

UNIVERSITÄT ZU KÖLN
Markets for Risk Management

Problem Set #1
28 May 2013
Professor Garven

Problem #1: Demand for Insurance (33 points)

Suppose you wish to insure an asset valued at €100. Only two states of the world can occur in the future, FIRE and NO FIRE, with probabilities .25 and .75 respectively. In the FIRE state, the asset is completely destroyed. Your initial wealth (including this asset) is €120, and your utility $U(W) = \ln W$.

1. (11 points) Suppose an insurer offers to fully insure your fire risk for a premium of €25. Should you purchase this insurance policy? Why or why not?
2. (11 points) If the premium for full coverage is €35, should you fully insure? Why or why not?
3. (11 points) What is the maximum premium you are willing to pay to fully insure this risk? Explain how you determined the answer to this question.

Problem #2: Moral Hazard (33 points)

The sole owner and manager of EMH, Inc. is a fellow by the name of Fama. Fama is risk averse, with utility $U(W) = \sqrt{W}$. The EMH factory facility is worth €3 million, and the main business risk facing EMH, Inc. is a factory fire. If the EMH factory burns down, the company will suffer a complete loss of €3 million. Fama also has €1 million in the bank that is *not* at risk. His initial wealth therefore consists of his €3 million factory plus his €1 million bank account.

The probability of a factory fire depends in part upon whether Fama runs a fire prevention training program at the EMH factory. It costs €100,000 to run such a program. If he does not run the program, probability of a factory fire is 5%. However, if he runs the program, this would reduce the probability of a factory fire down to only 1%.

In parts B and C below, Ace Insurance Company is a risk-neutral insurer who cannot observe whether Fama conducts the fire prevention program.

1. (11 points) If Fama has no insurance, will he run the fire prevention program? Why or why not?
2. (11 points) What is the maximum price that Fama would be willing to pay for full insurance coverage?
3. (11 points) What is Ace Insurance Company's expected profit if it offers EMH, Inc. the full insurance policy for the maximum price in part (B)?

Problem #3: Adverse Selection (34 points)

You are an insurer. All of your clients are arbitrarily risk averse; in the absence of insurance, each one of them starts out with €150 in initial wealth and loses €100 if they are involved in an accident. The insurance policies you can offer them are also shown, as well as the insured wealth under each policy:

	premium	Indemnity (payment by the insurer to the client)	wealth in non-loss state	wealth in loss state
uninsured wealth			€150	€50
policy A	€12	€44	€138	€94
policy B	€26	€100	€124	€124
policy C	€76	€100	€74	€74

Half of your clients have a probability of loss equal to .75, the others have probability of loss equal to .25. They know their risks but you don't. You do know that the high-risk clients rank the contracts, best to worse, in this order:

- High risk clients' insurance preferences: policy B is preferred to policy C, policy C is preferred to policy A, and policy A is preferred to not being insured.

The low-risk clients prefer the contracts in this order:

- Low risk clients' insurance preferences: policy B is preferred to policy A, policy A is preferred to not being insured, and not being insured is preferred to policy C.

Which policies should you offer if you are interested in maximizing the expected value of profit? Your choices are to offer 1) all three policies, 2) policies A and B, 3) policies A and C, 4) policies B and C, 5) just policy A, 6) just policy B, 7) just policy C, and 8) no policies. Explain carefully by showing that your choice produces a higher expected value of profit than any of the other possible choices that you can make.