

BAYLOR UNIVERSITY  
HANKAMER SCHOOL OF BUSINESS  
DEPARTMENT OF FINANCE, INSURANCE & REAL ESTATE

Problem Set #6  
Dr. Garven

Name: \_\_\_\_\_

Problem #1 (50 points)

Suppose you own a company which you expect will earn the following set of state-contingent profits, *prior* to compensating your company’s manager:

	<b>Weak Economy Profit</b> ( $\pi_{weak}$ )	<b>Average Economy Profit</b> ( $\pi_{average}$ )	<b>Good Economy Profit</b> ( $\pi_{good}$ )	<b>Expected Profit</b> ( $E(\pi)$ )
$p_s$	33.33%	33.33%	33.33%	
Low Effort $\pi_s$	\$10,000,000	\$20,000,000	\$30,000,000	\$20,000,000
High Effort $\pi_s$	\$12,500,000	\$25,000,000	\$37,500,000	\$25,000,000

As shown here, state-contingent profits depend jointly on the state of the economy *and* the manager’s effort level. Specifically, if the manager selects a low effort level, then your business is less profitable than when the manager selects a high effort level; specifically,  $E(\pi_{low\ effort}) = \$20$  million compared with  $E(\pi_{high\ effort}) = \$25$  million.

The manager’s utility  $U(W) = \begin{cases} \sqrt{W} & \text{under low effort} \\ \sqrt{W} - 50 & \text{under high effort} \end{cases}$  and her initial wealth is  $W_0 = \$0$ . Therefore, “minus 50” indicates the manager’s *disutility* associated with expending high rather than low effort.

As the risk neutral owner of this company, you wish to maximize expected profit, net of the cost of the manager’s compensation. You are considering three mutually exclusive compensation schemes:

- Compensation Scheme #1: a fixed salary of \$1,000,000;
- Compensation Scheme #2: a payment of 7 percent of profits; or
- Compensation Scheme #3: a salary of \$800,000 plus 25% of any profits above \$25 million.

Calculate the manager’s expected utility for each compensation scheme, under low and high effort scenarios. Also calculate expected profit for each compensation scheme, under low and high effort scenarios. As this company’s owner, which compensation scheme will you select, and why?

Problem #2 (50 points)

Assume that all drivers are risk averse with utility  $U(W) = \sqrt{W}$ . Each driver has cash in the amount of \$600 and owns a car worth \$2,000 (thus initial wealth  $W_0 = \$2,600$  for all drivers). However, drivers have different probabilities of crashing their cars; some are high risk ( $p_H = 30\%$ ), some are medium risk ( $p_M = 20\%$ ), and others are low risk ( $p_L = 10\%$ ). There are only two states of the world, crash and no crash. In the crash state, drivers suffer a total loss; i.e., cars become worthless whenever crashes occur.

Insurance is available, although it is not compulsory. Thus, drivers insure themselves only if the expected utility of being insured exceeds the expected utility of going without insurance.

While insurers know that there are equal numbers of high, medium, and low risk drivers, there is asymmetric information; specifically, insurers cannot identify *which* drivers are high, medium, and low risk.

- A. Liberty Insurance Company is a monopolist; it has no competitors, so insurance can only be obtained from Liberty. Liberty offers full ( $\alpha = 1$ ) coverage insurance policies for \$400. Which drivers purchase policies at this price, and which drivers go without insurance? What is Liberty Insurance Company's average profit (or loss) per policy sold?
- B. Suppose Liberty Insurance Company raises the price for full coverage insurance policies from \$400 to \$500. At this price, which drivers purchase policies and which drivers go without insurance? What is Liberty Insurance Company's average profit (or loss) per policy sold, given this increase in price?
- C. Suppose a new insurance company (Gecko Insurance Company) is formed for the purpose of challenging Liberty Insurance Company's monopoly. Gecko offers three different policies: 1) a full coverage ( $\alpha = 1$ ) policy for \$600, 2) a partial coverage ( $\alpha = .4$ ) policy for \$160, and 3) a partial coverage ( $\alpha = .15$ ) policy for \$30. Which policies offered by Gecko and Liberty (if any) will high, medium, and low risk drivers select in this more competitive environment?
- D. What impact will Gecko's entry into the insurance market have upon the average profit (or loss) per policy sold by Liberty Insurance Company?
- E. What is the average profit (or loss) per policy sold by Gecko Insurance Company?