Choice under risk

Consider an individual who has to decide whether to commit a crime or enter the labor market. If they enter the labor market, the individual receives R, if they commit the crime there are 2 possible outcomes, they successfully steal and obtain 200 or they get caught by the police and receive 0. The probability of each situation is 0.5. The individual has the following utility function: $u = x^2$.

1. Is this individual risk-averse, risk-neutral, or a risk-seeker? What does this mean?
2. If $R = 100$, what does the individual prefer, to go out to steal or to enter the labor market?
3. Suppose that the State provides a bonus for those individuals who have a salary of $R = 100$. How much should this bonus be for the individual to decide to enter the labor market instead of stealing?
4. Returning to the situation where $R = 100$, suppose that the mayor decides to combat crime by increasing police presence. The mayor has the following utility: $u = x$, in case the individual decides to steal the mayor faces the following expected utility: $u = -200 * 0.5 + 0 * 0.5$. Where 0.5 is the probability of the individual getting caught. While if the individual does not steal, the mayor receives: $u = -w$, where w is the cost of increasing police presence. If the mayor can increase the probability of the individual getting caught to 0.80 at a cost of $w = 50$, is it worthwhile to do so? Justify.

Solution

1. The individual is a risk-seeker, that is, given two lotteries with the same expected value, they will prefer the lottery with greater variance in payments.

2. We calculate the expected utility of each situation:

$$0.5 * 200^2 + 0.5 * 0^2 = 20000$$

   While if they enter the labor market:

$$100^2 = 10000$$

   Therefore, they prefer to go out to steal.

3. The bonus plus the salary should be greater than the expected utility of stealing:

$$(x + 100)^2 \geq 20000$$

$$x \geq 41.42$$

   With a bonus of 41.42, the individual is indifferent between going out to steal and entering the labor market. Any amount exceeding this will make the individual decide to enter the labor market.

4. We calculate the minimum probability of being caught that must exist for the individual to decide to enter the labor market:

$$(1 - p) * 200^2 + (p) * 0^2 \leq 10000$$

$$40000 - 40000p \leq 10000$$

$$0.75 \leq p$$

   Therefore, if $p = 0.8$, the individual decides not to steal, and the mayor would have a utility of $u = -50$, which is better than the situation in which the individual decides to steal and the mayor receives $u = -200 * 0.5 = -100$.