Reconsideration of MacLeod

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Model

- A risk-neutral principal and a risk-averse agent.
- Agent's utility: $u(c) - v(e)$, with reservation utility $\underline{U} = 0$. Also assume $u(0) = v(0) = 0$.
- Assume binary signals: $t \in \{0, 1\}, s \in \{0, 1\}$. 1 is "good" signal, while 0 is "bad".
- Let $\alpha_{ts}(e)$ be the probability that (t, s) is observed, when effort level is e.
- Unlike MacLeod (2003), principal's signal is not sufficient statistic of agent's.

Model

- **A1** (Signals are positively correlated):
  $\alpha_{11}(e)\alpha_{00}(e) > \alpha_{10}(e)\alpha_{01}(e)$ for all $e \in (0, 1)$.
- **A2** (Effort increase prob. of good outcome):
  $\alpha'_{11}(e) + \alpha'_{10}(e) > 0$ and $\alpha'_{11}(e) + \alpha'_{01}(e) > 0$ for all $e \in (0, 1)$.
- **A3** (MLRP):
  For all $e \in (0, 1)$, $\alpha'_{1s}(e)/\alpha_{1s}(e) > \alpha'_{0s}(e)/\alpha_{0s}(e)$ for $s \in \{0, 1\}$ and $\alpha'_{t1}(e)/\alpha_{t1}(e) > \alpha'_{t0}(e)/\alpha_{t0}(e)$ for $t \in \{0, 1\}$.

Contract

- $\{w_{ts}, c_{ts}\}_{t,s\in\{0,1\}}$: Essentially the same as MacLeod (2003).
- Principal first chooses $\{w_{ts}, c_{ts}\}_{t,s\in\{0,1\}}$ to implement a given e.
- Then chosses e to maximize profit.
- Fact 1: There must exist (t, s) so that $w_{ts} > c_{ts}$.
- Optimal contract:
  Type 1: $w_{01} > w_{11} = c_{11} = w_{10} = c_{10} > w_{00} = c_{00} = c_{01} = 0$;
  Type 2: $w_{01} = w_{11} = c_{11} > w_{10} = c_{10} = w_{00} = c_{00} > c_{01} = 0$;
  Type 3: $w_{01} > w_{11} = c_{11} > w_{10} = c_{10} > w_{00} = c_{00} > c_{01} = 0$;

Contract

- Type 1: Agent's report does not affect his own consumption (MacLeod's result).
- Type 2: Principal's report does not affect her payment. (Opposite to MacLeod).
- Type 3: Both signals utilized.
- Special case: If agent is risk-neutral, type 3 does not exist. Note that either principal's or agent's signal is not used.
- Special case: If t is a sufficient statistic of s, type 1 contract is optimal, i.e. MacLeod is correct.