

Quiz 3 (answer key)  
ECNS 491  
Spring 2018

\_\_\_\_\_Name

1.) (10 points) Chloe's utility of income is

$$u = 10I - (.001)I^2.$$

At her job, she has the opportunity to embezzle \$2,000, so that  $I_i = \$4,000$ . If she is caught, the sanction is such that  $I_i - s = \$1,000$ . The probability she is caught and convicted is  $p_c = .10$ . Solve for the legal income Chloe would have to earn to leave her indifferent between legal work and illegal activity.

Solve for  $I_L$  such that

$$u(I_L) = p_c u(I_i - s) + (1 - p_c) u(I_i)$$

$$\rightarrow 10I_L - .001I_L^2 = (.10)[10(1000) - (.001)(1000)^2] + (.90)[10(4000) - (.001)(4000)^2]$$

$$\rightarrow 10I_L - .001I_L^2 = 900 + 21,600$$

$$\rightarrow .001I_L^2 - 10I_L + 22,500 = 0$$

$$\rightarrow I_L = [10 \pm (10)^{-5}] / .002$$

$\rightarrow I_L = (3420, 6580)$ . Since 6580 is greater than  $I_i = 4000$ , we know that  $I_L = \$3420$  is the amount that leaves Chloe indifferent between legal work and illegal activity that comes with a probability of being caught.

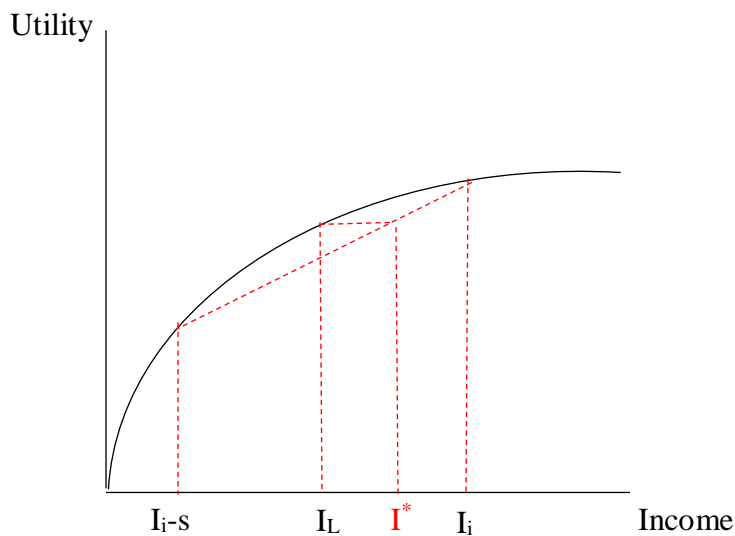
2.) (5 points) Suppose Rambo's utility of income can be modeled by the quartic root (i.e.,  $u(I) = I^{(1/4)}$ ). Is Rambo risk averse, risk seeking, or risk neutral in income? Show mathematically why your answer is correct.

$$u'(I) = (1/4)I^{(-.75)} > 0$$

$$u''(I) = -(3/16)I^{(-1.75)} < 0$$

Therefore, Rambo is risk averse.

3.) (5 points) In the diagram below, where  $I_L$  is income from legal work,  $I_i$  is income from illegal activity, and  $I_i - s$  is illegal income less sanction, illustrate a risk averse individual's risk premium (i.e., the extra expected income they require to compensate for giving up the certain legal income). Note that  $I_i > I_L > I_i - s$ .



Where risk premium =  $I^* - I_L$ .