# B.E. International Program
Faculty of Economics
Thammasat University

**EE311 Microeconomics Theory, Semester 1/2019**

**Homework Assignment #4 | Due date: Friday 27 September 2019**
**(in-class submission, before lecture begins!)**

**Instruction:**

1) Attempt all questions.
2) You may study and discuss in group but you have to write up your solutions independently and by handwriting only. Copying and/or Plagiarism is considered as a serious crime in academic arena and it will not be tolerated. If detected, all parties involved receive 'zero.'
3) If you have any questions, please feel free to email me at pwrasai@econ.tu.ac.th

## Risk and Information (Chapter 15)

1. What is the difference between the expected value of a lottery and the expected utility of a lottery?

11. You have a utility function given by $U = 2I + 10\sqrt{I}$. You are considering two job opportunities. The first pays a salary of $40,000 for sure. The other pays a base salary of $20,000, but offers the possibility of a $40,000 bonus on top of your base salary. You believe that there is a 0.50 probability that you will earn the bonus.
    a) What is the expected salary under each offer?
    b) Which offer gives you the higher expected utility?
    c) Based on your answer to (a) and (b), are you risk averse?

13. Based on these utility function, is the decision maker risk averse, risk neutral, or risk loving?
    a) $U = 10I - (1/8)I^2$
    b) $U = (1/8)I^2$
    c) $U = \ln(I + 1)$
    *d)* $U = 5I$

14. Consider Lottery *ABC,* where there is a 0.90 chance that you receive a payoff of $0 and a 0.10 chance that you receive a payoff of $400. Suppose that your utility function is U = $\sqrt{}$ I. Compute the risk premium of the lottery.

17. Consider a household that possesses $100,000 worth of valuables (computers, stereo equipment, jewelry, and so forth). This household faces a 0.10 probability of a burglary. If a burglary were to occur, the household would have to spend $20,000 to replace the stolen items. Suppose it can buy an insurance policy for $500 that would fully reimburse it for the amount of the loss.
    a) Should the household buy this insurance policy?
    b) What is the most the household would be willing to pay for this insurance?

19. You are a relatively safe driver. The probability that you will have an accident is only 1 percent. If you do have an accident, the cost of repairs and alternative transportation would reduce your disposable income from $120,000 to $60,000. Auto collision insurance that will fully insure you against your loss is being sold at a price of $0.10 for every $1 of coverage. Finally, suppose that your utility function is $U = \sqrt{I}$. You are considering two alternatives: buying a policy with a $1,000 deductible that essentially provides just $59,000 worth of coverage, or buying a policy that fully insures you against damage. The price of the first policy is $5,900. The price of the second policy is $6,000. Which policy do you prefer?

20. Consider a market of risk-averse decision makers, each with a utility function $U = \sqrt{I}$. Each decision maker has an income of $90,000, but faces the possibility of a catastrophic loss of $50,000 in income. Each decision maker can purchase an insurance policy that fully compensates her for her loss. This insurance policy has a cost of $5,900. Suppose each decision maker potentially has a different probability $q$ of experiencing the loss. What is the smallest value of $q$ so that a decision maker purchases insurance?

22. A small biotechnology company has developed a burn treatment that has commercial potential. The company has to decide whether to produce the new compound itself or sell the rights to the compound to a large drug company. The payoffs from each of these courses of action depend on whether the treatment is approved by the Food and Drug Administration (FDA), the regulatory body in the United States that approves all new drug treatments. (The FDA bases its decision on the outcome of tests of the drug's effectiveness on human subjects.) The company must make its decision before the FDA decides. Here are the payoffs the drug company can expect to get under the two options it faces:

| Outcome | Probability | Decision: Sell the Rights | Decision: Produce Yourself |
|---|---|---|---|
| FDA approves | 0.20 | $10 | $50 |
| FDA does not approve | 0.80 | $ 2 | −$10 |

*(payoffs are in millions of dollars)*

a) Draw a decision tree showing the decisions that the company can make and the payoffs from following those decisions. Carefully distinguish between chance nodes and decision nodes in the tree.
b) Assuming that the biotechnology company acts as a risk-neutral decision maker, what action should it choose? What is the expected payoff associated with this action?
c) Suppose that the biotech company can conduct its own test—at no cost—that will reveal whether the new drug will be approved by the FDA. What is the biotech company's VPI?

***"The biggest risk is not taking any risk."***
*Mark Zuckerberg*