Law And Economics

Review of Economic Concepts

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Review of Economic Concepts

- Welfare Theorems.
- Externalities.
- Game Theory.
  - Solution concepts in static and dynamic games.
  - Bayesian games.
- **Choice under uncertainty**.
- **Asymmetric information**.
  - **Moral Hazard**.
  - **Adverse Selection**.

Choice Under Uncertainty

- Gains from driving: 500 EUR a month.
- Probability of accident: 0.01.
- Cost of accident. 10.000 EUR.
- Expected value of driving:

$$EV = 0.99 \times \$500 + 0.01 \times (\$500 - \$10.000)$$

Choice Under Uncertainty

- Would the person drive if the EV is positive?
- utility: $u : R_+ \to R$

$$EU = 0.99 \times u(\$500) + 0.01 \times u(\$500 - \$10.000)$$

Insurance

The driver is offered full insurance for a price z. Would the driver buy the insurance?

$$EU(\text{insured}) = 0.99 \cdot u(\$500 - z) + 0.01 \cdot u(\$500 - z) = u(\$500 - z)$$

- $z = 0.01 * \$10.000 = \$100.$
- u concave $\Rightarrow$ driver buys the insurance.

Proof.

$$u \text{ concave} \quad \Leftrightarrow \quad u(\alpha \cdot x + (1-\alpha)\cdot y) > \alpha \cdot u(x) + (1-\alpha)\cdot u(y) \quad \forall \alpha \in (0,1) \quad x \neq y$$

So,

$$u(0.99 \cdot 500 + 0.01 \cdot (500 - 10000) > 0.99 \cdot u(500) + 0.01 \cdot u(500 - 10000)$$
$$u(400) > 0.99 \cdot u(500) + 0.01 \cdot u(-9500)$$

Insurance

What if the price is not actuarial? Solve for $u(x) = \sqrt{20000 + x}$.

$$\sqrt{(20500 - \bar{z})} = 0.99 \cdot \underbrace{\sqrt{20500}}_{\sim 143.1782} + 0.01 \cdot \underbrace{\sqrt{10500}}_{102.4695}$$

$\bar{z} = 20500 - (142.7711)^2 = \$116.41$

- The driver is willing to pay more than the actuarial price.
- Risk-aversion.

Continuous driving

Decision to drive might not be binary.

- amount of driving $x \in R_+$.
- accident $a \in \{0, 1\}$. Probability of accident $p(x)$ increasing.
- utility from driving $u : R_+ \times \{0, 1\} \to R$

$$\max_{x \in R_+} E[u(x, a)] = \max_{x \in R_+} p(x)u(x, 1) + (1 - p(x))u(x, 0)$$

- **Assumption**: separable preferences with cost of accident K:
  $u(x, a) = \hat{u}(x) - a \cdot v(w - K)$. (Normalizing $v(w) = 0$).

$$\max_{x \in R_+} \hat{u}(x) - p(x)K$$

- If $\hat{u}$ concave and $p(x)$ convex and smooth, the FOC is $\hat{u}'(x) = p'(x)K$. Solution x^*.

Insurance

Insurance contract: driver drives x^* and pays the actuarial price $p(x^*)K$.

This contract is good for a risk-averse driver.

$$v(w - p(x^*)K) < (1 - p(x^*))v(w) + p(x^*)v(w - K)$$

Insurance company breaks even.

Two problems:

- x might not be observable.
- Different drivers might have different functions $p(\cdot)$.

Moral Hazard

- If x is not observable, the driver has incentives to increase the miles driven per month.

$$u'(x^*) = p'(x^*) \cdot K > 0$$

- u has a local max at $\hat{x}$, this is what the driver will choose.

Moral Hazard

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Adverse Selection

- Two type of drivers: reckless (R) and safe (S).
- $p_R(x) > p_S(x)$ for all x.
- Proportion α of reckless drivers, with

$$p(x) := \alpha \cdot p_R(x) + (1 - \alpha) \cdot p_S(x)$$

- "Actuarially fair" insurance x^* with premium $p(x^*)K$.
- Reckless driver will buy the insurance (if not risk-loving).

$$\begin{aligned} u(x^*) - p(x^*)K &\geq u(\hat{x}_R) - p(\hat{x}_R)K \\ &> u(\hat{x}_R) - p_R(\hat{x}_R)K \end{aligned}$$

Adverse Selection

- Safe driver will NOT buy the insurance if sufficiently risk neutral:

$$\begin{aligned} u(\hat{x}_S) - p_S(\hat{x}_S)K &\geq u(x^*) - p_S(x^*)K \\ &> u(x^*) - p(x^*)K \end{aligned}$$

- If only the reckless driver buys the insurance, the insurance company does not break even:

$$p(x^*)K - p_R(x^*)K < 0.$$