LECTURE 7: RISK ADJUSTMENT + QUALITY COMPETITION

1. GLAZER + McGUIRE (2000)

- 2 types of consumers $i \in \{H, L\}$

  H: sick (λ)

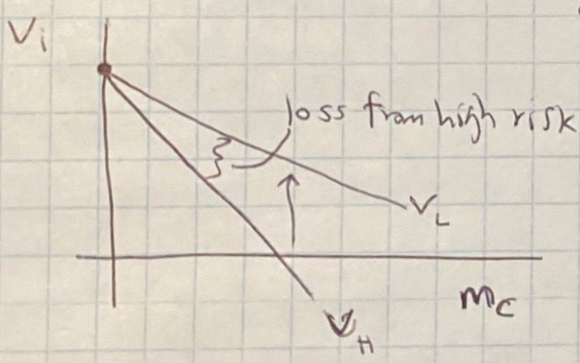
  L: healthy ($1-\lambda$)

- 2 illnesses: $j \in \{a, c\}$

  ↳ adverse selection in that $p_H > p_L$

- Costs to treat: $\{m_a, m_c\}$
- premium: r

PATIENT UTILITY: $V_i(m_a, m_c, r) = \underbrace{V_a(m_a)}_{p_a \equiv 1,\ \text{always happen}} + p_i V_c(m_c) - r$



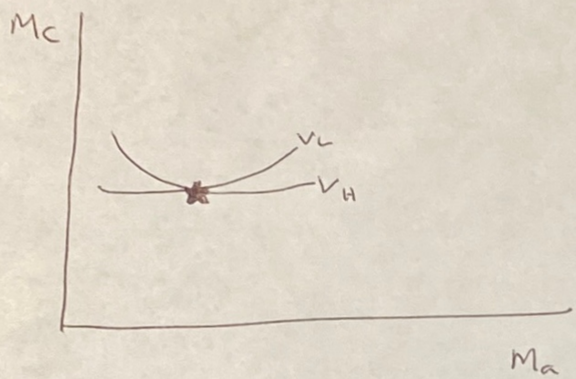
SOCIAL PLANNER's PROBLEM

① **Efficiency:** MB = MC for all patients

$$V_a'(m_a) = V_c'(m_c) = 1$$

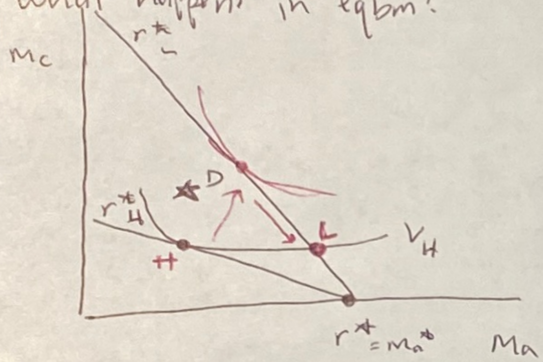
② **EQUIM:** $r^* = m_a^* + \underbrace{[\lambda p_H + (1-\lambda) p_L]}_{\text{average } \Pr(c=1)} m_c^*$

SOCIAL OPTIMUM



★ where we achieve ① and ②

what happens in eqbm?



RISK ADJUSTMENT

- Signal of type $i \in \{H, L\}$ shown to everyone:

$$\underset{\text{good signal}}{s} \in \{0, \underset{\text{bad signal}}{1}\} \qquad \underbrace{Pr(s=1/H) > Pr(s=1|L)}_{\text{signal needs to be INFORMATIVE}}$$

- Signals are "noisy": $q_i = Pr(s=1 / i \in \{H, L\})$

$$q_H > q_L$$

- posterior beliefs: transform $q_i \rightarrow \lambda_i$

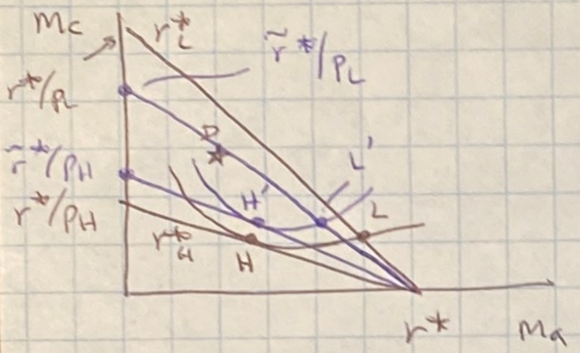
$$\lambda_H = Pr(i=H / s=1) = \frac{Pr(s=1/i=H) \cdot P(i=H)}{Pr(s=1)}$$

$$\underline{\lambda_H \simeq \lambda \cdot q_H} \qquad \text{similarly } \lambda_L = (1-\lambda) \cdot q_L$$

Risk adjusted premium:

$$\tilde{r}^* = m_a^* + [p_H \lambda_s + (1-\lambda_s) p_L] m_c^*$$

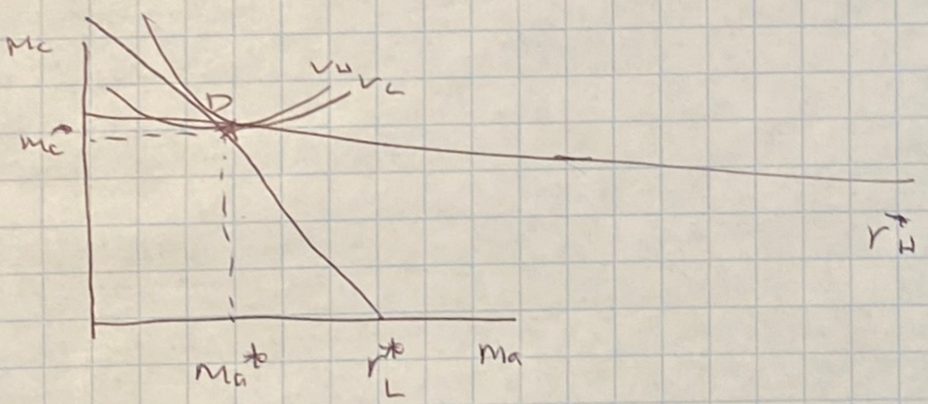
$$s \in \{0, 1\}$$



OPTIMAL RISK ADJUSTMENT

- First, pooling eqbm is "impossible" to achieve

$$\underbrace{\begin{aligned} r_H^* &= m_a^* + p_H m_c^* \\ r_L^* &= m_a^* + p_L m_c^* \end{aligned}}_{\text{we want to implement = second best}} \iff \underbrace{\begin{aligned} r_H^* &= q_H r_1^* + (1-q_H) r_0^* \\ r_L^* &= q_L^* r_1^* + (1-q_L) r_0^* \end{aligned}}_{\text{Choose } (r_1^*, r_0^*) \Rightarrow (r_H^*, r_L^*)}$$



$$r_0^* = [q_H r_L^* - q_L r_H^*] / [q_H - q_L]$$

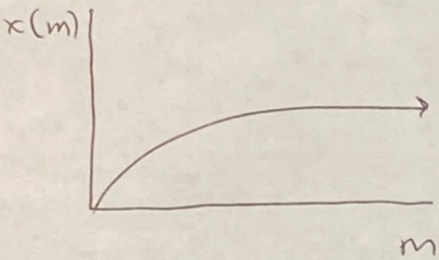
$$r_1^* = [(1-q_L) r_H^* - (1-q_H) r_L^*] / [q_H - q_L]$$

② EGGLESTON, ELLIS, LIU

- still have $i \in \{H, L\}$ w/ $c_H > c_L$
  $(1-\lambda)$ for H, λ for L

- dynamics: risk evolves over time

- patients choose investment m
  and $x(m) = Pr(i = L | m)$



$x'(m) > 0$

$x''(m) < 0$

- Suppose $\lambda_t(e, m)$ and specifically
  $\lambda_0, \lambda_1 = \lambda_0 \cdot x(m)$
- Can we implement $\begin{cases} e^* = 0 \\ m^* \end{cases}$?

SOCIAL PLANNER'S

$$W = B(m) - m - e$$

$\Rightarrow e^* = 0.$

$$B(m) = \underbrace{\lambda_0(e) \cdot x(m)}_{\lambda_1} \{ \underbrace{[B_L - c_L]}_{\text{net benefit for being low-risk}} - \underbrace{[B_H - c_H]}_{\text{net benefit from being high risk}} \}$$

Problem: $\max_m W$

FOC: $\dfrac{\partial W}{\partial m} = 0 \Rightarrow \boxed{B'(m) = 1}$

How to get m^*?

CASE 1: no risk adjustment

$$V(e,m) = \lambda_0(e)\pi_L + (1-\lambda_0(e))\pi_H - e - m + \delta\left(\lambda_1(e,m)\pi_L + (1-\lambda_1)\pi_H\right)$$

In eqbm: $(e^*, m^*) > 0$

CASE 2: Implement risk adjustment

- What does risk adjustment to?

  $\pi_L - \pi_H \to 0$

- Perfect risk adjustment: $\pi_L = \pi_H = 0$

- Then $V = \lambda_0(e)\pi + (1-\lambda_0(e))\pi - e - m + \left(\lambda_1(e)\pi + (1-\lambda_1(e))\pi\right)\delta$

  $= \pi - e - m + \pi$

  $V = 2\pi - e - m + \alpha[x(m) - x(0)]$

Now what's optimal?

$$\boxed{\begin{array}{l} e^* = 0 \\ m^* = 0 \end{array}}$$