Formal Models: Section 2 Exercises*

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Exercise 1

A lottery pays \$25 with probability 0.6 and \$0 with probability 0.4.

For each decision-maker with the following utility functions:

- (a) Calculate the expected monetary value
- (b) Calculate the expected utility
- (c) Find the certainty equivalent
- (d) Classify their risk attitude

Part i: $u(x) = 3x + 5$

1.i.a: Calculate the expected monetary value.

1.i.b: Calculate the expected utility.

*These exercises are original work. Any errant mistakes are mine alone.

1.i.c: Find the certainty equivalent.

1.i.d: Classify their risk attitude.

Part ii: $u(x) = x^{\frac{1}{2}} + 2$

1.ii.a: Calculate the expected monetary value.

1.ii.b: Calculate the expected utility.

1.ii.c: Find the certainty equivalent.

1.ii.d: Classify their risk attitude.

Part iii: $u(x) = x^2$

1.iii.a: Calculate the expected monetary value.

1.iii.b: Calculate the expected utility.

1.iii.c: Find the certainty equivalent.

1.iii.d: Classify their risk attitude.

Exercise 2

A voter supports a policy reform if their personal benefit B_i exceeds the cost C. The benefit has an idiosyncratic component: $B_i = \beta + \epsilon_i$, where β is a base benefit and ϵ_i follows a distribution with CDF G and density g (symmetric around 0, single-peaked).

The probability voter i supports reform is: $P_i = 1 - G(C - \beta)$.

(a) What is $\frac{\partial P_i}{\partial \beta}$? Calculate and interpret it.

(b) What is $\frac{\partial P_i}{\partial C}$? Calculate and interpret it.

Exercise 3

A voter decides whether to vote or abstain. Voting costs $c > 0$ jollies. If the voter votes, they are pivotal with probability $p \in (0, 1)$ and can secure their preferred outcome worth v jollies. If they vote but are not pivotal, the outcome is decided by a coin flip: their preferred outcome occurs with probability 0.5, giving them v jollies, and their non-preferred outcome occurs with probability 0.5, giving them 0 jollies. If they abstain, the outcome is also decided by a coin flip with the same probabilities: their preferred outcome occurs with probability 0.5, giving them v jollies, and their non-preferred outcome occurs with probability 0.5, giving them 0 jollies.

(a) Write the expected utility of voting and the expected utility of abstaining.

(b) What condition determines whether the voter turns out?

(c) How does an increase in p affect the turnout decision? Interpret your answer.