

Problem Set 6: Crime

Assigned: Dec. 5

Answers: Dec. 8

Final Exam: Friday, Dec. 22, 9:00 a.m. to noon

Alternate Exam: Tuesday, Dec. 19, 7:30 p.m. to 10:30 p.m.

Part A: Expectation of Continuous Random Variable

Question A1. Let X be a uniformly distributed random variable on $[0, 1]$. Compute the expectation of X^2 .

Question A2. Again, let X be a uniformly distributed random variable on $[0, 1]$. Let $Y = X$ if $X < K$ and $Y = 0$ otherwise. Compute the expectation of Y .

Part B: Costly Punishment

Take the extended model studied in class with probability of detection d , cost of detection $c(d) = (\alpha d)/(1-d)$, benefit of crime $b \sim U[0, 1]$, harm from crime h , and punishment $f \in [0, \bar{f}]$. To make the subsequent analysis easier, we will make some simplifying assumptions. Namely, assume $c(d) = 0$ (or, equivalently, $\alpha = 0$) and assume d is fixed at some value d_0 (it is not a choice variable). Assume there is no limit to the level of punishment f (i.e., f is no longer assumed to be bounded above by \bar{f}).

Now the extension to the model: rather than assuming that the punishment (fine) is simply a costless transfer from the criminal to the authorities, we will assume that there is an additional social cost so that if a punishment of f is levied, the cost is λf for $\lambda > 0$. The interpretation of this assumption is that it is expensive to extract a fine from the criminal (may involve auditing, handling of large sums of money, etc.) if the punishment is a fine, or that the punishment is imprisonment and imprisonment is expensive. In any event, with the parameter λ , we can investigate the effect of increasing the cost to society of punishment.

Question B1. Find f^* , the optimal level of punishment for society, as a function of the other parameters in the model.

Question B2. Show that f^* may be increasing or decreasing in λ , depending on the parameters.