Discretionary Disclosure
Verrecchia (1983)

Christina Zhu

Winter 2015

ACCT 611

January 12, 2015
Discretion in Disclosing Information

- Manager decides to release or withhold information (signal about true liquidating value of asset) based on the information’s effect on the asset’s market price.
- Discretion is in the threshold of information quality above which he discloses what he observes, below which he withholds the information.
- Rational expectations model.
- Result comes from the cost of disclosure.

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Verrecchia (1983)
Dyer and McHugh (1975), Patell and Wolfson (1982)

- Proprietary cost could decrease over time. As cost decreases, threshold of disclosure decreases. This could link the results of this paper to empirical findings.
- The manager could also be delaying the reporting of bad news because he hopes that some good news will occur to offset the bad news
Delays in Reporting Accounting Numbers

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Theoretical Work on Disclosure

- Reconciling theoretical results with empirical findings, Verrecchia introduces the concept of disclosure cost. With a cost of zero, his result is the same as Grossman’s and Milgrom’s

Reconciling theoretical results with empirical findings, Verrecchia introduces the concept of disclosure cost. With a cost of zero, his result is the same as Grossman’s and Milgrom’s.
What is Disclosure Cost?

- Cost associated with disclosing information that may be proprietary in nature. Information could be useful to competitors, shareholders, employees, etc. in a way that may be harmful to a firm’s prospects.
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Assumed to be independent of the signal
Cost Introduces Noise into the Model

If information is withheld, traders are unsure if it was withheld because:

- the information represents bad news
- the information represents good news, but not sufficiently good news to warrant incurring the cost

[Verrecchia (1983)]
Two principal actors: manager of a risky asset and traders, whose expectations determine a price for the risky asset

1. Manager is endowed with a signal about the true liquidating value of the risky asset
2. Manager makes disclosure decision based on the information’s effect on the price of the risky asset
3. Traders form expectations, determining a price for the asset
4. Risky asset is liquidated
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Verrecchia (1983)
- Traders’ prior beliefs about liquidating value $\tilde{u}$: $\tilde{u} \sim N(y_0, \frac{1}{h_0})$
  - Manager’s signal $\tilde{y} = \tilde{u} + \tilde{\epsilon}$
    - $\tilde{\epsilon} \sim N(0, \frac{1}{s})$ is noise

- $P(\Omega) = \frac{E[\tilde{u}|\Omega] - \beta(\text{var}[\tilde{u}|\Omega])}{1+r_F}$
- $\beta$ is a continuous, non-negative, non-decreasing function
- $r_F$ assumed to be 0
- Manager’s objective is to maximize $P$
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If the manager discloses information, the liquidating value of the risky asset is reduced by the proprietary cost $c$.

When a manager discloses what he observes:

$$P(\tilde{y} = y) = E[(\tilde{u} - c)|\tilde{y} = y] - \beta(var[\tilde{u} | \tilde{y} = y])$$

When a manager withholds information, the realization $y = \tilde{y}$ is below some point $x$:

$$P(\tilde{y} = y \leq x) = E[\tilde{u} | \tilde{y} = y \leq x] - \beta(var[\tilde{u} | \tilde{y} = y \leq x])$$
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- $P(\tilde{y} = y \leq x) = E[\tilde{u}|\tilde{y} = y \leq x] - \beta(var[\tilde{u}|\tilde{y} = y \leq x])$
Threshold level of disclosure is a point $x \in \mathbb{R}$ such that the manager withholds $\tilde{y} = y$ whenever $y \leq x$ and discloses it otherwise.

Disclosure equilibrium is a threshold level of disclosure $\hat{x} \in \mathbb{R}$ satisfying:

1. Choice of $\hat{x}$ maximizes the price of the risky asset for every observation $\tilde{y} = y$
2. When a manager withholds information, traders conjecture that the manager’s observation $\tilde{y} = y$ has the property $y \leq \hat{x}$

Christina Zhu, Verrecchia (1983)
Preliminaries

- \( P(\tilde{y} = y) = y_0 - c + \frac{s}{h_0+s} (y - y_0) - \beta\left(\frac{1}{h_0+s}\right) \)
- \( P(\tilde{y} = y \leq x) = y_0 - \frac{h_0^{-1} g(x)}{G(x)} - \beta(k(x)) \)
  
  \[ g(x) = \frac{1}{\sqrt{2\pi}} \sqrt{\frac{sh_0}{h_0+s}} \exp\left(-\frac{1}{2} \frac{sh_0}{h_0+s} (x - y_0)^2\right) \]
  \[ G(x) = \int_{-\infty}^{x} g(t) dt \]
  \[ k(x) = h_0^{-1} - \frac{s}{h_0+s} (x - y_0) \frac{h_0^{-1} g(x)}{G(x)} - \left[ \frac{h_0^{-1} g(x)}{G(x)} \right]^2 \]
When Information is Withheld

- \( E(\tilde{u} | \tilde{y} = y \leq x) = y_0 - \frac{h_0^{-1}g(x)}{G(x)} \)
  - \( -\frac{h_0^{-1}g(x)}{G(x)} \) is an increasing function of \( x \)
  - \( -\frac{h_0^{-1}g(x)}{G(x)} \) approaches \(-\infty\) as \( x \) approaches \(-\infty\) and 0 and as \( x \) approaches \( \infty \)
- \( \lim_{x \to -\infty} E(\tilde{u} | \tilde{y} = y \leq x) = -\infty \)
- \( \lim_{x \to \infty} E(\tilde{u} | \tilde{y} = y \leq x) = y_0 \)
When Information is Withheld (cont’d)

- \( \text{var}(\tilde{u}|\tilde{y} = y \leq x) = k(x) = \)
  
  \[
  h_0^{-1} - \frac{s}{h_0+s} (x-y_0) \frac{h_0^{-1}g(x)}{G(x)} - \left[ \frac{h_0^{-1}g(x)}{G(x)} \right]^2
  \]

  - increasing function of \( x \)
  - approaches \( \frac{1}{h_0+s} \) as \( x \) approaches \(-\infty\) and \( \frac{1}{h_0} \) and as \( x \) approaches \( \infty \)

- When information is withheld, the conditional variance of \( \tilde{u} \) increases as the threshold level \( x \) increases
Lemma

- \( \frac{1}{h_0+s} \leq k(x) \leq \frac{1}{h_0} \)
- \( k'(x) > 0 \)
- \( \lim_{x \to -\infty} k(x) = \frac{1}{h_0+s} \)
- \( \lim_{x \to -\infty} k(x) = \frac{1}{h_0} \)
- \( \frac{d}{dx} \left\{ \frac{h_0^{-1}g(x)}{G(x)} \right\} = h_0(k(x) - \frac{1}{h_0}) \)
Disclosure equilibrium is a threshold level of disclosure $\hat{x} \in \mathbb{R}$ satisfying:

1. Choice of $\hat{x}$ maximizes the price of the risky asset for every observation $\tilde{y} = y$
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Determining the Threshold

- Manager withholds information whenever
  \[ P(\tilde{y} = y) \leq P(\tilde{y} = y \leq x) \]
- \[ y \leq y_0 + \left[ \frac{h_0 + s}{s} \right] \left[ c - \frac{h_0^{-1}g(x)}{G(x)} + \beta\left(\frac{1}{h_0+s}\right) - \beta(k(x)) \right] \]
- Traders infer that \( y \leq x \) when the manager withholds information
- \[ \hat{x} = y_0 + \left[ \frac{h_0 + s}{s} \right] \left[ c - \frac{h_0^{-1}g(x)}{G(x)} + \beta\left(\frac{1}{h_0+s}\right) - \beta(k(x)) \right] \]

Theorem

There exists a unique discretionary disclosure equilibrium whenever the proprietary cost is positive

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Proof of Theorem

- Prove existence of \( \hat{x} \in \mathbb{R} \) such that \( F(\hat{x}) = c \)

\[
F(x) = \frac{s}{h_0+s}(x - y_0) + \frac{h_0^{-1}g(x)}{G(x)} + \beta(k(x)) - \beta(\frac{1}{h_0+s})
\]

1. \( F(x) \) is non-negative
2. \( F(x) \) is increasing
3. \( \lim_{x \to -\infty} F(x) = 0 \)
4. \( \lim_{x \to \infty} F(x) = \infty \)

- There exists a unique, finite, real-valued \( \hat{x} \) such that \( F(\hat{x}) = c \)
Examples

- When $c = 0$, the threshold $x$ is $-\infty$ (manager always discloses what he observes)
- Proprietary costs that are not constant: $c(y) = \alpha |y - y_0| + c_0$

Corollary

The threshold level is an increasing function of the proprietary cost

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