How does accounting produce information?

A Two-step Representation of Accounting Measurement

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Defining features of accounting

1. Accounting provides info by measuring transactions with a set of rules and/or procedures
2. An example: revenue is recognized when cash is received.
3. Features of measurement rules:
   - rigid and discards information: iPhone announcement
   - vulnerable to manipulation: AT&T acquires NCR, lease, OBSF...

The measurement problem

1. A firm has engaged in a transaction.
   - McDonald's sold a Big Mac to customers with cash;
   - WalMart sold a sofa with a generous return policy;
   - Citi sold mortgages with liquidity supports and residual interests.
2. How to measure the transaction?
   - Who are the users? What aspects of the firm do they care?
   - Why not disclose everything? Why GAAP rules? Are they optimal?

Coffee production with spot markets

1. the setting: a farmer exerts efforts; harvest for sale; info provided; customers pay.
2. The role of info: accurate pricing makes farmers work harder
3. How to make pricing more accurate?
   - Disclosure: darkness, size, smell...
   - consider a grading rule: good bean if darkness $\geq D$
     1. admitted: darkness
     2. not admitted but admissible: size
     3. not admissible: smell
4. Farmers' manipulation and customers' inference
   - Window dressing: observable actions (painting, genetic engineering)
   - Frauds: unobservable actions (genetic engineering)
5. Grading is preferred only if manipulation is possible.

Coffee production with futures contract

1. the setting: a grade-contingent futures contract with Starbucks; effort; harvest; measurement; settlement.
2. The role of info: accurate measurement makes farmers work harder
3. How to produce more accurate grading?
   - disclosure is irrelevant
   - grading: good bean if darkness $\geq D$
4. Farmers' manipulation and inference
   - Window dressing: observable actions (painting, genetic engineering)
   - Frauds: unobservable actions (genetic engineering)
5. Grading is subject to transparent manipulation in equilibrium.

A unified representation

$$\text{Effort } (e) - \text{State } (\omega) - \text{Evidence } (t) - \text{Report } (r) - \text{Decision } (d)$$

1. Effort e : work harder
2. State ω : coffee bean quality or firm value
3. Evidence t : {darkness, size, smell...} or {cash receipt, product delivery,...}
4. Report r : grades or revenue recognition
5. Decision d : coffee price or equity price

Question one: the economic consequences of info

Effort (e) – State (ω) – **Black box** – Report (r) – Decision (d)

1. Given an info system, what is its economic consequences? What is the optimal info system?
2. $f(\omega, r; \gamma)$ is a blackbox.

An example of question one

Effort (e) – State (ω) – **Black box** – Report (r) – Decision (d)

1. Info system $f(\omega, r; \gamma)$ is indexed by γ :

$$r = \omega + \varepsilon, \varepsilon \tilde{} N(0, 1/\gamma), \omega \tilde{} N(0, 1/\alpha)$$

2. Decision $d^*(r)$ depends on r :

$$d^*(r) = E[\omega|r] \text{ if } v(d, \omega) = d\omega - \frac{k}{2}d^2$$

3. Efficiency $V(\gamma)$ depends on γ :

$$V(\gamma) = E[v(d^*, \omega)] - c\gamma = \frac{1}{2k}\frac{\gamma}{\alpha + \gamma}\frac{1}{\alpha} - c\gamma$$

4. Solve $\gamma^* = \gamma^*(\alpha, k, c)$

Question two: the supply of info through rules

Effort (e) – State (ω) – Evidence (t) – Report (r) – Decision (d)

1. How to design measurement rules to produce desirable γ^*?
   - "talks about" $f(\omega, r; \gamma)$
   - little formalization
2. Accounting uses rules to convert a transaction into a report, aiming to capture its economic substance as accurately as possible.
3. Definitional questions:
   1. What is an accounting rule?
   2. How does a rule relate a transaction's economic substance to a report?
   3. What are the major frictions in the process?
   4. What instruments does a rule designer control to influence γ?

Formalizing a two-step measurement framework

$$\text{Effort } (e) - \text{State } (\omega) - \text{Evidence } (t) - \text{Report } (r) - \text{Decision } (d)$$

- A two-step representation of accounting measurement:

$$r(\omega; \gamma) = f(\omega, t) \circ h(t, r)$$

1. $f(\omega, t)$: state ω manifests itself in evidence t
2. $h(t, r)$: A rule maps evidence t to report r

- Restriction: while the rule aims to measure the state as accurately as possible, it is restricted to be written on transaction characteristics.
- Two frictions in the process
  1. evidence is noise
  2. evidence can be manipulated

The main friction: evidence management (EM)

$$\text{effort } (e) - \underbrace{\text{state } (\omega) - \text{evidence}}_{\text{manager influence}} \underbrace{(t) - \text{report } (r)}_{\text{rule design}} - \text{decision } (d)$$

- Conflict of interest between users and manager
- Manager influences evidence distribution (without changing the state)
  - $\tilde{f}(t, \omega; \beta) = (1 - \beta) f^{\omega}(t) + \beta f^{G}(t)$
  - at a private cost of $C(\beta)$
- Frauds, real earnings management, rule arbitrage, accounting motivated transactions...

What do standard setters do?

1. A technical task: identify $f(\omega, t)$ and $d^*(r)$
2. A strategic task: choose instruments to counter EM
    1. Admissible transaction characteristics: darkness but not size
    2. Verification requirement: whether darkness painted
    3. Evidence threshold: $r = g$ iff $t \geq D$.

The central question

How to design instruments in the shadow of EM?

- Without EM, $r^*(t) = t$. Disclosure is the panacea
- With EM, $r^*(t) = t$ is in general not optimal.
- Even though rules are vulnerable to manipulation, rules are optimal only if manipulation exists.
- Does the reduced-form $f(\omega, r; \gamma)$ change the policy implications?

The confusion

the **goal** versus the **instruments**
of accounting standard setting

1. Decisions are improved as the report is *closer* to the true state.
2. The **goal** of a rule: $r(\omega)$
3. The **instruments** of a standard: $r(t)$
4. The gap induces opportunistic influence on evidence t.
5. Rule design as a response to the opportunism

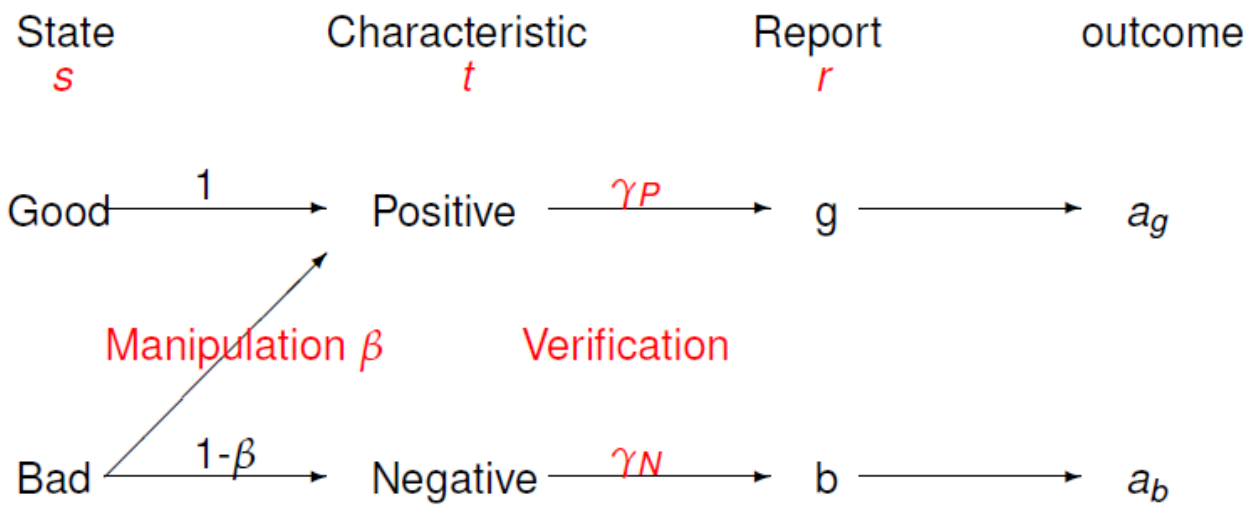
Disclosure v.s. recognition

- Without EM, $r(t) = t$ is optimal to reduce $Var[\omega|r]$.
- With EM, informativeness of r depends on two components
  1. the distribution of t, which is affected by manipulation
  2. the disclosure of t conditional on t.
- Disclosure of t has a trade-off between these two channels.
  1. improves the second component
  2. makes manager sensitive to t and exacerbates manipulation
- Commitment of no disclosure of t is needed.

The optimal threshold

- In a medical test, the threshold T^{BM} is used to balance the two types of errors. In fact, recognition is not needed.
- In an accounting test, the threshold $T^* \neq T^{BM}$.
- If the manager would like to inflate the report, it is still possible that $T^* < T^{BM}$.
- Intuition: the non-monotonicity of the effect of the threshold on manipulation
- Conservative revenue recognition rules

The optimal verification requirement



1. While type I and II errors are costly, manager prefers g to b.
2. The **goal** of a standard: fair value.
3. The **instruments** of a standard: asymmetric verification.
4. Due to manager's one-sided incentive, the optimal verification requirement is conservative.
5. Conservative rules are the path to "fair value"!

Beyond mechanic rules

$$\text{effort } (e) - \underbrace{\text{state } (\omega) - \text{evidence}}_{\text{manager influence}} \underbrace{(t) - \text{report } (r)}_{\text{rule design}} - \text{decision } (d)$$

- $r(t)$ so far is a mechanic rule.
- Principle-based: leave the determination of $r(t)$ to auditors
- It is optimal if the auditor is knowledgable and impartial.

Conclusion

$$\text{effort } (e) - \underbrace{\text{state } (\omega) - \text{evidence}}_{\text{manager influence}} \underbrace{(t) - \text{report } (r)}_{\text{rule design}} - \text{decision } (d)$$

- Provide a descriptive representation of rule design
- Strategic versus statistical consideration: rules are optimal only if manipulation exists
- The optimal design of instruments can be studied.
- Beyond mechanic rules: principle-based standards