The Art of Waiting

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Motivation

A Principal - Agent problem — choosing an action together with 2 key features:

1. Agent knows feasible actions, Principal does not
2. Conflicting preferences over the actions

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For example:

- Merger analysis (Federal Trade Commission - Facebook)
  - Facebook privately knows feasible mergers + submits proposal
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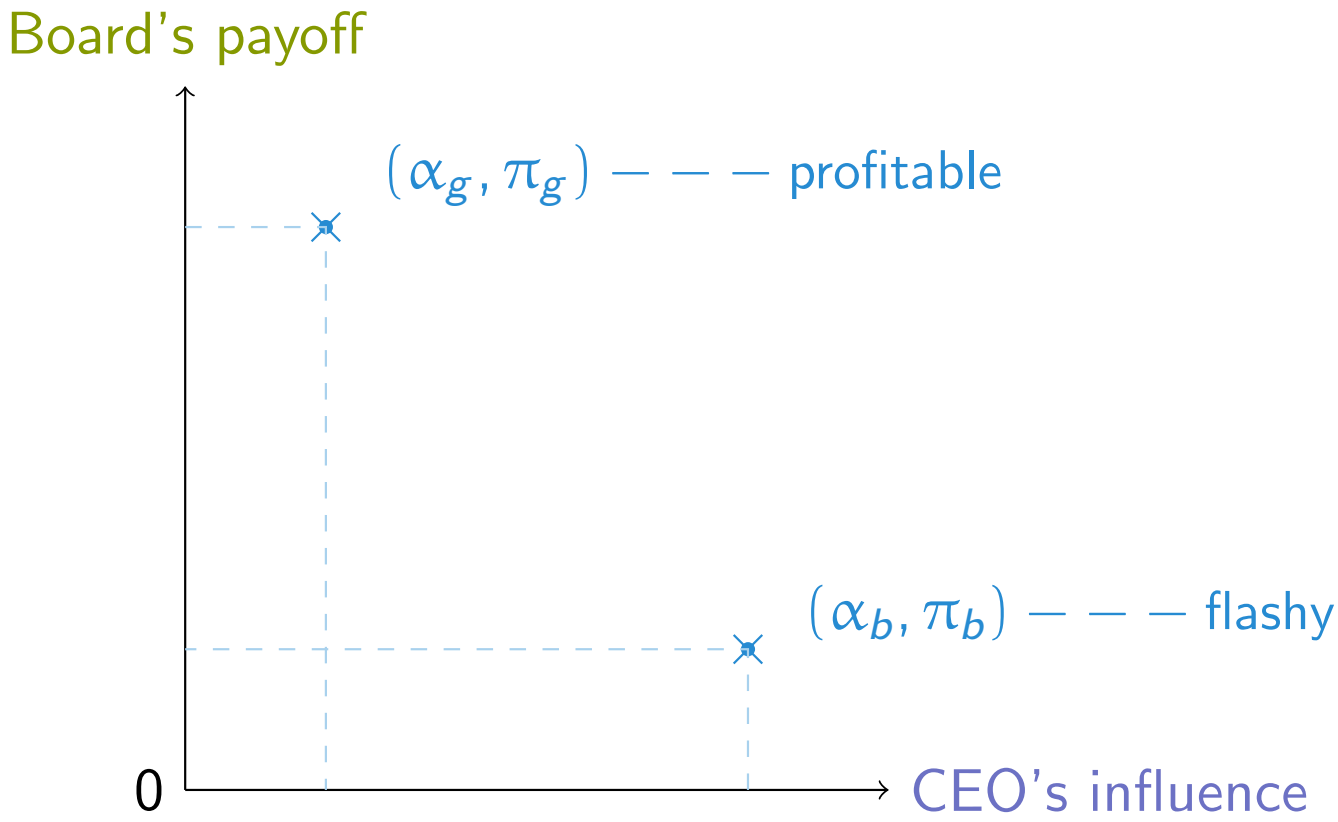
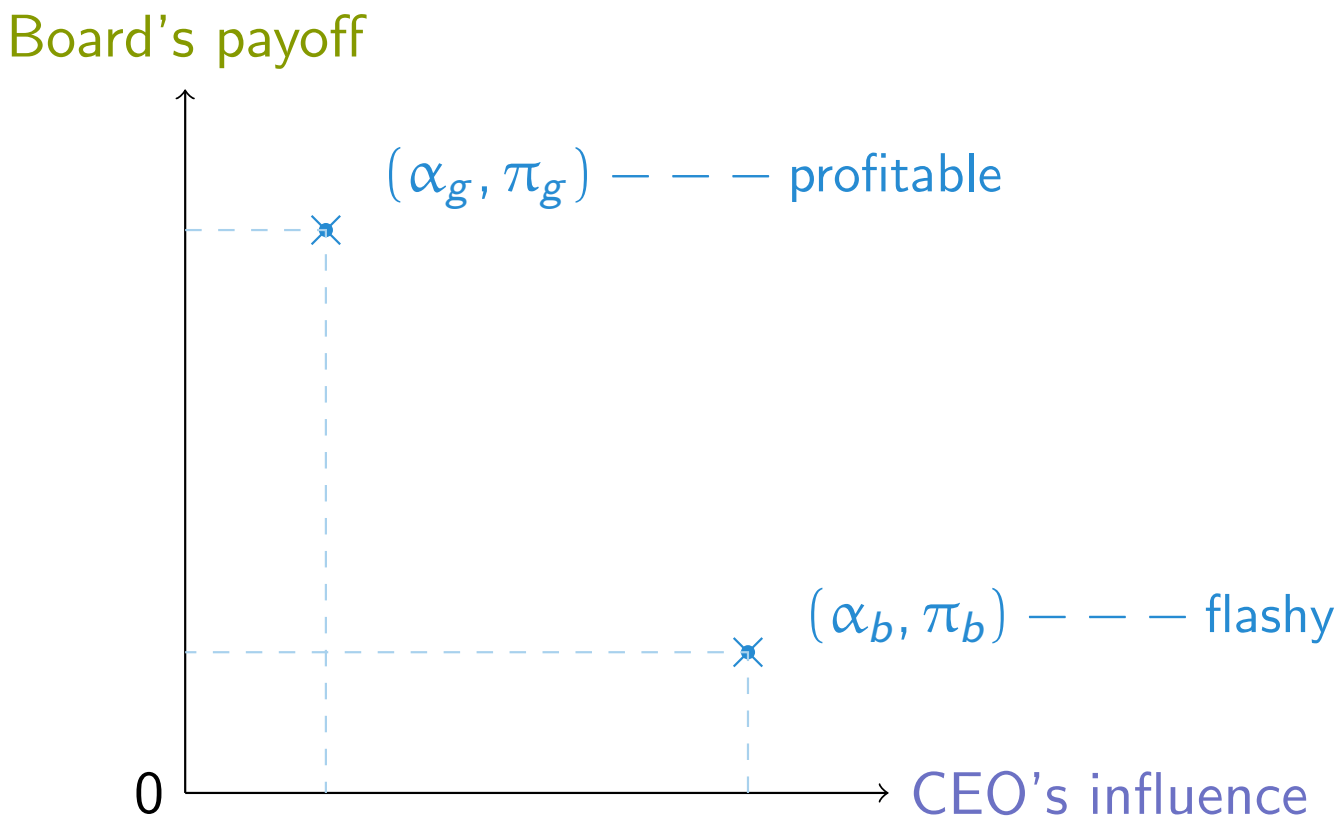
- Initiating new projects in organizations (Board of Directors - CEO)
  - CEO knows feasible projects better + recommends a direction
  - CEO: ↑ her influence & Board: ↑ shareholder value


Board's payoff
(α_g, π_g) − − − profitable
(α_b, π_b) − − − flashy
0
CEO's influence



- CEO can "hide" the more profitable project by not proposing
- Board does not know what is feasible. Is g not feasible or was it simply not proposed?

Principal - Agent problem has asymmetric information & conflict of interest

Two extreme approaches to Principal - Agent problems:

1. Board can fully delegate the choice to CEO

   Full discretion to the informed party

   Easy but not best outcome for the Board

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   Easy but not best outcome for the Board

2. Board can incentivize CEO to reveal the available options

   Commitment to a binding contract

   Best outcome for the Board but not practical

Consider our interaction as an alternative:

CEO can make proposals over time

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Main question: If the Board receives proposals from the informed CEO, would it be at a disadvantage?

- CEO has information + proposal power — upper hand
- Board is uninformed and responds to proposals
- Board cannot commit and must behave strategically

Art of Waiting

Main result: With this approach, Board can do just as well as fully committing to a contract!

- Board can use time to its advantage → delay the approval of inferior actions
- Delay is long enough → CEO only waits if nothing else feasible
  - Profitable project *today* vs. Flashy one *with a long delay*
- Better actions for Board implemented immediately resulting in the same outcome as optimal contract

Key insight: Proposal power of CEO helps the Board achieve a high payoff

Takeaway: New Understanding of Agency Relations

- ⋆ CEO can be motivated to propose Board-optimal projects without profit-sharing

- ⋆ Giving the CEO flexibility to propose rather than mandating what must be done plays to Board's advantage

This kind of protocol also features in merger analysis

Contribution

∗ Prior work on project selection: Armstrong & Vickers (2010), Nocke & Whinston (2013), Guo & Shmaya (2022), ...

- Literature assumes Principal (Board) can commit to which projects to approve in a one-shot interaction

  → commitment may not be possible; interactions are often dynamic

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⋆ First contribution: Timing and delay are effective instruments — replacing the need for commitment

∗ Second contribution: Organizations benefit from bottom-up processes rather than top-down

- ⋆ better outcome for the delegating party
- providing motivation
- improving efficiency by ↓ communication cost

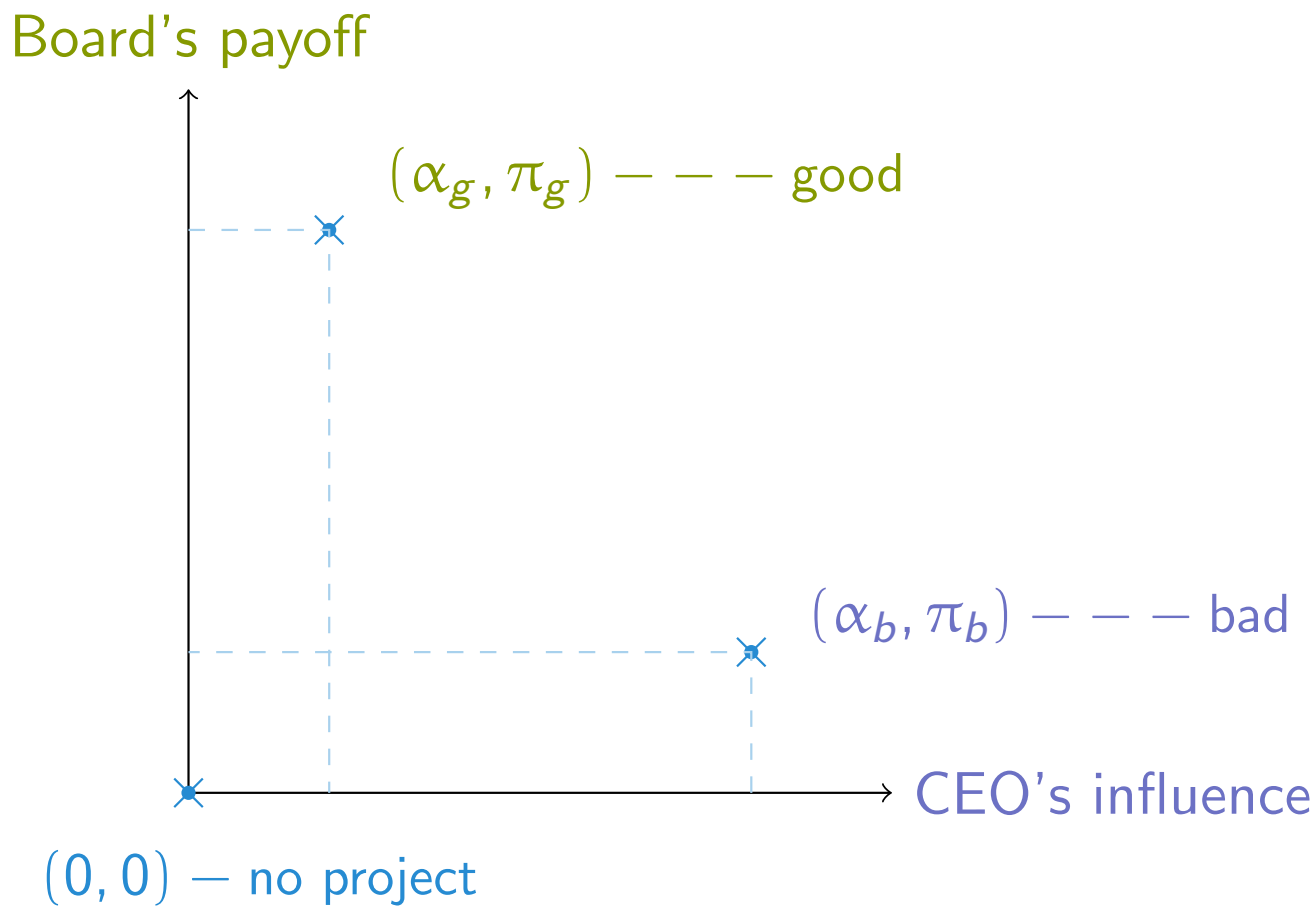
Overview for Talk

1. Setup with two projects
2. Sequential delegation game
3. Commitment benchmark
   - ⋆ Best outcome if Board could commit to a mechanism
4. Achieving commitment payoff
   - ⋆ Main result: Board can always attain commitment outcome in equilibrium with two projects

Projects

A project: pair of payoffs for CEO and Board — $(\alpha, \pi) \in \mathbb{R}^2_{++}$

Status quo: no project $(0, 0)$



Setup with Two Projects

- Two possible projects: (α_g, π_g) (good) and (α_b, π_b) (bad) with

$$\pi_g > \pi_b > 0$$

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- A subset is *available*: drawn according to a distribution $\mu(\cdot)$
- Available projects $\equiv$ CEO's *type*; privately observed
- CEO has 4 types:
  - $\varnothing$: *empty* type —— $\mu_\varnothing$
  - $\{(\alpha_g, \pi_g)\}$: *good* type —— μ_G
  - $\{(\alpha_b, \pi_b)\}$: *bad* type —— μ_B
  - $\{(\alpha_g, \pi_g), (\alpha_b, \pi_b)\}$: *mixed* type —— μ_M

Sequential Delegation Game

Discrete time game with common discount factor $\delta \in (0, 1)$

- Nature first draws CEO's type
- At each $t = 0, 1, \ldots, \infty$:
  - CEO can propose an available project or stay silent;
    - stays silent $\rightarrow$ the game proceeds to $t + 1$
  - Board can accept or reject the proposal
    - accepts $\rightarrow$ the game ends and players get their (discounted) payoffs
    - rejects $\rightarrow$ the game proceeds to $t + 1$
- If no project is accepted, status quo prevails with payoff $(0, 0)$

* We focus on $\delta \rightarrow 1$ as the frequent-offer limit

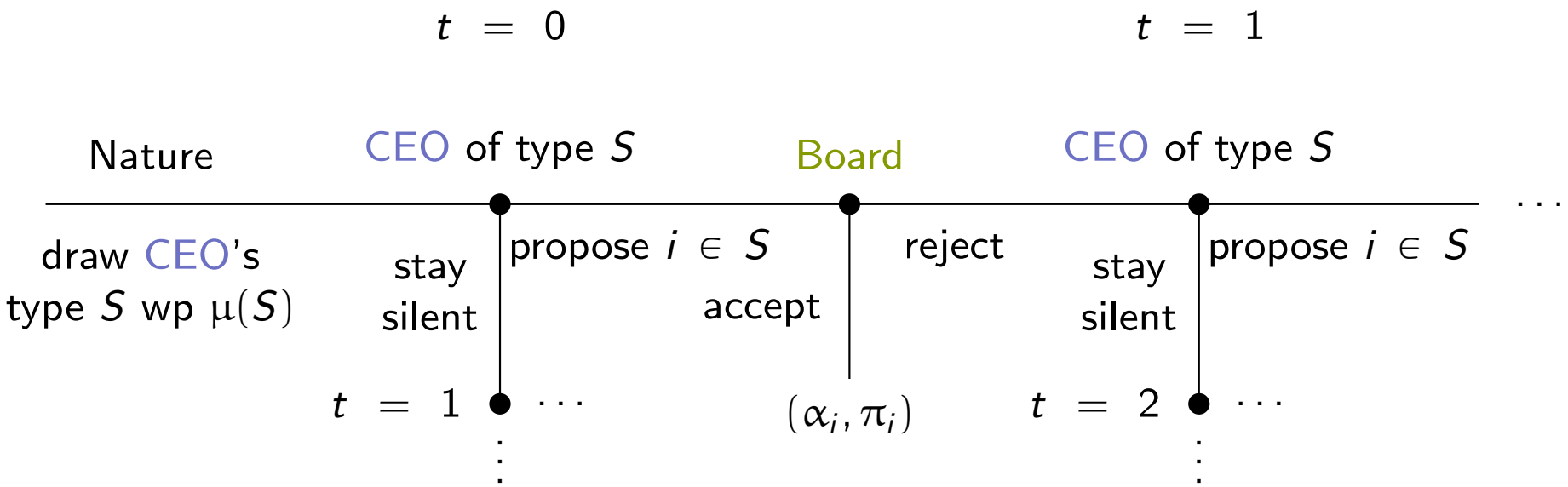

Figure: Timeline of the sequential delegation game.

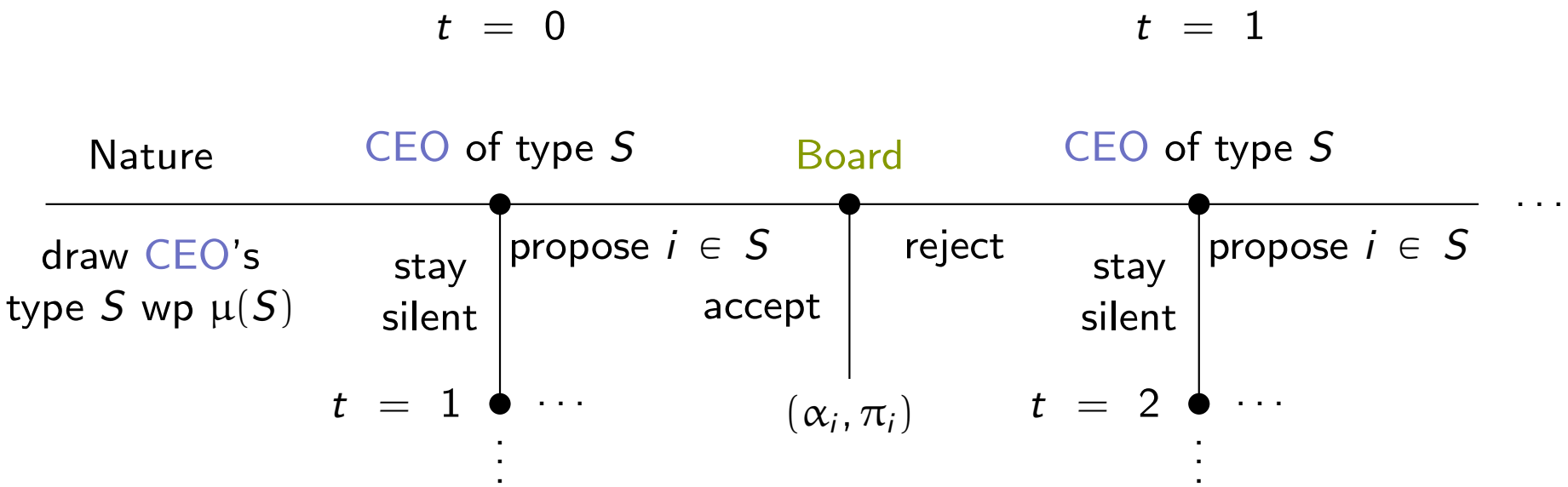

Figure: Timeline of the sequential delegation game.

Solution concept: Perfect Bayesian Equilibrium

- beliefs are updated according to Bayes' rule whenever possible
- strategies are optimal given beliefs

Main tension in the game:

- CEO can "hide" the good project by not proposing it
- Board may then become pessimistic and approve the bad project

If Board could commit to responses $\Rightarrow$ best outcome

$\rightarrow$ Does it suffer in the game by not being able to commit?

$\rightarrow$ Step 1: benchmark with commitment power

$\rightarrow$ Step 2: compare with the equilibrium outcomes

Commitment Benchmark

Goal: Establish what can be achieved with commitment power

Benchmark: Board writes a very detailed and binding contract

- Board decides which project gets implemented for each type
- CEO reports a type

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Benchmark: Board writes a very detailed and binding contract

- Board decides which project gets implemented for each type
- CEO reports a type

CEO's report must be a subset of her type: she can hide an available project, but she cannot offer an unavailable project

Board must incentivize CEO to report *truthfully* (incentive compatibility) to achieve the best outcome

Mechanism design approach to solving the optimal contract

A mechanism here is a mapping between reported types and probabilities of implementing each available project or no project:

- "*Good*" $\mapsto (\alpha_g, \pi_g)$ with q_{Gg}, no project with $1 - q_{Gg}$
- "*Bad*" $\mapsto (\alpha_b, \pi_b)$ with q_{Bb}, no project with $1 - q_{Bb}$
- "*Mixed*" $\mapsto (\alpha_g, \pi_g)$ with q_{Mg}, (α_b, π_b) with q_{Mb}, no project with $1 - q_{Mg} - q_{Mb}$

Board's Problem

Incentive compatibility (IC) $\Rightarrow$ Mixed type should report Mixed

Payoff of Mixed should be higher when she reports Mixed vs. Good/Bad

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Board's problem:

$$\max_{q_{Gg}, q_{Bb}, q_{Mg}, q_{Mb}} \quad \text{Board's expected payoff}$$

subject to

$$U(M, M) \geqslant U(M, G) \qquad (IC_{MG})$$

$$U(M, M) \geqslant U(M, B) \qquad (IC_{MB})$$

Solving for Optimal Mechanism

Key decision: What to implement when the report is "*Mixed*"?

$\rightarrow$ pins down the remaining probabilities

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Focus today: obtain the good project from the mixed type ("Separation")

Separation is optimal when

- the good project is significantly better than the bad
- the mixed type is significantly more likely than the bad type

Solving for Optimal Separating Mechanism

Good project from the mixed type is implemented: $q^*_{Mg} = 1, q^*_{Mb} = 0$

$\Rightarrow$ Payoff of Mixed reporting Mixed $= U(M, M) = \alpha_g$

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Optimal mechanism:

Good project is implemented from the good type: $q^*_{Gg} = 1$

Bad project is *sometimes* implemented from the bad type: $q^*_{Bb} = \frac{\alpha_g}{\alpha_b} < 1$

$\Rightarrow$ The Board rejects the bad project even if this is Pareto inefficient to incentivize the mixed type to report mixed

Challenge: Can separation be achieved in the game without commitment?

Theorem

In the frequent-offer limit, the Board can always achieve its commitment payoff in an equilibrium of the sequential delegation game.

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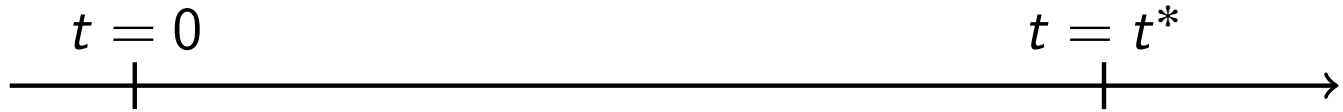
Separating equilibrium attains the commitment payoff:

- Board accepts the good project at $t = 0$ and the bad project at t^* where $t^* := \min\{t : \alpha_g \geqslant \delta^t \alpha_b\}$.
- CEO's good and mixed types propose the good project at $t = 0$; bad type stays silent until t^* and then proposes the bad project.

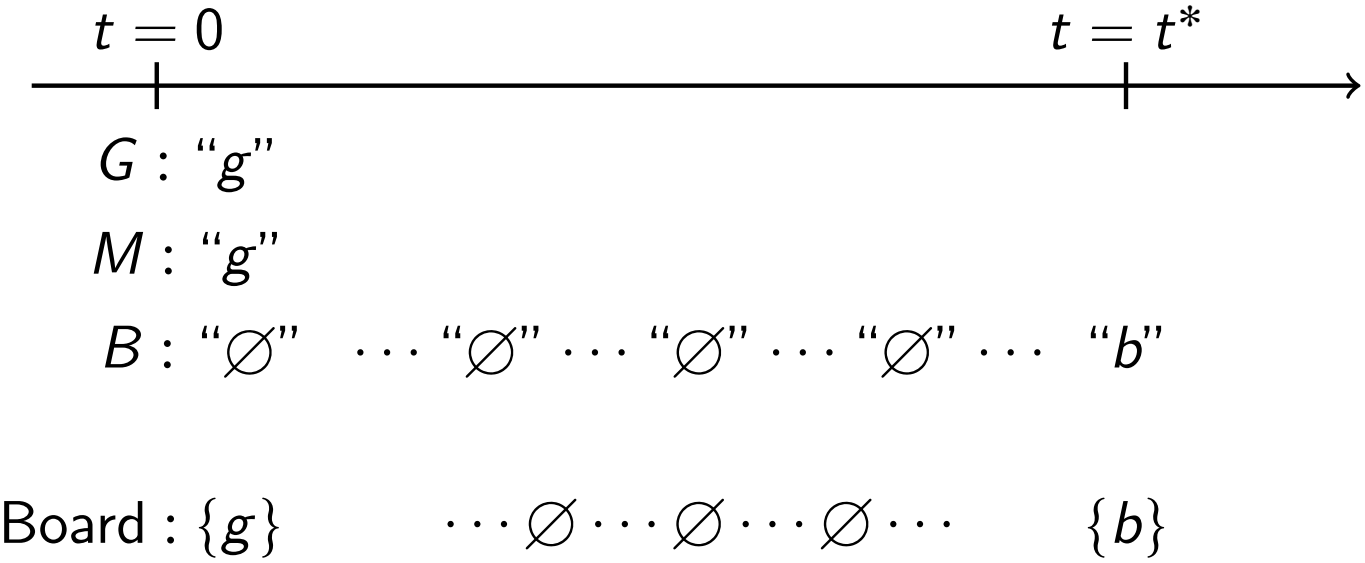


G : "g"

M : "g"

B : "$\varnothing$" $\cdots$ "$\varnothing$" $\cdots$ "$\varnothing$" $\cdots$ "$\varnothing$" $\cdots$ "b"

Board : $\{g\}$ $\cdots \varnothing \cdots \varnothing \cdots \varnothing \cdots$ $\{b\}$



Equilibrium outcome:

- good project is implemented immediately when it's feasible $\leftrightarrow q^*_{Gg} = 1$, $q^*_{Mg} = 1$
- bad project is implemented with long delay when good project is not feasible $\leftrightarrow q^*_{Bb} = \dfrac{\alpha_g}{\alpha_b}$

  discount: as $\delta \to 1$, $\delta^{t^*} \to \dfrac{\alpha_g}{\alpha_b} \Rightarrow$ delay replaces randomization

Sketch of Proof

CEO needs incentive to propose the good project when both are available

$\Rightarrow$ Board must accept the bad project only after a certain period

* Mixed type: $\underline{\alpha_g \text{ today}}$ vs. α_b later $\Rightarrow \alpha_g \geqslant \delta^t \alpha_b$

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What if the bad project is proposed before t^*?

* Board's belief: "It's the mixed type with certainty and she will propose the good project next period if I reject the proposal now."

$\Rightarrow$ Board rejects the bad project before t^* and only accepts the good one if this happens

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$\Rightarrow$ Art of waiting: threat of punishment through beliefs guarantees the delay

Role of Proposal Power

Key insight: Proposal power of CEO helps the Board achieve a high payoff

⋆ Board can incentivize CEO to delay the proposal of the bad project

What if the Board had proposal power instead?

∗ Board proposes projects

∗ CEO can accept to implement an available one or reject the proposal

Can the Board achieve separation and attain commitment payoff?

Proposal power hurts the Board

Suppose the Board tries to attain the commitment outcome:

- Board proposes good project at $t = 0$, bad project at $t = t^*$
- CEO accepts good project at $t = 0$ if available (Good, Mixed), bad project at $t = t^*$ otherwise (Bad)

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$*$ Board believes it's the bad type $\Rightarrow$ only bad project available

$\Rightarrow$ waiting until t^* not optimal $\Rightarrow$ deviates to propose bad project at $t = 1$

$\Rightarrow$ CEO's mixed type also rejects the proposal at $t = 0$

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$\Rightarrow$ CEO's mixed type also rejects the proposal at $t = 0$

$\Rightarrow$ Board cannot achieve separation with proposal power!

$\star$ Benefit of "bottom-up" process rather "top-down" instructions

Other Results in the Paper

⋆ For the talk, compared equilibrium to a *static* commitment benchmark

- Right notion of commitment? Perhaps it is where the Board commits to actions in the dynamic game
- ⋆ We show in the paper that these benchmarks coincide

⋆ We show with multiple projects, under commitment, the best protocol to use is allowing the CEO to propose, similar to our two-project analysis

⋆ We show that the commitment benchmark above is achieved by an equilibrium under some conditions

⇒ Board does not have to commit

Conclusion

⋆ Studied how a Principal copes with an Agent who privately knows what projects are feasible but has different preferences

⋆ Key Challenge: what if the Principal cannot commit to reject proposals the Agent prefers and he disprefers?

⋆ Analysis reveals that Principal can achieve optimum without commitment through a strategic use of timing and delay

⋆ Results offer a new rationale for giving the Agent (CEO) flexibility to propose initiatives rather than mandating the company's direction

⋆ Principal benefits from waiting for the right proposal