

Instructions

- i. This assignment contains some problems in elementary probability to give you an idea of the probabilistic pre-requisites for this course.
- ii. Parts carrying extra credits and starred problems are not required part of the assignment. Nevertheless, a serious attempt followed by a discussion of these during office hours is encouraged.
- iii. Constructive comments on the assignments and for that matter any other aspect of the course will be welcomed.

Problem 1 Consider a decision maker with an exponential utility function given by

$$u_\alpha(w) = -\exp\{-\alpha w\}, \quad \forall w$$

Let G_α be the break-even premium or net premium that the decision maker is willing to pay for full insurance against a possible loss modeled by the random variable X . In class we used the moment generating function to show that

$$\lim_{\alpha \rightarrow 0} G_\alpha = \mathbb{E}(X)$$

Here we give a reason to expect the above to happen; to this end, do the following problems.

- i. Show that the net premium is the same with respect to the modified utility function, say $u^*(\cdot)$, given by

$$u_\alpha^*(w) = \frac{1 - \exp\{-\alpha w\}}{\alpha}, \quad \forall w$$

- ii. Find the limiting utility function defined as $\lim_{\alpha \rightarrow 0} u_\alpha^*(\cdot)$ - Show that it is a linear utility function.
- iii. Confirm that the expectation is the net premium with respect to any linear utility function.

The following problems are from the text, *Actuarial Mathematics*: 1.2 part d, 1.13, 1.14, 1.18 and 1.19.

Problems 1.21, 1.22 and 1.23 all carry extra credits - I would add that in my opinion they are a "must do" for all passionate actuaries.