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Long Run versus Short Run Player

Moral Hazard

choose $a^i \in A$

observe $y \in Y$

$\rho(y|a)$ probability of outcome given action profile

$u^i(a^i, y)$ utility

private history: $h^i = (a_1^i, a_2^i, \dots)$

public history: $h = (y_1, y_2, \dots)$

strategy $\sigma^i(h^i, h) \in \Delta(A^i)$

“public strategies” , *perfect public equilibrium*

Moral Hazard Example

mechanism design problem

each player is endowed with one unit of income

players independently draw marginal utilities of income $\eta \in \{\bar{\eta}, \underline{\eta}\}$

player 2 (SR) has observed marginal utility of income

player 1 (LR) has unobserved marginal utility of income

player 2 decides whether or not to participate in an insurance scheme

player 1 must either announce his true marginal utility or he may announce $\bar{\eta}$ independent of his true marginal utility

non-participation: both players get $\gamma = \frac{\bar{\eta} + \underline{\eta}}{2}$

participation: the player with the higher marginal utility of income gets both units of income

normal form

non-participation participate

truth

γ, γ	$\frac{\bar{\eta} + \gamma}{2}, \frac{\bar{\eta} + \gamma}{2}$
lie	$\frac{3\gamma}{2}, \frac{\bar{\eta}}{2}$

$p^* = \frac{\eta}{\gamma}$ makes player 2 indifferent

$$\max u^1(a) = \frac{3\gamma}{2}$$

$$\text{mixed precommitment/Stackelberg} = \frac{\bar{\eta} + \gamma}{2} + \left(1 - \frac{\eta}{\gamma}\right) \frac{\eta}{2}$$

$$\bar{v}^1 \text{ best dynamic equilibrium} = \frac{\bar{\eta} + \gamma}{2}$$

$$\text{pure precommitment/Stackelberg} = \frac{\bar{\eta} + \gamma}{2}$$

Set of dynamic equilibria

$$\text{static Nash} = \gamma$$

$$\underline{v}^1 \text{ worst dynamic equilibrium} = \gamma$$

$$\min u^1(a) = \gamma, \text{ minmax} = \gamma$$

moral hazard case

player 1 plays “truth” with probability p^* or greater

player 2 plays “participate”

$$\bar{v} = (1 - \delta) \frac{\bar{\eta} + \gamma}{2} + \delta \left(\frac{1}{2} w(\underline{\eta}) + \frac{1}{2} w(\bar{\eta}) \right)$$

$$\bar{v} \geq (1 - \delta) \frac{3\gamma}{2} + \delta w(\bar{\eta})$$

$$\bar{v} \geq w(\underline{\eta}), w(\bar{\eta})$$

$w(\bar{\eta})$ must be as large as possible, so inequality must bind; $w(\underline{\eta}) = \bar{v}$

$$\bar{v} = (1 - \delta) \frac{3\gamma}{2} + \delta w(\bar{\eta})$$

solve two equations

$$\bar{v} = \bar{\eta} - \frac{\gamma}{2}$$

$$w(\bar{\eta}) = \frac{\bar{v} - (1 - \delta)3\gamma/2}{\delta}$$

check that $w(\bar{\eta}) \geq \gamma$

leads to $\delta \geq 2\left(2 - \frac{\bar{\eta}}{\gamma}\right)$

from $\delta < 1$ this implies

$$\bar{\eta} > \underline{3\eta}$$

Moral Hazard Mixing Games

$$\rho(y | a) > 0$$

then $\bar{v}_{MH} < \bar{v}_{PO}$

moral hazard worse than perfect observability