not requesting. If the professional privately acquires the high quality information, the market price is  $\lambda(s; \tau^l, \tau^h)$ , with its expectation denoted by  $[E(\lambda)](\tau^l, \tau^h)$ . The professional's *ex ante* expected speculative profit is

$$q[E(v) - [E(\lambda)](\tau^l, \tau^h)]. \quad (4.7)$$

We state the following results. The proof of the first claim is similar to the one of Proposition 3. The second claim follows Lemma 2 and 4. The third claim follows Proposition 1.

**Proposition 6.** *Under fair disclosure, for small investors, requesting the low quality information dominates any other strategies if  $q(E(v) - \lambda_1(\tau^l)) > C_p$ , otherwise all strategies are equally good. If they use this strategy in equilibrium, then*

1. *The low quality information is made public without cost.*
2. *If  $q[E(v) - [E(\lambda)](\tau^l, \tau^h)] > C_p$ , then the professional privately produces the high quality information at cost  $C_p$ . The market price discounts the stock's value. Otherwise, the professional may request public disclosure of the low quality information, but he is equally better off. The market price equals the stock's expected value.*

3. *If Assumption 1 holds and the professional acquires private information, then the expected market price rises, the professional's ex ante expected speculative profit decreases, and the real loss of small investors decreases.*

Compare Propositions 5 and 6. The sufficient condition for the professional to produce the high quality information, under selective disclosure, is  $q(E(v) - \lambda_1(\tau^h)) > \min\{C_s, C_p\}$ , and under fair disclosure, is  $q[E(v) - [E(\lambda)](\tau^l, \tau^h)] > C_p$  if  $\tau^l$  is disclosed, or  $q(E(v) - \lambda_1(\tau^h)) > C_p$  if otherwise.

The implications are, first, to have the high quality information produced, the cost under fair disclosure is not lower in general, and is higher if  $C_s < C_p$ . Second, as the professional's expected speculative profit could be lower under fair disclosure than under selective disclosure, the high quality information is less likely to be produced under selective disclosure.

**Theorem 2.** *Suppose awareness is asymmetric. Under fair disclosure, low quality public information is more likely to be produced, but the high quality information  $\tau^h$  is less likely to be produced if Assumption 1 holds.*

*When the high quality information is produced, the cost of information is not lower than that under selective disclosure, and higher if the cost of selective forums is lower than that of private acquisition.*

#### 4.6 Discussion: overconfidence and unawareness

In our model, the unaware small investors underestimate the private information of the professional. Similar ideas are seen in models with overconfident agents whose posterior beliefs overweight private information and underweight public information (Barucci, 2003). Our model can be considered as an alternate way of modeling overconfidence about information. It would be both interesting and challenging to show the essential relationship between two different models.

## 5 Implications

### 5.1 The overall cost and benefit of the regulation

Small investors' expected profit is

$$\pi_U := q(E(\lambda) - E(v)). \quad (5.1)$$

When small investors are aware of the high quality information, the market price equals the value of stock under fair disclosure. When small investors are only aware of the low quality information, they *expect* that the market price equals the value of stock under fair disclosure. Hence, the regulation improves small investors' confidence. Other things being equal, they are more likely to invest in a primary market. This is certainly good news for stock issuers. If small investors are the major source of funds, then the cost of capital is reduced and the overall allocative efficiency of the stock market is improved.<sup>12</sup> Although the *real* profits of small investors can still be negative, if Assumption 1 holds, the losses are also reduced under fair disclosure.

Nonetheless, while the low quality information is made public at no cost, the regulation does not carefully consider the incentive of the professional investor and increases the cost of producing high quality information, or prevents the production. This creates an inefficiency of information production. Also, when the high quality information is not produced, the information asymmetry between firms and markets increases. According to Kanodia (2007), it is more undesirable:

The real effects perspective, that I have illustrated suggests that the key information asymmetry that affects resource allocation in the economy is the information asymmetry between the firm managers and the capital market as a whole rather than asymmetries among individual traders in the capital market.

---

<sup>12</sup>We formally show this point in the previous version of this paper.

## 5.2 Empirical implications

We summarize the empirical implications of the model with asymmetric awareness, relating them to the existing evidence.

A few factors increase the chance that a professional who produces high quality information under selective disclosure does not do so under fair disclosure. They are:

1. A high cost of private information production;
2. A low cost of using selective forums;
3. A small quantity of shares available for the professional to trade.

All of these factors vary among public firms. The first factor is related to firms with less informative financial statements and less media coverage, or complex business models. The second factor is related to firms which prefer closed conference calls in the pre-FD period, and according to Bushee et al. (2003), such firms have lower number of share holders, higher institutional ownership, higher analyst following, lower average share turnover and higher intangible assets. The third factor is related to firms with small market capitalization or small size.

Our results help to understand a set of empirical findings. Gomes et al. (2007) report that, 1. On average, small firms lost 17 percent of their analyst following while big firms increased theirs by 7 percent. In addition, small firms experienced higher forecast errors and volatility at earnings announcement, while no significant increases occurred for big firms.<sup>13</sup> 2. More complex firms (using intangible assets as a proxy for complexity) overall were more adversely affected than less complex firms. Regardless of size, more complex firms suffered a significantly larger loss of analyst following.<sup>14</sup> This finding is explained by Factors 1, 2 and 3.

Ahmed and Schneible (2007) find that the regulation worsened the information quality of average investors for some firms (particularly small, high tech firms), by observing greater stock price reactions to earnings announcements in the post-FD period. Their argument is

---

<sup>13</sup>Survey data also support this finding: The ABA FD Task Force Survey, which surveyed securities attorneys about their clients' practices, reports that FD had bigger impact on small and midsize companies rather than large companies. Source link: <http://www.sec.gov/news/studies/regfdconf.txt>.

<sup>14</sup>The authors did not find satisfactory explanations and suggested that "Our cross-sectional results suggest that Reg FD had unintended consequences and that 'information' in financial markets may be more complicated than current finance theory admits."

that greater reactions are driven by more informative earnings announcements, which implies worse information available prior to the announcement. This finding is explained by Factors 1 and 3.

The regulation still grants credit rating agencies access to selective forums. Jorion et al. (2005) find that the information effect of upgrades and downgrades of the agencies in the post-FD period is much larger, especially for firms with greater analyst following and larger firms. Mohanram and Sunder (2006) find that: In the post-FD period analysts *reduce* coverage for well followed firms, and *increase* coverage of firms that were less followed prior to the regulation. These findings are explained by Factor 2.

Note that some of the findings are mixed, e.g., both large (well followed) firms and small (less followed) firms may cause the loss of information production. It is possible that one factor dominates the other for the samples used in these papers. We leave this issue to future research.

### 5.3 Policy implications

In practice, the regulator actually does not completely ignore the possibility that sophisticated investors can acquire information that other investors are unaware of. The former Chairman of the SEC, Arthur Levitt, said in Levitt (2002):

Nor does FD prevent the smart analyst from seeking, or a company from providing, nonmaterial information that helps the analyst piece together a mosaic that, when completed, is material.

Following this argument, Mr. Levitt presented an example that at a conference call a smart analyst asks a question on nonmaterial information, which “does not reveal much of anything to other people”, but “to the analyst who has done his homework, it can be highly revealing.”

This implies that Mr. Levitt seems to believe that other participants cannot fully understand the information conveyed by the answers or at least the analyst who asks the question believes so. Clearly, this is the opposite of our assumption that small investors can fully

understand the questions and answers. It will of course need further investigation to show which assumption is more valid.

However, in the same article when Mr. Levitt discusses how small investors can use public conferences, he seems to agree on our assumption:

When investors listen in, they are often rewarded for their effort. They hear for themselves how well managers field tough questions—even the tone of a CEO’s voice can tell you something.

It is difficult to argue whether one needs great awareness or sophistication to interpret the CEO’s tone of voice, but generally speaking, a better interpretation can only be made by a more sophisticated mind. Indeed, we note that the regulation makes exclusions for credit rating agencies (Jorion et al., 2005), and one-on-one meetings on immaterial information between analysts and executives. In the light of our theory, these actions certainly remedy the inefficiency of information production.

Finally, awareness has value. If small investors’ awareness increases, more public information can be produced via fair disclosure. With new technology, there could be an industry producing both information and awareness for all investors. The rise of independent chartered financial analysts and well organized financial websites and blogs (such as SeekingAlpha.com) may be such examples.

## 6 Conclusive remarks

Our model is not without restrictions. In order to avoid the interaction of rational expectations and unawareness, i.e., the situation when market prices reveal information to *surprise* unaware traders, we use a quote-driven-market model, rather than using an order-driven-market model, and assume small investors are liquidity traders.

The cost structure of information production is made utterly simple. For example, we assume the private production costs of both the high quality information and the low quality information are equal. This is possible but not always true.

Some extensions may be worth future study. Firstly, we can consider the agency issue by introducing managers as imperfect agents and analyze how managers may exploit the awareness asymmetry. Secondly, as the regulation is mainly targeted at financial analysts, we may use the framework to analyze analysts' behavior and welfare, for example, sophisticated and experienced analysts may gain while other analysts may lose from the regulation. Thirdly, our framework may be used to analyze more specific rules of conference calls and other disclosure policies.

## A Proofs

### Proof of Lemma 1.

**i. and ii.** The results follow by observing Expression 4.2.

**iii.** Suppose  $\tau_2^I$  is finer than  $\tau^I$ . The corresponding probability distributions, conditional on public message  $\tau^U$ , of the professional's valuation are  $G_2(x|\tau^U(s))$  and  $G(x|\tau^U(s))$ . Because  $E(E(v|s, \tau_2^I)|\tau^I) = E(v|s, \tau^I)$ ,  $G_2(x|\tau^U(s))$  is a mean preserving spread of the distribution of  $G(x|\tau^U(s))$ .

This implies that  $G_2(x|\tau^U(s))$  second-order stochastically dominates  $G(x|\tau^U(s))$  and

$$\int_0^{\lambda(s)} G_2(x|\tau^U(s))dx \geq \int_0^{\lambda(s)} G(x|\tau^U(s))dx,$$

for all  $\lambda(s) \geq 0$ .<sup>15</sup> By Expression 4.2, the result follows.

**QED.**

### Proof of Lemma 2.

**i.** Define function  $f(\lambda) \equiv q[E_{\tau^U}(v|s) - \lambda] - E_{\tau^U}(\pi_I|s)$ .

---

<sup>15</sup>This follows Proposition 6.D.2 in Colell et al. (1995).

First,  $f(\lambda)$  is continuous in  $\lambda$  by the first claim of Lemma 1. Second, if  $\lambda = 0$ , then  $E_{\tau^U}(\pi_I|s) = 0$ , and

$$f(0) = qE_{\tau^U}(v|s) \geq 0.$$

If  $\lambda = E_{\tau^U}(v|s)$ ,

$$f(E_{\tau^U}(v|s)) = -E_{\tau^U}(\pi_I|s) \leq 0.$$

By Intermediate Value Theorem, there is at least one  $\lambda \in [0, E_{\tau^U}(v|s)]$  such that  $f(\lambda) = 0$ . Hence, the pricing rule  $\lambda(s; \tau^U, \tau^I)$  exists. Since  $E_{\tau^U}(\pi_I|s)$  increases in  $\lambda$ ,  $f(\lambda)$  also *strictly* decreases in  $\lambda$ ; this implies the uniqueness.

**ii.** To show that  $\lambda(s; \tau^U, \tau^I)$  decreases when  $\tau^I$  becomes finer, we use contradiction. Suppose  $\lambda(s; \tau^U, \tau^I)$  increases instead. Then equilibrium condition 4.4,

$$q[E_{\tau^U}(v|s) - \lambda] = E_{\tau^U}(\pi_I|s),$$

cannot hold, as when  $\tau^I$  becomes finer the RHS increases but the LHS decreases.

**QED.**

**Proof of Lemma 3.** By the properties of FOSD, if  $G(\cdot|t_1)$  first-order stochastically dominates  $G(\cdot|t_2)$ , then  $\int_0^\infty x dG(x|t_1) \geq \int_0^\infty x dG(x|t_2)$ , or

$$E(v|t_1) \geq E(v|t_2).$$

It also implies that  $G(x|t_1) \leq G(x|t_2)$ ,  $\forall x \geq 0$ ; therefore

$$\int_0^\lambda G(x|t_1) dx \leq \int_0^\lambda G(x|t_2) dx.$$

Recall Function 4.3 and Function 4.2; if  $\lambda_1$  is the equilibrium price at  $t_1$ , then by Condition 4.4,

$$q[E(v|t_1) - \lambda_1] - k \int_0^{\lambda_1} G(x|t_1) dx = 0.$$

Suppose  $\lambda_1 < \lambda_2$ ; we must have

$$q[E(v|t_2) - \lambda_2] - k \int_0^{\lambda_2} G(x|t_2)dx < q[E(v|t_1) - \lambda_1] - k \int_0^{\lambda_1} G(x|t_1)dx = 0.$$

It contradicts that  $\lambda_2$  is the equilibrium price at  $t_2$ . Therefore,  $\lambda_1 \leq \lambda_2$ .

**QED.**

**Proof of Lemma 4.**

Using Function 4.3 and Function 4.2, if  $\lambda(t)$  is the equilibrium price at  $t$ , then by Condition 4.4,

$$q[E(v|t) - \lambda(t)] - k \int_0^{\lambda(t)} G(x|t)dx = 0.$$

Integrating the LHS of the equation about  $t$  with conditional probability  $P(t|t')$ , we have

$$q[E(v|t') - E(\lambda(t)|t')] - k \int dP(t|t') \int_0^{\lambda(t)} G(x|t)dx = 0.$$

For the equilibrium price  $\lambda(t')$ , by Condition 4.4,

$$q[E(v|t') - \lambda(t')] - k \int_0^{\lambda(t')} G(x|t')dx = 0.$$

Suppose  $E(\lambda(t)|t') < \lambda(t')$ , then the above two equations imply that

$$\int dP(t|t') \int_0^{\lambda(t)} G(x|t)dx > \int_0^{\lambda(t')} G(x|t')dx.$$

However, note that

$$\begin{aligned}
& \int dP(t|t') \int_0^{\lambda(t)} G(x|t)dx - \int_0^{\lambda(t')} G(x|t')dx \\
&= \int dP(t|t') \int_{\lambda(t')}^{\lambda(t)} G(x|t)dx \\
&\leq \int [\lambda(t) - \lambda(t')] G(\lambda(t')|t) dP(t|t') \\
&\leq \int [\lambda(t) - \lambda(t')] dP(t|t') \int G(\lambda(t')|t) dP(t|t') \\
&= (E(\lambda(t)|t') - \lambda(t')) \int G(\lambda(t')|t) dP(t|t') \\
&< 0.
\end{aligned}$$

The first inequality is true because function  $G(x|t)$  increases in  $x$ .

The second inequality follows by identifying that the integration form satisfies the condition of one version of Chebyshev's integral inequality as follows <sup>16</sup>

**Theorem 4.** *Let  $g, h : [a, b] \rightarrow \mathbb{R}$  and  $F : [a, b] \rightarrow [0, 1]$  be a distribution function. Suppose that  $g$  is decreasing and  $h$  is increasing, then*

$$\int_a^b g(t)h(t)dF(t) \leq \int_a^b g(t)dF(t) \int_a^b h(t)dF(t).$$

It suffices to show that function  $h(t) := [\lambda(t) - \lambda(t')]$  and  $g(t) := G(\lambda(t')|t)$  can be ordered in opposite directions. To see this, note that by Assumption 1, distributions  $G(\cdot|t)$  can be ordered by first-order stochastic dominance. Therefore, as  $\lambda(t')$  is a constant, by Lemma 3,  $[\lambda(t) - \lambda(t')]$  can be ranked by an order, and  $G(\lambda(t')|t)$  can be ranked by the opposite order.

The last inequality comes from the assumption that  $E(\lambda(t)|t') < \lambda(t')$ . This completes

---

<sup>16</sup>The version we use is tailored for our application. The original version appears at (Wagener, 2006) as follows:

**Theorem 3.** *Let  $g, h : [a, b] \rightarrow \mathbb{R}$  and  $F : [a, b] \rightarrow [0, 1]$  be a distribution function. Suppose that  $g$  is monotonically increasing. Define  $H_F : (a, b) \rightarrow \mathbb{R}$ ,  $H_F(t) = \int_a^t h(s)dF(s) / \int_a^t dF(s)$ . If*

$$H_F(t) \leq H_F(b)$$

for all  $t \in (a, b)$ , then

$$\int_a^b g(t)h(t)dF(t) \geq \int_a^b g(t)dF(t) \int_a^b h(t)dF(t).$$

the proof.

**QED.**

**Proof of Proposition 1.**

The second claim of Lemma 1 leads to the monotonicity in  $k$ .

When  $\tau^I$  becomes finer, by the second claim of Lemma 2, the equilibrium market price increases. Then Function 4.5 increases.

Given Assumption 1, when  $\tau^U$  becomes finer, by Lemma 4, the market makers make less profit from small investors' liquidity trade. By Condition 4.4, the professional's profit decreases.

**QED.**

**Proof of Proposition 3.** If small investors do not request the disclosure of the high quality information and  $q(E(v) - \lambda_1(\tau^h)) > C_p$ , then the professional will acquire the high quality information and trade, small investors' make a loss. Suppose small investors request the disclosure of the high quality information, the market makers know  $\tau^h$ . At every  $s$ , the market makers' interim expected aggregate profit is

$$\begin{aligned} E_{\tau^h}(\pi_M|s) &= q(E_{\tau^h}(v|s) - \lambda) + r(E_{\tau^h}(v|s) - \lambda) \\ &= (q + r)(E_{\tau^h}(v|s) - \lambda). \end{aligned}$$

Condition 4.4 implies in equilibrium  $\lambda_e(s) = E_{\tau^h}(v|s)$ . Therefore, the professional will not trade and the price is not discounted. For small investors, the ex ante profit is maximized at 0.

If  $q(E(v) - \lambda_1(\tau^h)) \leq C_p$ , small investors expect no private information acquisition whether they request the disclosure. As information is symmetric, the professional does not trade and the price is not discounted. Their ex ante profit is also 0.

**QED.**

## References

- Abreu, Dilip and Markus K. Brunnermeier**, “Bubbles and Crashes,” *Econometrica*, 2003, *71* (1), 173–204.
- Agrawal, Anup, Sahiba Chadha, and Mark A. Chen**, “Who is Afraid of Reg FD? The Behavior and Performance of Sell-Side Analysts Following the SEC’s Fair Disclosure Rules,” *Journal of Business*, November 2006, *79* (6).
- Ahmed, Anwer S. and Richard A. Schneible**, “The impact of regulation Fair Disclosure on investors’ prior information quality - Evidence from an Analysis of Changes in Trading Volume and Stock Price Reactions to Earnings Announcements,” *Journal of Corporate Finance*, June 2007, *13*, 282–299.
- Arya, Anil, Jonathan Glover, Brian Mittendorf, and Ganapathi Narayanamoorthy**, “Unintended Consequences of Regulating Disclosures: The Case of Regulation Fair Disclosure,” *Journal of Accounting and Public Policy*, 2005, *24*, 243–252.
- Bailey, Warren, Haitao Li, Connie X. Mao, and Rui Zhong**, “Regulation Fair Disclosure and Earnings Information: Market, Analyst, and Corporate Responses,” *Journal of Finance*, 2003, *58* (6), 2487–2514.
- Barucci, Emilio**, *Financial Markets Theory*, Springer, 2003.
- Boot, Arnoud W. A. and Anjan V. Thakor**, “The Many Faces of Information Disclosure,” *Review of Financial Studies*, 2001, *14* (4), 1021–1057.
- Bushee, Brian, Dawn Matsumoto, and Gregory Miller**, “Open versus closed conference calls: the determinants and effects of broadening access to disclosure,” *Journal of Accounting and Economics*, 2003, *34*, 149–180.
- Bushee, Brian J., Dawn A. Matsumoto, and Gregory S. Miller**, “Managerial and Investor Responses to Disclosure Regulation: The Case of Reg FD and Conference Calls,” *The Accounting Review*, July 2004, *79* (3), 617–643.

- Carnaghan, Carla and Ranjini Sivakumar**, “The Effects of Regulation Fair Disclosure on Management Forecasts,” 2004.
- Colell, Andreu M., Michael D. Whinston, and Jerry R. Green**, *Microeconomic Theory*, Oxford, 1995.
- Copeland, Thomas E. and Dan Galai**, “Information Effects on the Bid-Ask Spread,” *The Journal of Finance*, December 1983, *38*, 1457–1469.
- Dye, Ronald A.**, “An Evaluation of “Essays on Disclosure” and the Disclosure Literature in Accounting,” *Journal of Accounting and Economics*, 2001, *32*, 181–235.
- Ferreira, Eurico J. and Stanley D. Smith**, “The Effect of Regulation FD on Analysts Recommendations,” *Financial Analysts Journal*, May 2006, *62* (3), 44–57.
- Francis, Jennifer, Dhananjay Nanda, and Xin Wang**, “Re-examining the Effects of Regulation Fair Disclosure Using Foreign Listed Firms to Control for Concurrent Shocks,” *Journal of Accounting and Economics*, 2006, *41* (3), 271–292.
- Gadarowski, Christopher and Praveen Sinha**, “On the Efficacy of Regulation Fair Disclosure: Theory & Evidence,” April 2005.
- Glosten, Lawrence and Paul Milgrom**, “Bid, Ask and Transaction Prices in a Specialist Market with Heterogeneously Informed Traders,” *Journal of Financial Economics*, 1985, *14*, 71–100.
- Gomes, Armando R., Gary Gorton, and Leonardo Madureira**, “SEC Regulation Fair Disclosure, Information, and the Cost of Capital,” *Journal of Corporate Finance*, June 2007, *13*, 300–334.
- Griffin, Paul A., David H. Lont, and Benjamin Segal**, “Regulation Fair Disclosure: An Analysis of SEC Enforcement Action,” 2005.

- Heflin, Frank, K. R. Subramanyam, and Yuan Zhang**, “Regulation FD and the Financial Information Environment: Early Evidence,” *Accounting Review*, January 2003, 78 (1), 1–37.
- , – , and – , “Stock Return Volatility Before and After Regulation FD,” 2003.
- Heifetz, Aviad, Martin Meier, and Burkhard C. Schipper**, “Interactive Unawareness,” *Journal of Economic Theory*, September 2006, 130 (1), 78–94.
- , – , and – , “Unawareness, beliefs, and games,” 2007.
- Irani, Afshad J.**, “The Effect of Regulation Fair Disclosure on the Relevance of Conference Calls to Financial Analysts,” *Review of Quantitative Finance and Accounting*, 2004, 22 (1), 15–28.
- and **Irene Karamanou**, “Regulation Fair Disclosure, Analyst Following and Analyst Forecast Dispersion,” *Accounting Horizons*, March 2003, 17 (1), 15–29.
- Jorion, Philippe, Zhu Liu, and Charles Shi**, “Informational Effects of Regulation FD: Evidence from Rating Agencies,” *Journal of Financial Economics*, May February00May 2005, 76, 309–330.
- Kanodia, Chandra**, *Accounting Disclosure and Real Effects*, Now Publishers Inc, 2007.
- Ke, Bin, Kathy Petroni, and Yong Yu**, “Did Regulation FD Limit Institutional Investors’ Ability to Predict the Future? An Analysis of Transient Institutional Investors’ Trading Behavior before a Break in a String of Consecutive Earnings Increases,” April 2006.
- Levitt, Arthur**, *Take On the Street: What Wall Street and Corporate America Don’t Want You to Know*, 1st ed., Pantheon, 2002.
- Li, Jing**, “Information Structures with Unawareness,” 2006.
- Malmendier, Ulrike M. and Devin M. Shanthikumar**, “Are Small Investors Naive about Incentives?,” *Journal of Financial Economics*, August 2007, 85, 457–489.

- Merton, Robert C.**, “A Simple Model of Capital Market Equilibrium with Incomplete Information,” *Journal of Finance*, June 1987, *42*, 483–510.
- Milgrom, Paul and Robert J. Weber**, “The Value of Information in A Sealed-bid Auction,” *Journal of Mathematical Economics*, 1982, *10*, 105–114.
- Mohanram, Partha and Shyam V. Sunder**, “How Has Regulation Fair Disclosure Affected the Functioning of Financial Analysts?,” *Contemporary Accounting Research*, 2006, *23* (2), 491–525.
- Sidhu, Baljit, Tom Smith, and Robert E. Whaley**, “Regulation Fair Disclosure and the Cost of Adverse Selection,” May 2006.
- Soffer, Leonard C. and Huai Zhang**, “The Role of Security Analysts and its Implications for Regulation FD,” April 2001.
- Straser, Vesna**, “Regulation Fair Disclosure and Information Asymmetry,” March 2002.
- Sunder, Shyam V.**, “Investor Access to Conference Call Disclosures: Impact of Regulation Fair Disclosure on Information Asymmetry,” April 2002.
- Verrecchia, Robert E.**, “Essays on disclosure,” *Journal of Accounting and Economics*, 2001, *32*, 97–180.
- Wagner, Andreas**, “Chebyshev’s Algebraic Inequality and Comparative Statics under Uncertainty,” *Mathematical Social Sciences*, 2006, *52*, 217–221.
- Zitzewitz, Eric**, “Regulation Fair Disclosure and the Private Information of Analysts,” April 2002.