ACSC/STAT 3703, Actuarial Models I

WINTER 2023

Toby Kenney

Homework Sheet 1

Due: Wednesday 25th January: 11:30

Note: This homework assignment is only valid for WINTER 2023. If you find this homework in a different term, please contact me to find the correct homework sheet.

Basic Questions

1. A customer has utility function $u(x) = \log(x)$. The customer's current wealth is \$18,000. The customer's car has a value of \$11,300. The probability of the car being stolen is 0.01. How much would the customer be willing to pay for insurance against the car being stolen?

2. Which of the following risks are insurable? For risks which are not insurable, explain why they are not insurable.

   (i) The risk of an individual being killed by a meteorite.

   (ii) The risk that an airline will have fewer flights in winter than in summer.

   (iii) The risk that poor weather will adversely affect a farmer's crops.

   (iv) The risk that a couple will divorce.

   (v) The risk that a \$5 child's toy will be broken.

   (vi) The risk that a debt will not be repaid.

   (vii) The risk that you fail this course.

   (viii) The risk that investors will not make enough money on the stock market.

3. A homeowner's house is insured at \$470,000. The insurer requires 80% coverage for full insurance. The home sustains \$12,800 damage from wind. The policy has a deductible of \$5,000, which decreases linearly to zero when the total cost of the loss is \$15,000. The insurance company reimburses \$8,840. What value are they using for the house's value?

4. A tennant's insurance policy has a deductible of \$1,000, a policy limit of \$20,000 and co-insurance such that the policyholder pays 30% of the remaining claim. How much does the insurer pay if the loss is:

(i) \$800

(ii) \$6,200

(iii) \$21,400

Standard Questions

5. An insurer charges a loading of 28% on its policies with limit \$1,000,000, and a loading of 26% on its policies with limit \$500,000. It purchases stop-loss reinsurance of \$500,000 over \$500,000 for a loading of 45%. What percentage of the insurer's premiums for a policy with limit \$1,000,000 are paid to the reinsurer?

6. Policyholders are assumed to have a utility function $u(x) = -e^{-\frac{x}{15000}} - e^{-\frac{x}{30000}}$. Policyholder wealth is assumed to follow an exponential distribution with mean \$10,000. An insurance company is considering selling an insurance policy which covers a risk which causes a loss of \$3,000 with probability 0.02. The expenses for this policy are \$2 million plus \$2 per policy sold. If there are 2 million policyholders who might buy the policy, what will the expected profit on this policy be for the insurance company if they set the premium for each policy at \$65?