Information Distortion, R&D, and Growth

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Motivation & Summary

- Reduced-form/survey/anecdotal evidence of earnings management
- What are the real implications?
- Firms can distort
  a. accounting variables (e.g., accruals) $\rightarrow$ no real effect
  b. real variables (e.g., R&D) $\rightarrow$ real effect
- **This paper:** estimate model with a. and b.
- Q1: Effect of earnings management?
  - (no a, no b) $\rightarrow$ (a, b)
  - R&D volatility $\uparrow$ 6 pp; firm value $\downarrow$ 13%
- Q2: Effect of perfect enforcement of accounting rules?
  - (a, b) $\rightarrow$ (no a, only b)
  - R&D volatility $\uparrow$ 0.5 pp; firm value $\downarrow$ 0.5%

Convex compensation

- Manager's payoff $= \theta_d D + \theta_o \max\{P - P_{-1}, 0\}$

  θ_d: stock ownership D: dividend

  θ_o: option ownership $P - P_{-1}$: stock price $-$ exercise price

- $\Rightarrow$ Incentive to increase stock price volatility $\rightarrow$ do so by increasing earnings volatility

  - Relies on assumption that investors' info set $= \{$current earnings$\}$

  - Other variables informative about firm value: past earnings, etc.

- How robust to more realistic info set? (computationally difficult...)

- One way to gauge how imperfect is information set: how predictable are stock returns using "public info" in simulated data?

Convex compensation

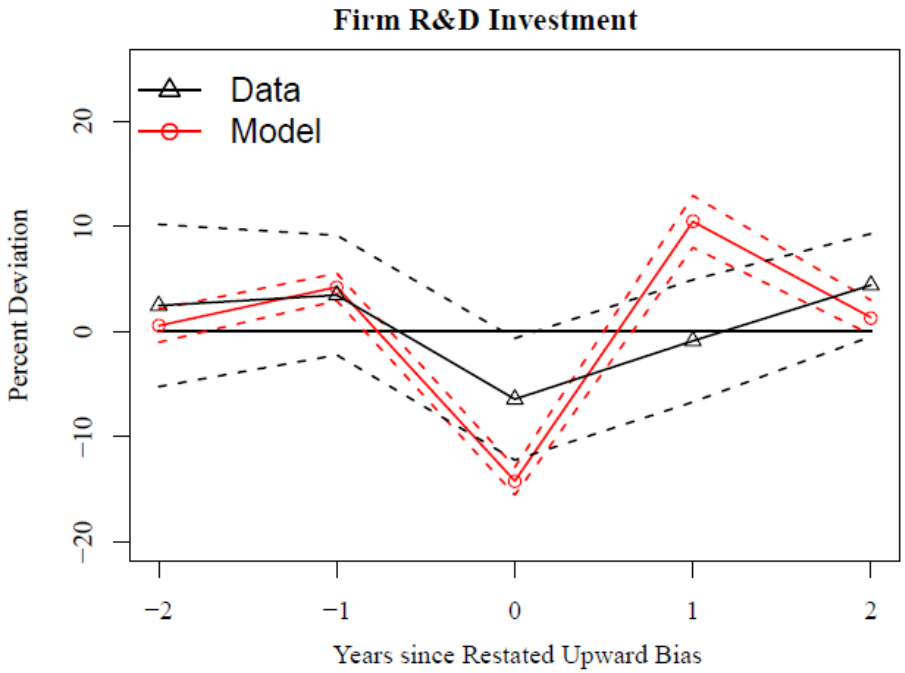
- Graham, Harvey, and Rajgopal (2005)

  "We survey and interview more than 400 executives to determine the factors that drive reported earnings and disclosure decisions. We find that managers would rather take economic actions that could have negative long-term consequences than make within-GAAP accounting choices to manage earnings. A surprising 78% of our sample admits to sacrificing long-term value **to smooth earnings**. *Managers also work to maintain predictability in earnings and financial disclosures. We also find that managers make voluntary disclosures to reduce information risk and boost stock price but at the same time, try to avoid setting disclosure precedents that will be difficult to maintain."*

- $\neq$ increase earnings volatility
  - Need to reconcile motivation/outcome of the model with literature

Convex vs. concave compensation

- Do they make different predictions regarding earnings manipulation?
- Same predictions
  1. Incentives to manipulate earnings
  2. Cov (R&D, Earnings bias) < 0
     - When incentives to increase earnings: R&D $\downarrow$ and earnings bias $\uparrow$
     - Consistent with data (although lack of rebound at $t = 1$ in data seems more consistent with smoothing)



Convex vs. concave compensation

- Do they make different predictions regarding earnings manipulation?

- Different predictions

  1. Opposite effects on R&D volatility and earnings volatility

     - Difficult to assess empirically

  2. With convex (concave) compensation: incentive to increase earnings when positive (negative) profit shock

     - Conjecture:

       Convex compensation: Cov(Earnings bias, Profit growth) > 0

       Concave compensation: Cov(Earnings bias, Profit growth) < 0

     - Can/should look at this moment

Convex vs. concave compensation

- Do they different implications for firm value?
  - Not obvious: incentives to distort real decisions in both cases
- Does observed Cov(R&D, Earnings bias) imply different firm value loss depending on nature of incentives to manipulate?
  - $\rightarrow$ Toy model

Toy model

- Firm value $V = I - \frac{1}{2}I^2 \quad \Rightarrow$ first best $I^* = 1$
- Manager's payoff $= V + \frac{\alpha}{2}\underbrace{(1 - I + B + \epsilon)^2}_{\text{earnings surprise}} - \frac{c}{2}B^2$

  I: investment $\qquad$ ϵ: earnings shock

  B: earnings bias $\qquad$ $\alpha \lessgtr 0$: convex vs. concave compensation
- FOC: $\qquad I = 1 - \frac{c\alpha}{c - \alpha(1+c)}\epsilon \qquad B = \frac{\alpha}{c - \alpha(1+c)}\epsilon$
- $Cov(I, B) = -\frac{c\alpha^2}{(c - \alpha(1+c))^2}\sigma_\epsilon^2 < 0, \quad \forall \alpha \lessgtr 0$
- $\mathbb{E}[V] = \frac{1}{2} - \frac{c^2\alpha^2}{2(c - \alpha(1+c))^2}\sigma_\epsilon^2 = \frac{1}{2} + \frac{c}{2}Cov(I, B)$ does not depend directly on $\alpha \Rightarrow Cov(I, B)$ is sufficient statistic for value loss (given c)

Cross-section of incentives

- Parameters driving manager compensation (stock ownership θ_d and option ownership θ_o) directly observed in data and vary across firms
- In the model, moments depend on $(\theta_d, \theta_o) \rightarrow$ more incentives to manipulate when θ_o/θ_d is high
- Which simulated moments depend significantly on θ_o/θ_d?
- Compare to (untargeted) data moments
  - Would be a stronger test of the model
  - (Caveat: compensation structure endogenous, but already applies to current SMM estimation)

(Cross-)elasticity of manipulation to cost of manipulation

- Counterfactual with perfect enforcement of accounting rule $\rightarrow$ no accounting manipulation $\rightarrow$ larger R&D distortion
- Because model has built-in substitutability between earnings manipulation through earnings bias and through R&D distortion
  - Additive convex costs
- Would like to see that data are consistent with this
  - Exploit change in cost of accounting manipulation (Sarbanes-Oxley, Dood-Frank)

    e.g., conditional on restatement, size of restatement is smaller and distortion in R&D in larger $\rightarrow$ informative about substitutability between accounting manipulation and R&D distortion

Misc.

- How can productivity shifting parameter (ξ) and price of R&D (p_w) be separately identified?
  - Define $E \equiv p_w W$
  - Endogenous quality grows at rate $\xi \left(\frac{W}{Q}\right)^{\gamma} = \frac{\xi}{p_w^{\gamma}} \left(\frac{E}{Q}\right)^{\gamma}$
  - Only $\frac{\xi}{p_w^{\gamma}}$ is identified?

- 24 targeted moment listed in the text vs. 17 moments reported in Table 3