Exam Solution
Insurance Economics

1. **[45 marks] Insurance demand**

(a) **[5 marks]**

You are given the utility function:

$$u(y) = y - \delta y^2$$

To determine risk preferences, inspect the second derivative:

$$u''(y) = -2\delta < 0 \quad (\text{since } \delta > 0)\textbf{[3]}$$

This indicates that the utility function is strictly concave, so the individual is

$\boxed{\text{risk-averse.}}$ **[2]**

(b) **[8 marks]**

The Arrow–Pratt coefficient of absolute risk aversion is defined as:

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

Compute first and second derivative:

$$u'(y) = 1 - 2\delta y, \quad u''(y) = -2\delta$$

Thus:

$$\boxed{A(y) = \frac{2\delta}{1 - 2\delta y} > 0}$$

Hence, the individual is indeed $\boxed{\text{risk-averse.}}$ **[4]**

To determine how risk aversion changes with income inspect the formula:

$$A(y) = \frac{2\delta}{1 - 2\delta y}$$

As income y increases, the denominator $1 - 2\delta y$ decreases, causing the overall expression to increase. Therefore:

$\boxed{\text{The individual exhibits increasing absolute risk aversion (IARA).}}$ **[3]**

For an alternative way to find out how their risk aversion changes as income increases, differentiate:

$$\frac{dA(y)}{dy} = \frac{4\delta^2}{(1 - 2\delta y)^2} > 0$$

Same result: The individual exhibits IARA.

This is generally viewed as unrealistic, since most individuals become less risk-averse as their wealth increases (DARA). **[1]**

(c) **[8 marks]**

You are given:

$$q^* = ay + bL + c$$

with:

$$a = \frac{p-\pi}{D}, \quad b = \frac{\pi(1-p)}{D}, \quad c = \frac{p-\pi}{2\delta D}, \quad \text{where } D = p^2(1-\pi) + \pi(1-p)^2$$

Set $p = \pi$. Then:

$$a = 0, \quad c = 0, \quad b = \frac{\pi(1-\pi)}{\pi(1-\pi)[\pi + (1-\pi)]} = 1 \text{ [3]}$$

So:

$$q^* = bL = L \quad \Rightarrow \quad \boxed{q^* = L} \text{ [2]}$$

Intuition: When the premium is actuarially fair ($p = \pi$), a risk-averse individual will choose full coverage ($q^* = L$). This is a standard result in insurance economics – when insurance is priced fairly, risk-averse individuals optimally transfer all risk to the insurer by purchasing full coverage. The wealth level doesn't affect this decision when premiums are fair. **[3]**

(d) **[6 marks]**

If $p = \pi$, then from above you know:

$$q^* = L \quad \Rightarrow \quad \boxed{\frac{\partial q^*}{\partial y} = 0} \text{ [3]}$$

Intuition: Under fair pricing, the optimal choice is always full coverage regardless of income level. This is because the fair premium exactly compensates for the expected loss, making full insurance the utility-maximizing choice at any wealth level. This result is consistent with the basic insurance principle that fair insurance eliminates all risk, which is optimal for any risk-averse individual regardless of their wealth. **[3]**

(e) **[8 marks]**

If $p > \pi$, then:

$$\frac{\partial q^*}{\partial y} = a = \frac{p-\pi}{D} > 0 \text{ [3]} \quad \Rightarrow \quad \boxed{\frac{\partial q^*}{\partial y} > 0} \text{ [2]}$$

Intuition: With IARA preferences, the individual's absolute risk aversion increases with income. As the person becomes wealthier, their willingness to pay for insurance increases. In this setting, insurance behaves as a *normal good*: demand increases with income due to rising risk sensitivity. **[3]**

(f) [10 marks]

If $p < \pi$, then:

$$\frac{\partial q^*}{\partial y} = a = \frac{p - \pi}{D} < 0 \; \textbf{[3]} \quad \Rightarrow \quad \boxed{\frac{\partial q^*}{\partial y} < 0} \; \textbf{[2]}$$

Intuition: When insurance is underpriced, the individual may purchase more than full coverage – not to eliminate risk, but to profit from the contract. This is akin to a risky investment with a positive expected return. Though risk-averse, the individual tolerates this risk due to the favorable expected value. However, with IARA, increasing wealth reduces their willingness to accept this additional variability, leading to lower "insurance" demand at higher income levels (*inferior good*). **[5]**

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2. **[25 marks] Insurance supply**

(a) **[4 marks]**

In a perfectly competitive insurance market, insurers must offer contracts that maximize consumer utility, as any contract that fails to do so would be outcompeted. This means insurers cannot charge more than what is utility-maximizing for customers – any markup would be competed away.

In the absence of any insurance cost, the optimal (first-best) contract is full insurance at an $\boxed{\text{actuarially fair premium, } p = \pi.}$ This contract eliminates all risk for the risk-averse consumer without a change in their expected income (basically 'for free"). **[5]**

Not asked, but helpful: However, this outcome is not feasible in practice because insurers typically face non-zero (physical) costs of insurance provision. If insurers charged only $p = \pi$, they would operate at a loss.

Not asked, but helpful: The Raviv model addresses this tension by examining how optimal contract structures change when insurers must recover costs while still competing for consumer demand.

(b) **[7 marks]**

If the insurer faces a fixed cost to offer any contract (regardless of claims or payout), but no marginal cost, then the optimal contract is still full insurance. The insurer recovers the fixed cost by charging a lump-sum fee. **[3]**

Intuition: Since marginal pricing remains fair, full insurance maximizes the customer's utility. The only constraint is to recover the fixed cost. The result is a two-part tariff: a lump-sum to cover fixed costs and an actuarially fair premium. The customer either accepts full insurance or opts out (if the lump-sum is too high). Partial insurance is not optimal in this setting. **[4]**

(c) **[7 marks]**

If the insurer's cost increases linearly with the amount of coverage, marginal cost exceeds the actuarially fair rate, so full insurance is too expensive.

The optimal contract features a deductible: the individual bears losses up to a threshold D, and the insurer provides full coverage above D. **[3]**

Intuition: Covering small losses is not cost-effective. A deductible removes inefficient coverage at the low end of the loss distribution. Risk-averse individuals prefer deductibles to coinsurance under linear costs because deductibles second-order stochastically dominate coinsurance: they offer more protection in the worst states. In a competitive market, any insurer offering inefficient designs would lose customers to more efficient alternatives. **[4]**

(d) **[7 marks]**

If the insurer's cost function is convex then covering large losses fully is no longer efficient. A deductible alone cannot address this: as it rises to avoid high marginal costs, it also removes coverage from intermediate loss levels, which greatly reduces the contract's value. The optimal contract combines a deductible with coinsurance above the deductible. **[3]**

Intuition: Coinsurance limits the insurer's exposure in high-cost states while preserving some protection. This structure avoids the inefficiency of full coverage when costs rise steeply, while maintaining value for the insured. It is the only contract form that balances cost recovery and consumer utility in a competitive market where customers can switch to better offers. **[4]**

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3. **[20 marks] Behavioural insurance**

(a) **[8 marks — 4 marks for each bias]**

There may be many more, but two prominent behavioural biases that may lead the consumer to accept the overpriced offer are:

(1) Anchoring: The insurance price is mentally compared to the price of the smartphone rather than evaluated on its own merits. For example, if the smartphone costs, say, EUR 900 and the insurance is offered for EUR 90 at checkout, the consumer may perceive the insurance as cheap (only 10% of the phone's value), even if the same policy is available online for EUR 45. The high anchor of the phone price distorts their perception of value.

(2) Loss aversion: At checkout, the consumer has psychologically taken ownership of the phone. The idea of losing or damaging it shortly after purchase is framed as a loss of a newly gained item. Because losses loom larger than equivalent gains, the consumer may overweight the pain of losing the phone relative to the objective risk. This increases willingness to pay for insurance as a way to "lock in" the gain and avoid regret – even if the policy is overpriced.

These biases operate simultaneously: the anchoring effect makes the price seem reasonable, while loss aversion amplifies the perceived benefit of protection.

(b) **[12 marks]**

Pros and cons of regulating this practice:

Some pros (there are more) [2]:

- Regulation can prevent consumers from being systematically exploited due to predictable cognitive biases, such as anchoring and loss aversion.
- Reducing overpayment may improve allocative efficiency by helping consumers make more informed, welfare-enhancing decisions.
- Regulating add-on pricing may encourage more transparent and competitive pricing practices, especially in digital marketplaces where search frictions are high.

Some cons: (there are more) [2]:

- Overregulation could discourage firms from offering insurance products that may still provide value to certain consumers (e.g., those with high risk aversion or low liquidity).
- Behavioural regulation risks overreach or paternalism. If consumers are prevented from choosing what they perceive as convenient (even at a higher price), regulation may infringe on individual autonomy and preferences.
- Implementing and monitoring behavioural rules across all online retailers may be costly and difficult to enforce uniformly.

Three potential regulatory tools (there are more) and their ranking: [2 for each]

(1) Disclosure requirements: Require sellers to inform consumers that the same policy is available at a lower price elsewhere (e.g., “This policy is also available for €7/month on the insurer’s website”). This targets the anchoring bias by encouraging price comparison.

(2) Cooling-off periods: Allow consumers to cancel the policy within 14 days without penalty. This counteracts impulsive checkout decisions by giving consumers time to reassess once the salience of the purchase fades.

(3) Pricing regulation: Impose a cap on markups for point-of-sale insurance or require insurers to unify pricing across channels. This directly prevents exploitative pricing but constrains firm behavior.

Ranking by liberty preservation [2]:

- **Most liberty-preserving:** Disclosure – empowers consumers without limiting choice.
- **Middle:** Cooling-off period – protects consumers from momentary bias but still allows freedom of choice.
- **Least liberty-preserving:** Pricing regulation – directly restricts firm pricing strategy and removes higher-priced options, even if some consumers might value convenience.

Note: Many students did not mention specific policies but general regulation tools (bans, mandates, incentives, nudges, information provision), which also earned them full points if they were explained and ranked well.

In summary, Behavioural IO supports targeted regulation where systematic biases distort consumer choice, but policymakers must weigh effectiveness against autonomy and market flexibility.