

EC 313 Spring 2000 Problem Set 3

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Due Tuesday 21 March 2000 at classtime

Produce a Mathematica notebook containing the answers to these questions, label it with your name, and email it (as an email attachment) to baum@bc.edu to submit your problem set. I will be glad to answer any clarifying questions; please stop by or send me email.

The constant relative risk aversion (CRRA) utility function is defined as $U(W, \rho) = W^{1-\rho} / (1-\rho)$, where ρ is the coefficient of risk aversion. Define the CRRA function.

1. A risk premium, γ , could be considered the amount a CRRA consumer is willing to pay (e.g. as an insurance premium) to avoid a loss. Consider a consumer with a 50 per cent chance of incurring a loss of \$2 (versus no loss nor gain). The risk premium is the amount that would equalize utility of the insured consumer to that of the uninsured consumer (i.e. at this level of premium, the consumer would be indifferent toward insurance). Use numerical methods (hint: FindRoot) to find the risk premium that makes the consumer with wealth of \$10 indifferent if her $\rho=3$.

2. This problem can be solved algebraically (by hand, not by Mathematica). Solve for the risk premium, define a risk premium function (in terms of wealth, ρ and level of loss) and verify that the risk premium generated by this function agrees with your numerical solution.

3. Using this risk premium function, graph the risk premium (for $\rho=3$) as a function of the loss for loss levels of \$0 through \$10 (again, assuming that a loss is 50 per cent likely).

4. Consider a CRRA consumer with an opportunity to invest in a risky asset. The asset has a 50 per cent chance of returning 70 per cent of the amount invested and a 50 per cent chance of losing 30 per cent of the amount invested. Fix wealth at \$10 and ρ at 3, and plot expected utility versus the amount invested for investments of \$0 through \$10.

5. Find the optimal amount of investment for this consumer (hint: you want to maximize her utility, or minimize its negative (see FindMinimum)).

6. Recalculate the optimal investment amount if the odds for gain vs. loss are altered to 55-45 percent in favor of gains.