Accounting Manipulation, Peer Pressure, and Internal Control

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2017 Tuck Workshop

September 8, 2017
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The empirical difficulty in identifying SOX’s benefits and costs for individual firms, let alone its externality, we provide one rationale for regulating firms’ internal control over financial reporting.
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Motivation (continued): peer pressure for manipulation

Ben Horowitz: "Once WorldCom started committing accounting fraud to prop up their numbers, all of the other telecoms had to either (a) commit accounting fraud to keep pace with WorldCom's blistering growth rate, or (b) be viewed as losers with severe consequences." Qwest and Global Crossing: accounting frauds. AT&T and Sprint: took ST actions at the expense of LT viability.
Motivation (continued): peer pressure for manipulation

- peer pressure for manipulation is often alleged

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strategic complementarity: manager $A$ manipulates more when he suspects that manager $B$ is more likely to manipulate
- we provide a rational explanation of peer pressure for manipulation in capital market
Contributions and related literatures

- peer pressure in other contexts
- externality of truthful disclosure and corporate governance
The model
Timeline

- two firms, indexed as $A$ and $B$
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- at date 2, investors observe $(r_A, r_B)$ and set stock price $P_i(r_A, r_B)$
- at date 3, payoffs are realized
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Payoffs

- firm value: \( V_i = s_i - C_i(m_i) - K_i(q_i) \)
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- firm type \( s_i \in \{1, 0\} \) with \( \Pr(s_i = 1) = \theta_i \)
- manager cares about short-term stock price and long-term value of his own firm

\[
U_i = \delta_i P_i + (1 - \delta_i) V_i
\]
Information structure

- correlation between $s_A$ and $s_B$: $\rho \in [-1, 1]$
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- $q_i$ is observable, while $m_i$ and $s_i$ are not
Definition of an equilibrium

A PBE (perfect Bayesian Equilibrium) is a set of decisions \((q_i^*, m_i^*(s_i), P_i^*(r_A, r_B))\) such that

- each is made to maximize respective objective functions;
- they are consistent with each other.
The Analysis with $\rho = 0$
Investors’ pricing at date 2

- upon receiving $r_A$, investors price the firm

$$P_A^*(r_A) = \theta_A(r_A) + (1 - \theta_A(r_A))(0 - C_A^*) - K_A(q_A)$$
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- investors use $r_A$ to update belief about $s_A$

$$\theta_A(1) \equiv \Pr(s_A = 1 | r_A = 1) = \frac{\theta_A}{\theta_A + (1 - \theta_A)\mu_A^*}.$$
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2. $\mu^*_A = 1$, $\theta_A(1) = \theta_A$
3. $\mu^*_A \in (0, 1)$, $\theta_A(1)$ is decreasing in $\mu^*_A$
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- manager has incentive to manipulate

\[ P_A^*(1) - P_A^*(0) = \theta_A(1)(1 + C_A^*) > 0 \]
Manager’s manipulation at date 1

- given investors’ conjecture $\mu_A^*$, manager’s FOC for $m_A$

\[ \delta_A \frac{\partial \mu_A}{\partial m_A} \theta_A (1)(1 + C_A^*) - (1 - \delta_A) C_A'(m_A) = 0 \]
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  - rational investors are not systematically fooled in equilibrium

- info asymmetry persists. Firms with $r_A = 1$ receives the same price $P_A (1)$

- info asymmetry increases in manipulation in our model
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The Analysis with $\rho \neq 0$
Investors’ pricing at date 2

- upon receiving $r_A$ and $r_B$, investors price the firm

$$P^*_A(r_A, r_B) = \theta_A(r_A, r_B) + (1 - \theta_A(r_A, r_B))(0 - C^*_A) - K_A(q_A).$$
Investors’ pricing at date 2

- upon receiving $r_A$ and $r_B$, investors price the firm
  \[ P_A^*(r_A, r_B) = \theta_A(r_A, r_B) + (1 - \theta_A(r_A, r_B))(0 - C^*_A) - K_A(q_A). \]

- investors use $r_A$ and $r_B$ to update belief about $s_A$
  \[ \theta_A(r_A, r_B) \equiv \Pr(s_A = 1|r_A, r_B). \]
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  - for both \( \rho \), impact of \( r_B \) moves towards 0 as \( \mu^*_B \) increases
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  - for both $\rho$, impact of $r_B$ moves towards 0 as $\mu^*_B$ increases

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$$P^*_A(1, r_B) - P^*_A(0, r_B) = \theta_A(1, r_B)(1 + C^*_A) > 0, \text{ for any } r_B$$
Manager’s manipulation at date 1

- given conjectures about $\mu^*_B$, manager A’s FOC for $m_A$:

$$\delta_A \frac{\partial \mu_A}{\partial m_A} W^A(\mu^*_B)(1 + C^*_A) - (1 - \delta_A) C'_A(m_A) = 0.$$
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- the key driver of manipulation: bad manager’s expectation about investors’ expectation averaged over $r_B$

$$W^A(\mu_B^*) \equiv E_{r_B}[\theta_A(1, r_B)| s_A = 0]$$
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- the key driver of manipulation: bad manager’s expectation about investors’ expectation averaged over $r_B$

$$W^A(\mu^*_B) \equiv E_{r_B}[\theta_A(1, r_B)|s_A = 0]$$

- Proposition 1: $\frac{\partial m_A^*}{\partial \mu_B^*} > 0$ for any interior $\mu_B^*$. 

The intuition of the peer pressure for manipulation

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- manager A knows his own firm’s value better than investors
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- manager $A$ knows his own firm’s value better than investors
- he can use this info advantage to forecast the impact of $\mu^*_B$ on $r_B$ better than investors
The intuition of the peer pressure for manipulation

- manipulation increases equilibrium information asymmetry
- manager $A$ knows his own firm’s value better than investors
- he can use this info advantage to forecast the impact of $\mu^*_B$ on $r_B$ better than investors
- he thus manipulates more to take advantage of investors’ pricing inaccuracy
An extreme example

- example: $\rho = 1$
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- suppose \( \mu_B^* > 0 \), then \( m_A^* > 0 \)
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  - without manipulation, \( r_B \) is perfectly informative about \( s_B \) and \( s_A \)
- suppose \( \mu^*_B > 0 \), then \( m^*_A > 0 \)
  - with manipulation, \( r_B \) is less informative about \( s_B \) and \( s_A \)
- the key is that manipulation reduces informativeness
Intuition for general cases

- investors’ expectation of $s_A$ conditional on $r_A = 1$ averaged over $r_B$
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Intuition for general cases

- investors’ expectation of $s_A$ conditional on $r_A = 1$ averaged over $r_B$

$$E_{r_B}[\theta_A(1, r_B)] = \theta_A(1, 0) + \Pr(r_B = 1| r_A = 1)[\theta_A(1, 1) - \theta_A(1, 0)]$$

- probability effect
- discounting effect
Intuition for general cases

- investors’ expectation of \( s_A \) conditional on \( r_A = 1 \) averaged over \( r_B \)

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E_{r_B}[\theta_A(1, r_B)] = \theta_A(1, 0) + \Pr(r_B = 1| r_A = 1)[\theta_A(1, 1) - \theta_A(1, 0)]
\]

- an increase in \( \mu^*_B \) has two effects
Intuition for general cases

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➤ probability effect

➤ discounting effect

➤ an increase in \( \mu^*_B \) has two effects

➤ the probability effect: \( r_B = 1 \) is more likely
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- probability effect
- discounting effect

» an increase in $\mu^*_B$ has two effects
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  » the discounting effect: investors discount $r_B = 1$ more
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  \item discounting effect
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Intuition for general cases (continued)

- the key driver of manipulation: bad manager’s expectation about investors’ expectation averaged over $r_B$
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$$\mathcal{W}^A(\mu_B^*) = \theta_A(1, 0) + \Pr(r_B = 1|s_A = 0)[\theta_A(1, 1) - \theta_A(1, 0)]$$
Intuition for general cases (continued)

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- manager and investors have different expectations about the distributions of $s_B$ and $r_B$
Intuition for general cases (continued)

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Intuition for general cases (continued)

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- $\rho < 0$: investors discount $r_B = 1$ too much because they overestimate the probability effect. Less confrontation.
The effect of internal control on manipulation

- the equilibrium externality effect (Proposition 2):
  \[
  \frac{\partial m^*_A(q_A, q_B)}{\partial q_A} < 0 \quad \text{and} \quad \frac{\partial m^*_B(q_B, q_A)}{\partial q_A} < 0.
  \]
The effect of internal control on manipulation

- the equilibrium externality effect (Proposition 2):
  \[ \frac{\partial m_A^*(q_A, q_B)}{\partial q_A} < 0 \text{ and } \frac{\partial m_B^*(q_B, q_A)}{\partial q_A} < 0. \]

- the amplification effect:

\[
\frac{dm_A^*}{dq_A} = \frac{\partial m_A(q_A, m_B^*)}{\partial q_A} \text{ direct effect} + \frac{\partial m_A(q_A, m_B^*)}{\partial m_B} \frac{\partial m_B^*}{\partial \mu_A^*} d\mu_A^* \text{ indirect effect}
\]
The private incentive for internal control

- the firm value at date 0:

\[ V_{A0}(q_A) = \theta_A - \Pr(s_A = 0)C_A(m_A^*) - K_A(q_A) \]
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- the firm’s FOC for \( q_A \):

\[ \frac{\partial V_{A0}}{\partial m_A^*} \frac{\partial m_A^*}{\partial q_A} - K'_A(q_A) = 0. \]
The social incentive for internal control

- are the privately optimal choices of internal control efficient from a social perspective?

Proposition 4: the privately optimal choices of internal control are not Pareto efficient. There exists a pair of internal control higher than the private choices that lead to a Pareto improvement. The intuition comes from the positive externality.
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there exists a pair of internal control higher than the private choices that lead to a Pareto improvement.

the intuition comes from the positive externality

\[
\frac{\partial V_{A0}}{\partial m_A^*} \frac{\partial m_A^*}{\partial q_A} + \frac{\partial V_{B0}}{\partial m_B^*} \frac{\partial m_B^*}{\partial q_A} - K_A'(q_A).
\]

Private Incentives + Positive Externality
The discussion

- a rationale for regulation internal control
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- comprehensive evaluation of regulation is complicated.
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- a rationale for regulation internal control
- comprehensive evaluation of regulation is complicated.
- disclosure v.s. internal control: underinvestment in internal control arises even though disclosure of internal control is perfect in our model.
The generality of the peer pressure result

- key driving force: manipulation reduces informativeness
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- **key driving force:** manipulation reduces informativeness
  - a continuous extension: peer pressure occurs if manipulation is assumed to reduce informativeness
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  - the manipulation decision is captured by a scaler, as opposed to a function
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- the advantage of the binary state-message space
  - manipulation degrades informativeness
  - the manipulation decision is captured by a scaler, as opposed to a function
  - the interaction of internal control and manipulation is transparent
Spillover vs peer pressure (strategic complementarity)

I spillover: firm A manipulates less when firm B is present.

I peer pressure: manager A manipulates less when he suspects manager B to manipulate less.

I spillover occurs if two firms' fundamentals are correlated.
I peer pressure occurs if two firms' fundamentals are correlated.

AND manipulation reduces informativeness.

I our model: both occur.
I Stein: spillover occurs but no peer pressure.

I peer pressure justifies regulation while spillover does not.
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Take-away

- a plausible mechanism of peer pressure for manipulation.
- peer pressure arises in capital market, regardless of the sign of correlation.
- firms under-invest in internal control, despite perfect disclosure.