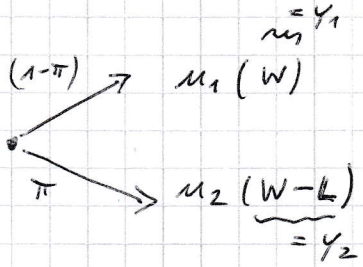
Question 1: Insurance Demand

a) [15 points]

- **Setup:**
  - W = initial endowment
  - π = probability of Loss L
  - $u_1'(y) > u_2'(y)$
  - $p = \pi$ (fair premium)



- **Calculate slope of indifference curve** [2 Points]

$$E(u) = (1-\pi) \cdot u_1(y_1) + \pi \cdot u_2(y_2)$$

$$\hookrightarrow \boxed{\frac{dy_2}{dy_1} = -\frac{(1-\pi)}{\pi} \cdot \frac{u_1'(y_1)}{u_2'(y_2)}}$$

Marginal rate of substitution = Slope of IC

- **Slope of IC where it crosses security line** [3 Points]

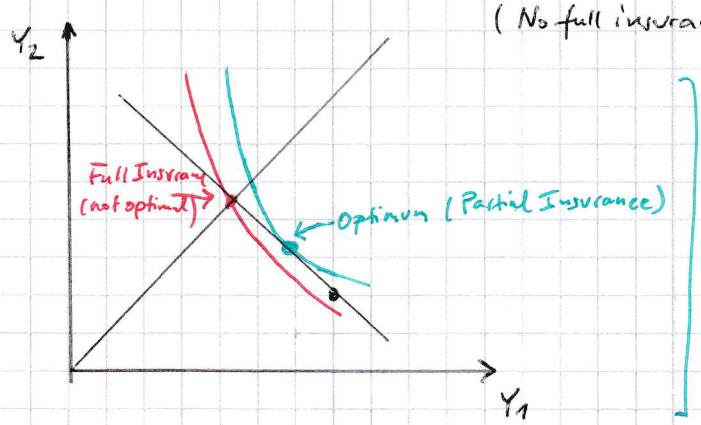
$y_1 = y_2 = y$

$$\hookrightarrow \left.\frac{dy_2}{dy_1}\right|_{y_1=y_2} = -\frac{1-\pi}{\pi} \cdot \frac{u_1'(y)}{u_2'(y)} \quad \begin{cases} < -\frac{1-\pi}{\pi} > -\frac{1-p}{p} \\ \text{because } u_1' > u_2' \end{cases}$$

[5 points]

- ↳ This means that IC is steeper than budget line on certainty line
  - ↳ Full insurance (as in $y_1 = y_2$) not optimal
    - ↳ Instead, the optimum (point of tangency) has to be to the South East
      - ↳ Less than full insurance (Intuition: Marginal Income is less valuable in state 2, hence the individual wants more income in state 1 (No full insurance)

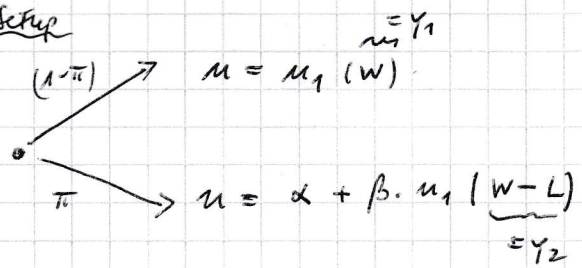
- **Graphical Illustration**



[5 Points]

b) [10 points]

- Setup



- Maximization Problem:

$$\max_C E[u] = (1-\pi)\cdot u_1(W-pC) + \pi \cdot u_2(W-pC-L+C)$$
$$= (1-\pi)\cdot u_1(W-pC) + \pi \cdot u_2(W+(1-p)\cdot C - L)$$

[3 Points]

First-Order Condition:

$$\text{FOC: } \frac{\partial E(u)}{\partial C} = \underbrace{(1-\pi)(-p)\cdot u_1'(y_1)}_{\text{Expected Marginal Cost of Buying Insurance}} + \underbrace{\pi\cdot(1-p)\cdot u_2'(y_2)}_{\text{Expected Marginal Benefit of Buying Insurance}} \overset{!}{=} 0$$

[5 Points] [2 Points]

Rewrite FOC:

$$\boxed{-(1-\pi)(p)\cdot u_1'(W-pC) + \pi(1-p)\cdot \beta u_1'(W+(1-p)C-L) = 0}$$

c) [15 Points]

→ Increase in α:

$$\frac{dC^*}{d\alpha} = -\frac{dFOC/d\alpha}{dFOC/dC} = \frac{0}{SOC} = 0$$

[3 Points] (Formula) [2 Points] (Result)

⇒ No change in insurance demand as (absolute) level of utility increases in loss state [2 Points] (Interpretation)

→ Increase in β:

$$\frac{dC^*}{d\beta} = -\frac{dFOC/d\beta}{dFOC/dC} = -\frac{\overset{(+)}{\pi}\overset{(+)}{(1-p)}\cdot u_1'(y_2)}{\underset{(-)}{SOC}} > 0 \quad \left\{ < 0 \right.$$

[2 Points] (Formula) [3 Points] (Result)

⇒ Insurance demand increases, as marginal utility in loss state increases [3 Points] (Interpretation)

Question 2: Insurance Supply

a) [10 points]

Possible explanations:

- Shareholders are risk averse and firms are not infinitely large, hence risk-spreading is not perfect → Firm wants profit smoothing and buys insurance to achieve this
- Managers are risk-averse and participating in firm's profits (via bonus contracts). Hence, they prefer income smoothing and buy insurance
- Risk of bankruptcy if reserves are too low creates ~~convex~~ concave profit function. Hence a firm wants to have insurance to insure catastrophic risks at the least
- Convex tax structures can also create concave profit functions, which induces quasi risk-aversion and demand for insurance

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b) [10 points]

- One of the assumptions in the risk-pooling model is likely violated in real world
  - ↳ Risks of individual claims can be positively correlated for primary insurer
    - ↳ In that case, reserves can be too low to pay out all claims in a particularly bad year
    - ↳ Reinsurance firm will become insurer of last resort

Question 3: Behavioral Insurance

a) [7 points]

- See slides 21/22/26 of Chapter 4

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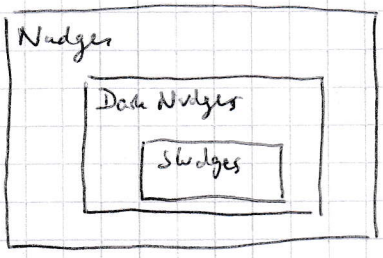
b) [7 points]

- Nudges are a superset of Dark Nudges, which are a superset of Sludges [1P]



- Dark Nudge: A nudge with the aim of influencing behaviour that goes against the self interest of an individual [3P]
- Sludge: A nudge that makes advantageous behavioral change more difficult [3P]

~~Example:~~

~~Nudge~~

c) [7 points]

- Nudge Example: [E.g. Asking for pre-commitment to increase pension contribution] [2P]
- Dark Nudge Example: [E.g: Using anchoring to sell overpriced travel insurance on airline website] [3P]
- Sludge Example: [E.g.: Requiring a multi-step procedure to cancel an insurance contract] [2P]

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d) [9 points]

① Re-commitment to increase contribution rate before a scheduled pay increase [2P]

↳ Behavioral Bias: Endowment Effect [1P]: Reducing Net Pay more painful than Not Getting Net Pay
↳ Hence pre-commit before Pay Increase realizes, therefore avoiding Endowment Effect [1P]

② Automated Increase in contribution rate for future pay increases [2P]

↳ Status Quo Bias [1P]: Individuals tend towards inaction. This nudge exploits this [1P]

- Both are nudges, as they do not prescribe/mandate or forbid any options, does not make it overly difficult to avoid the nudge and does not change incentives [1P]