Day 2

P1

$\ln(y)$

$$A(y) = -\frac{u''(y)}{u'(y)}$$

(a)

$$= \quad = \quad - \frac{\frac{1}{y^2}}{\frac{1}{y}} = \frac{1}{y}$$

$$\boxed{y \rightarrow W \quad | \quad q \rightarrow C}$$

$$\cdot \begin{cases} \xrightarrow{\pi} W - L \\ \xrightarrow{(1-\pi)} W \end{cases}$$

$$\boxed{\max_{C} EU = \pi \cdot u(\underbrace{W - L - pC + C}_{y_B}) + (1-\pi)\, u(\underbrace{W - pC}_{y_G})}$$

BED

$$\frac{\partial EU}{\partial C} = \boxed{\pi \cdot u'(y_B)(1-p) \pm (1-\pi) \cdot u'(y_G) \cdot (p)}$$

$E(MB) = E(MC)$

$$\Leftrightarrow \boxed{-\frac{u'(y_G)}{u'(y_B)} \cdot \frac{1-\pi}{\pi} = -\frac{1-p}{p}}$$

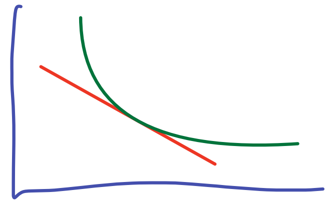
MRT

MRS

Slope of IC

Relative Prices

Slope of Insurance Line (Budget Line)



$C^{*} = 2$

$$u(y) = \ln(y)$$

FOC becomes

$$\boxed{-\frac{u'(y^{G})}{u'(y^{B})} \cdot \frac{1-\pi}{\pi} = -\frac{1-p}{p}}$$

MRT

$$-\frac{y_B}{y_G} \cdot \frac{(1-\pi)}{\pi} = -\frac{1-p}{p}$$

$$y_B \cdot \frac{1-\pi}{\pi} = \frac{1-p}{p} \cdot y_G$$

$$\left(W - L - pC + C\right)\cdot\frac{1-\pi}{\pi} = \frac{1-p}{p}\cdot\left(W - pC\right)$$

$$\frac{1-\pi}{\pi}(1-p)\cdot C + \frac{1-\pi}{\pi}(W-L) = \frac{1-p}{p}(-p)C + \frac{1-p}{p}W$$

$$\left[\frac{1-\pi}{\pi}(1-p) + (1-p)\right]C = \frac{1-p}{p}W - \frac{1-\pi}{\pi}(W-L) \;\Big|\cdot\frac{1}{(1-p)}$$

$$\left[\underbrace{\frac{1-\pi}{\pi} + 1}\right]C = \frac{1}{p}W - \frac{1-\pi}{\pi(1-p)}(W-L) \;\Big|\cdot\pi$$

$$\frac{1-\pi+\pi}{\pi} = \frac{1}{\pi}\cdot C$$

$$\boxed{C = \frac{\pi}{p}W - \frac{1-\pi}{1-p}(W-L)}$$

$$= \left(\underbrace{\frac{\pi}{p} - \frac{1-\pi}{1-p}}\right)W + \frac{1-\pi}{1-p}L$$

$$\frac{\pi(1-p) - (1-\pi)p}{p(1-p)} = \frac{\pi - \cancel{\pi p} - p + \cancel{\pi p}}{p(1-p)} = \frac{\pi - p}{p(1-p)}$$

$p(1-p)$

$$\cancel{\boxed{C^* = \frac{\overset{=0}{\pi - p}}{p(1-p)} W + \frac{1-\pi}{1-p} L}}$$

$$\boxed{p = \pi} \qquad \boxed{C^* = L}$$

$$\cancel{\frac{1-p}{1-p}} \quad 1$$

$$\boxed{C^* = L}$$

(c) When would demand become negative?

$$C^* = \frac{\pi - p}{p(1-p)} W + \frac{1-\pi}{1-p} L \leq 0$$

$$\frac{(\pi - p) W + p(1-\pi) L}{p(1-p)} \leq 0 \quad \Big| \; p(1-p)$$

$$C^* = (\pi - p)W + p(1-\pi)L \le 0 \iff$$

$$\pi W - pW < -p(1-\pi)L$$

$$\pi W < [W-(1-\pi)L]\,p \quad \Big| \cdot \frac{1}{W-(1-\pi)L}$$

$$\boxed{\underbrace{\frac{\pi W}{W-(1-\pi)L}}_{p_{crit}} < p}$$

If p is larger than p_{crit}, I'd rather not buy any insurance.

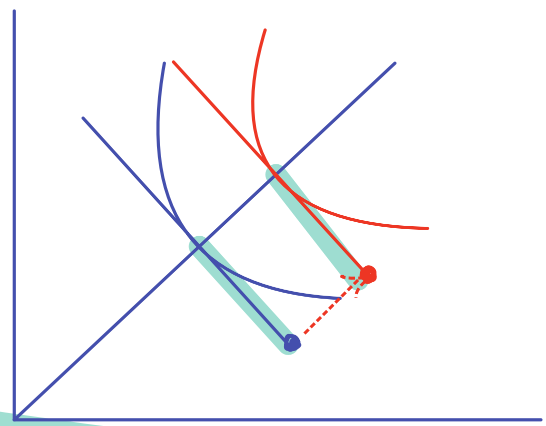
(d) $$\frac{dC^*}{\partial W} < 0 \quad [\text{Inferior Good}]$$

$$\frac{d\left[C^* = \frac{\pi - p}{p(1-p)}W + \frac{1-\pi}{1-p}L\right]}{dW}$$

$$\frac{dC^*}{\partial W} = \frac{\pi - p}{p(1-p)} \gtreqless 0$$

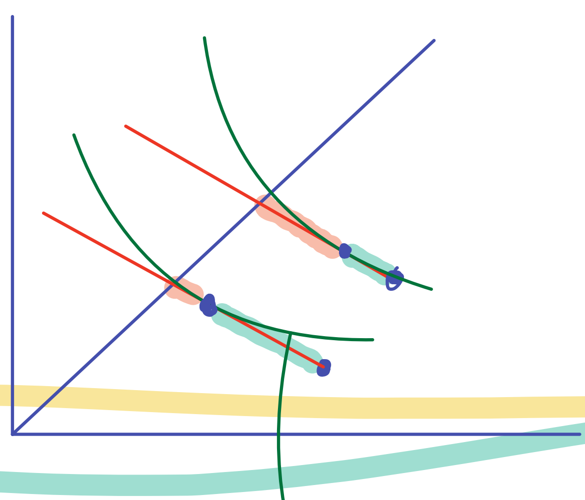
$\pi = p$ (Fair premium)

$$\boxed{\frac{dC}{\partial W} = 0}$$

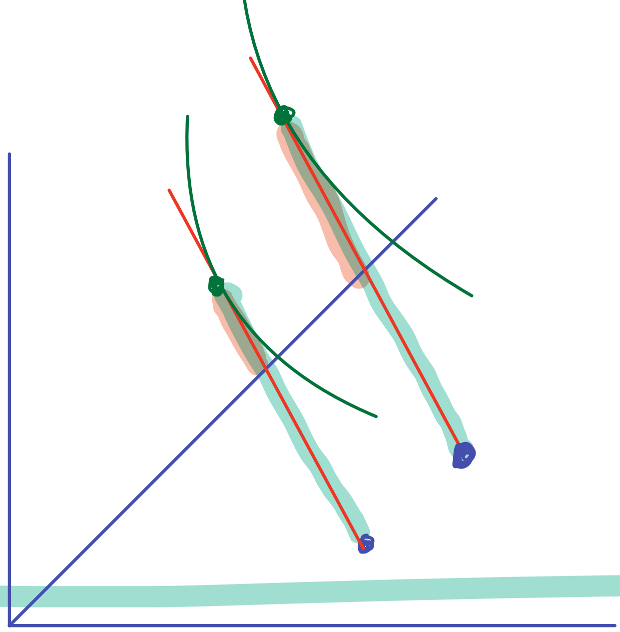


$\pi < p$ (Positive loading)

$$\frac{dC^*}{\partial W} < 0$$



$p < \pi$



DARA

$$\frac{dc^*}{\partial w} > 0$$

$$\frac{dc^*}{dL} > 0$$

$$\frac{d\left[\frac{\pi - p}{p(1-p)} w + \frac{1-\pi}{1-p} L\right]}{dL}$$

$$\frac{dc^*}{dL} = \frac{1-\pi}{1-p} > 0$$

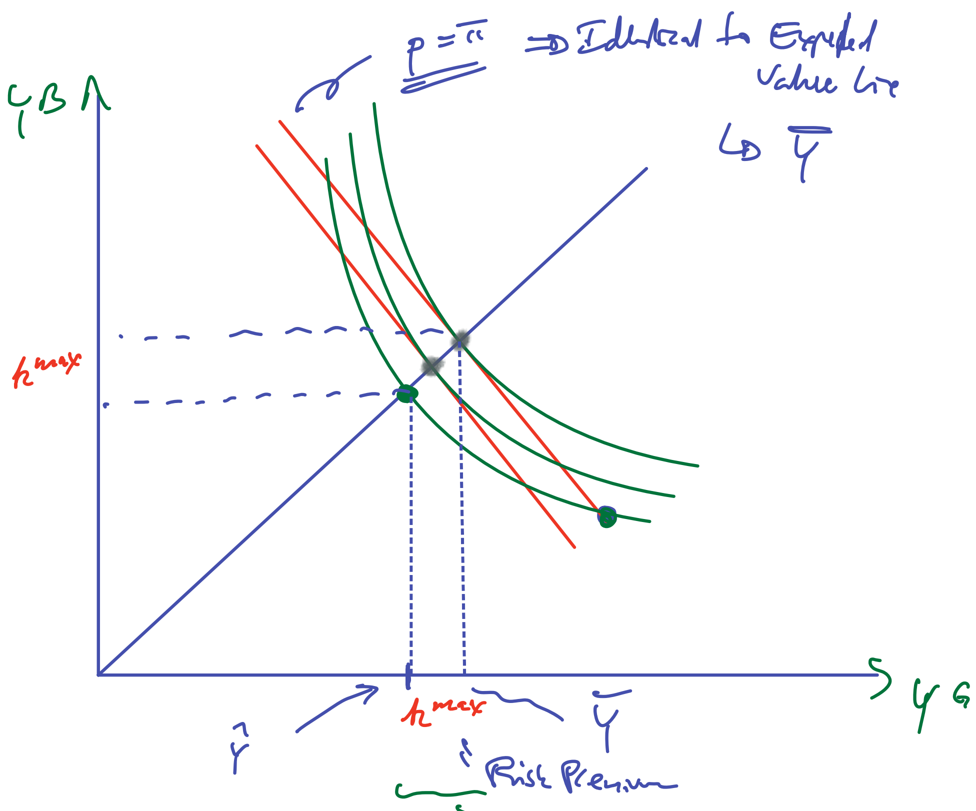
$$\frac{dc^*}{d\pi} > 0$$

$$\frac{d\left[\frac{\pi-p}{p(1-p)}W+\frac{1-\pi}{1-p}L\right]}{d\pi}$$

$$\frac{dc^*}{d\pi}=\left[(\pi-p)\cdot\frac{W}{p(1-p)}+(1-\pi)\cdot\frac{L}{1-p}\right]'$$

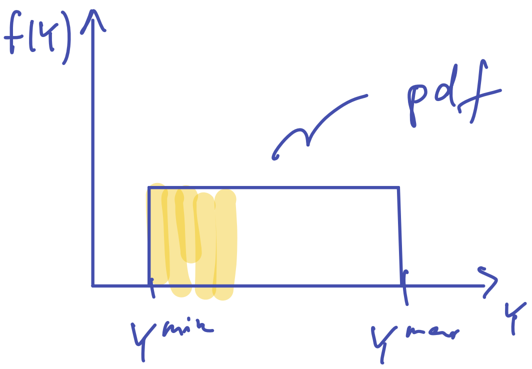
$$=\frac{W}{p(1-p)}-\frac{L}{1-p}$$

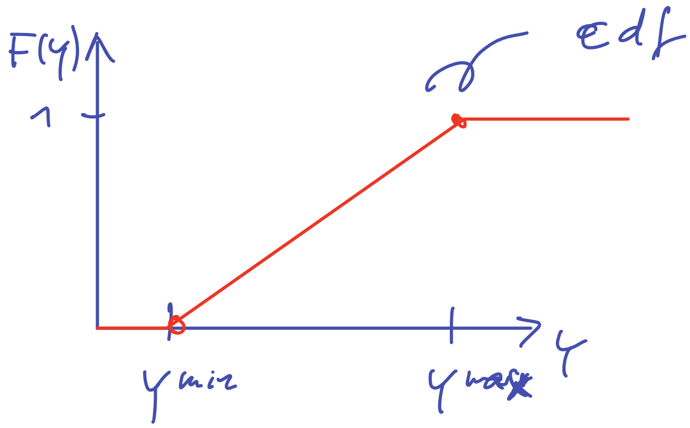
$$=\frac{W-pL}{p(1-p)}>0 \quad \forall\; W>pL$$

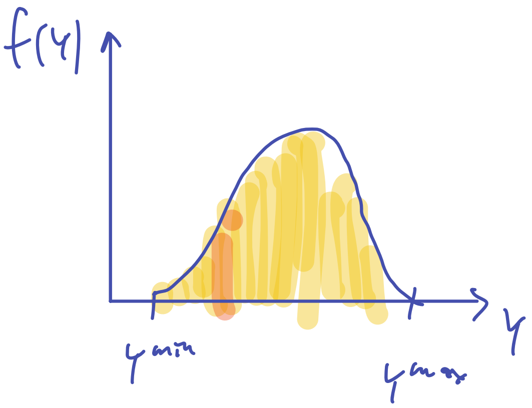


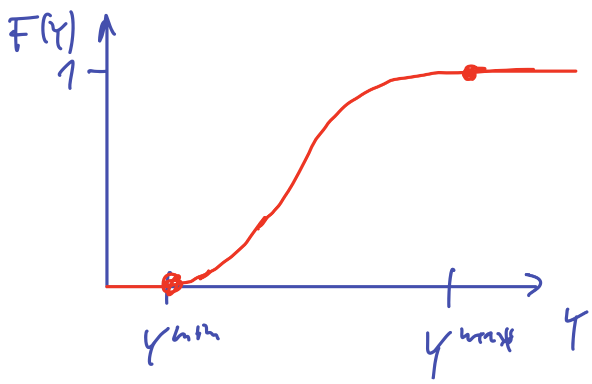
$$\boxed{\text{Risk Premium } r=\bar{Y}-\hat{Y}}$$

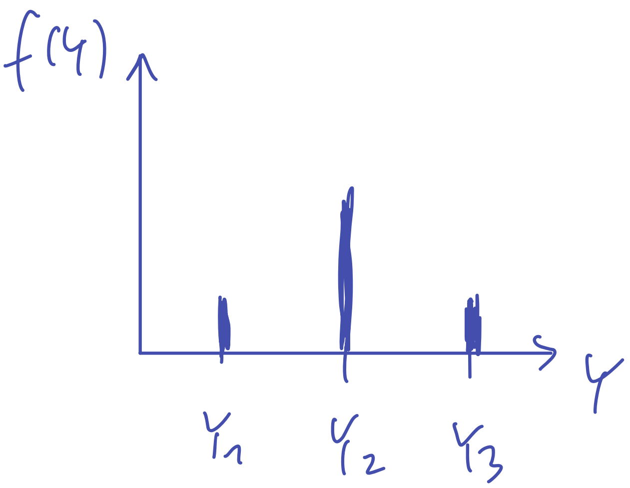
$F(y) = Pr(y_i \le y)$

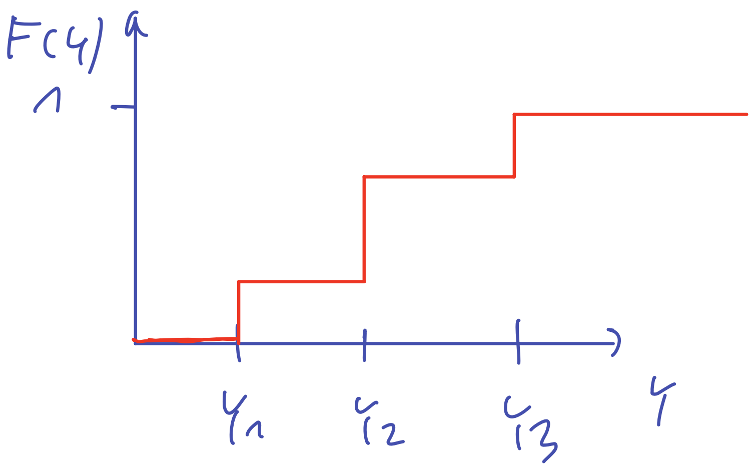

f(y)
pdf
y min
y max
y


F(y)
cdf
1
y min
y max
y


f(y)
y min
y max
y


F(y)
1
y min
y max
y


f(y)
y1
y2
y3
y


F(y)
1
y1
y2
y3
y

P2

Co-Insurance Plan

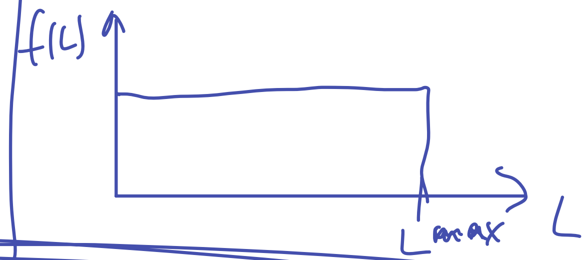
$$C^C = \alpha \cdot L \qquad (\alpha < 1)$$

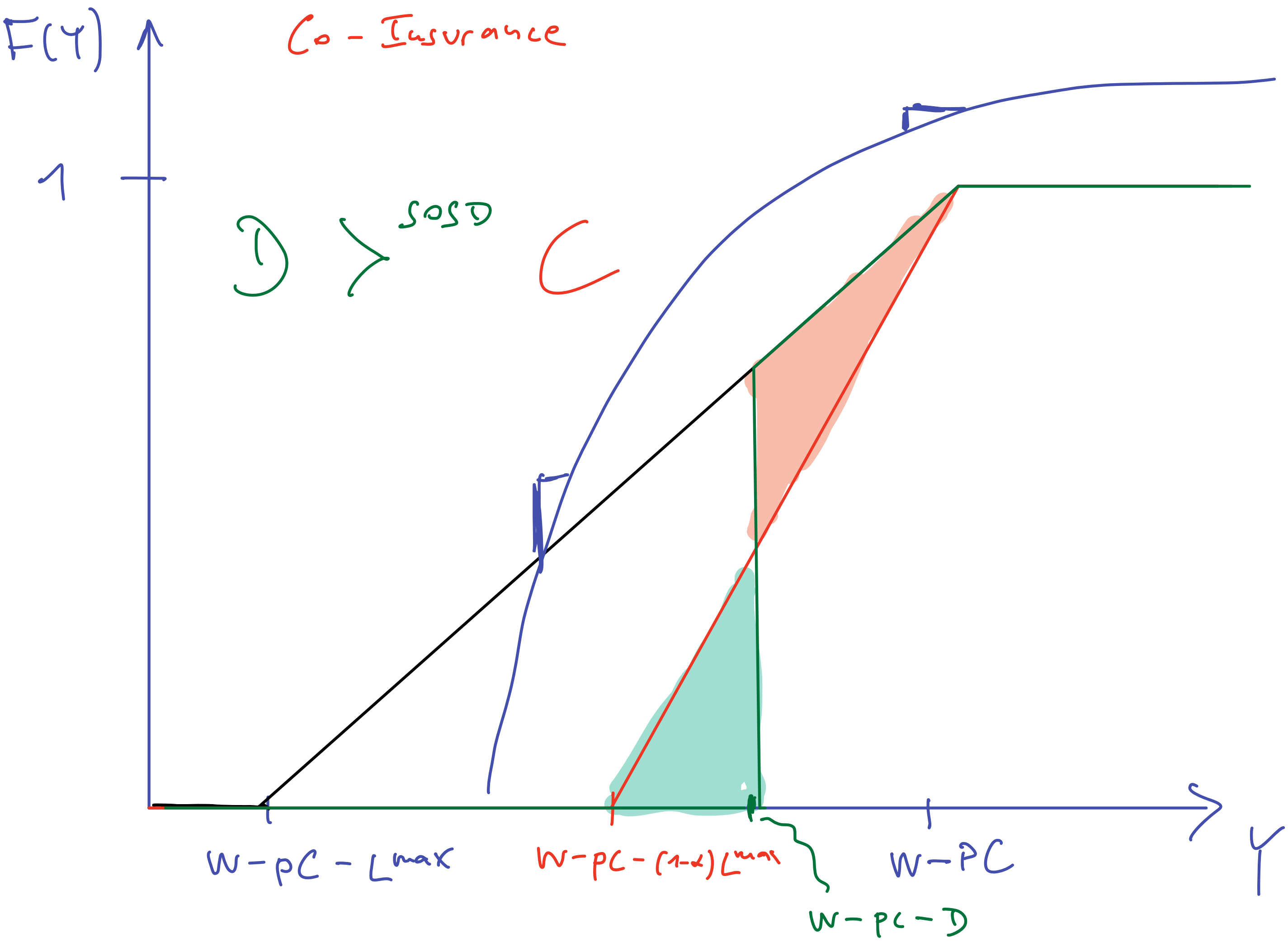
99%

Deductible Plan

$$C^D = L - D$$

$$L \in [0, L^{max}]$$





W = Income Endowment

① Benchmark :

Best Case : $Y = W - pC$

Worst Case : $Y = W - pC - L^{max}$

$C^c = \alpha \cdot L$

② Co-Insurance Contract

Best Case : $Y = W - PC$

Worst Case : $Y = W - PC - L^{max} + \alpha L^{max}$

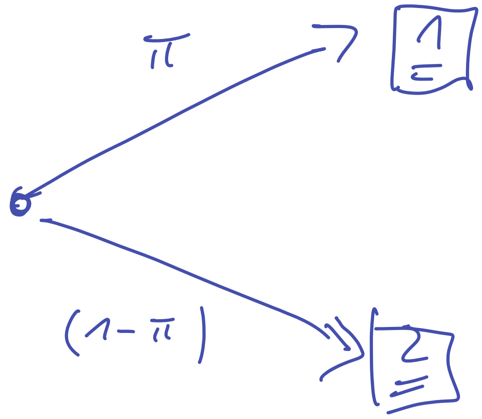
$= W - PC - (1-\alpha) L^{max}$

③ Deductible Contract

Best Case : $Y = W - PC$

Worst Case : $Y = W - pC - D$

$\boxed{P3}$

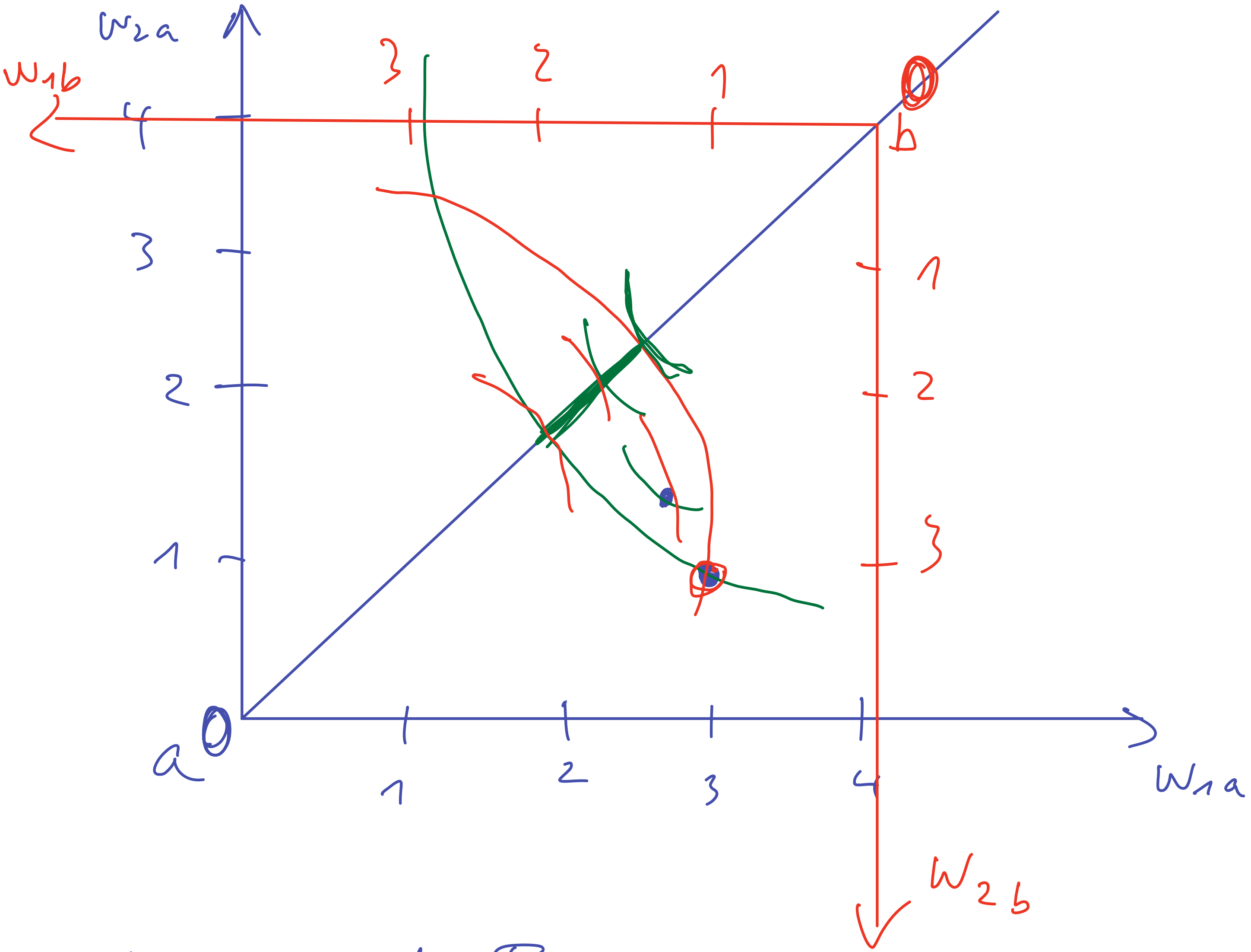


	a	b	Σ
1	w^0_{1a}	w^0_{1b}	$w^0_1 = w^0_{1a} + w^0_{1b}$
2	w^0_{2a}	w^0_{2b}	$w^0_2 = w^0_{2a} + w^0_{2b}$

Social Risk: $w_1^0 \neq w_2^0$

(i) No Social Risk

	a	b	Σ
1	3	1	4
2	1	3	4

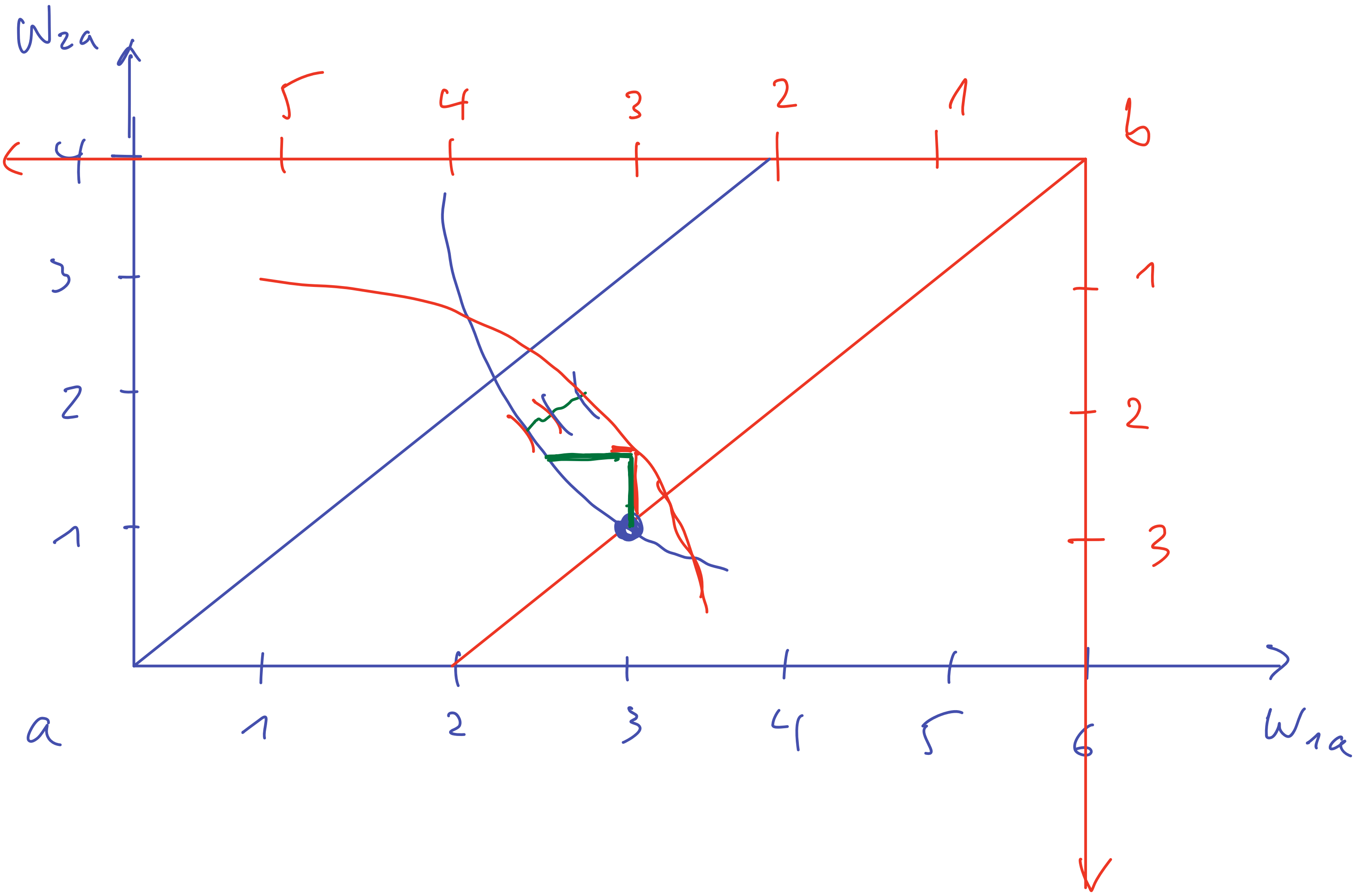


No Social Risk

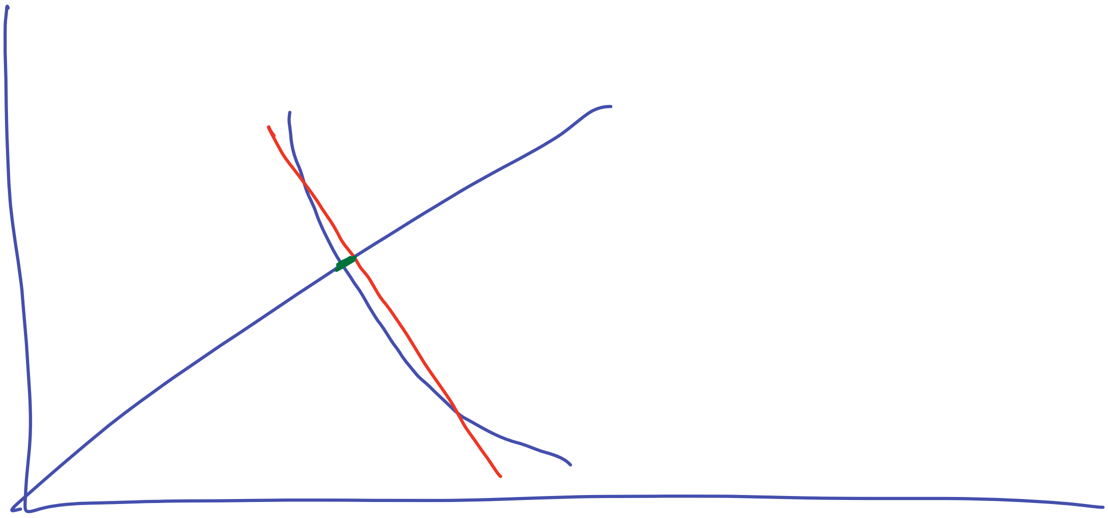
↳ No Private Risk in Optimum

(vi) Social Risk

	a	b	Σ
1	3	3	6
0	1	3	4



↳ If Social Risk & Both are Risk Averse, both will bear some risk



Chapter 3: Insurance Supply

Typical assumptions:

- Risk-neutrality
- Perfect Competition $\Rightarrow$ $P = MC = \pi$

$\hookrightarrow \boxed{p = \pi}$

[1] Imperfect Competition (Market Power) $\xrightarrow{IO}$ $\Rightarrow p > MC$

[2] Asymmetric Information ✓

[3] Insurance Cost — Raviv Model

[4] Bankruptcy $p = \pi + \varepsilon \delta$ — Risk Pooling

[5] Risk-averse shareholders $p = \pi + \varepsilon$ — Risk-Spreading

[6] Behavioral Insurance — C4

ε iid

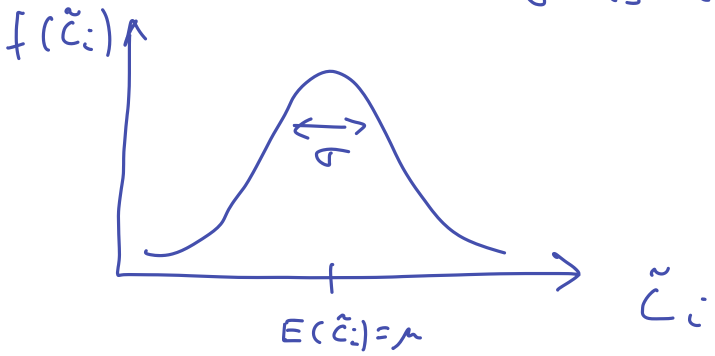
identically — independently

Risk Pooling

Expected Claim of 1 Customer

$$\boxed{\tilde{C}_i \sim \square(\mu, \sigma^2)}$$

σ is iid



$$\boxed{p = \mu}$$

$\Rightarrow p = E(MC)$

Answer: Reserves

$$p = \mu + \underbrace{\frac{R(n)}{n}}_{\lim_{n \to \infty} \varepsilon \,=\, 0} \uparrow \downarrow$$

Number of Customers ↑

Total Claims

$$\boxed{\sum_i \tilde{C}_i = \tilde{C}_n \sim (\underbrace{n\mu}_{\text{Mean}} ; \underbrace{n \cdot \sigma^2}_{\text{Variance}})}$$

$$E(\tilde{C}_n) = E\left(\sum C_i\right) = E[n \cdot C_i] = n \cdot E(C_i)$$

$$= n \cdot \mu$$

$$Var(\tilde{C}_n) = Var\left(\sum C_i\right) = \sum Var(C_i) + \underbrace{\cancel{\sum_i Cov(C_i, C_j)}}_{=0}$$

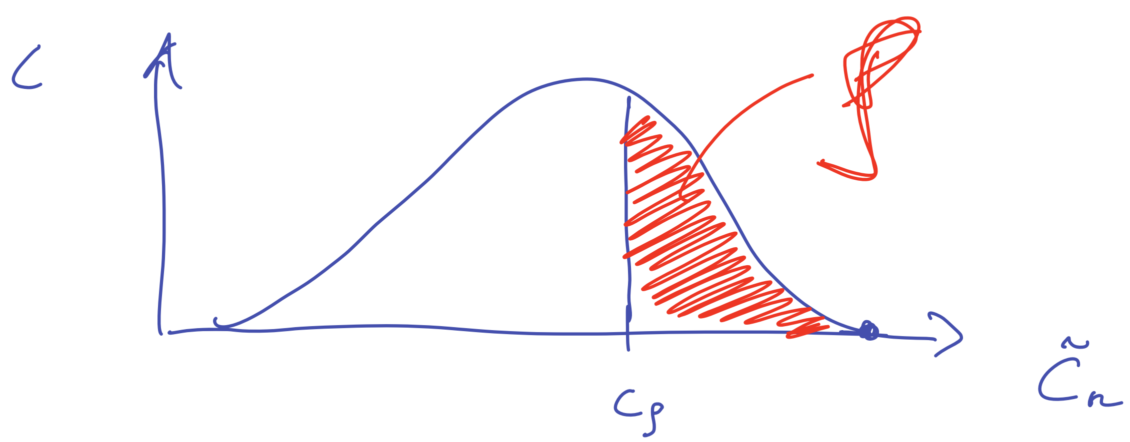
$$\bar{C}_n = \frac{1}{n}\sum \tilde{C}_i \Rightarrow \boxed{\bar{C}_n \sim \left(\mu, \frac{\sigma^2}{n\uparrow}\right)}$$

Sample Mean

StdError

$$\boxed{P = \mu + \varepsilon \downarrow^{n \to \infty}}$$

$$P = \mu + \varepsilon \uparrow$$



$$\boxed{R = n \cdot \tilde{C}_n}$$