Cason Konzer ECN 370 Homework #6, Fall 2022-3

Friday, December 2, 2022 3:36 AM

ECN 370
Homework 6
Due: Thursday, December 8th by the end of the day

Directions: Please complete this homework on a separate piece of paper and email your answers to me at ccdougla@umich.edu. A .pdf file is preferred, though any file works in practice. I will email you the solutions after I receive your homework. I will also post solutions on Blackboard the day after the due date.

1. Suppose you have a job paying $50,000 per year. There is a 5% chance next year your wage will be reduced to $20,000. Your utility function can be expressed by $U = \sqrt{C}$, where C is your income.

a. What is your expected income next year?

$E = 0.95(50,000) + 0.05(20,000)$

$= 47,500 + 1,000 =$ **$48,500**

b. Suppose you could fully insure yourself against the risk of reduced consumption next year. What would the actuarially fair premium be?

Cost of Reduction = 50,000 − 20,000 = $30,000

AFP = 0.05 × 30,000 = **$1,500**

c. Using the utility function given, show that your expected utility rises with the purchase of full insurance at the actuarially fair price. That is, show that expected utility with insurance is greater than expected utility without insurance.

$U(\text{Full insurance}) = \sqrt{50,000 - 1,500} = \sqrt{48,500}$

$= 220.227\ldots$ utils

$U(\text{No insurance}) = 0.95\sqrt{50,000} + 0.05\sqrt{20,000}$

$= 219.498\ldots$ utils

you gain a little less than 1 util w/ insurance.

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2. Consider the market for health insurance:

a. Some health insurance is called "first dollar coverage," meaning the insurance kicks in for the first dollar of health expenditure incurred. That is, the consumer pays absolutely nothing out of pocket. Suppose your utility function is $U = \sqrt{C}$ as before and your income is $50,000 per year, as before. Also, suppose that there is a 1% chance that you will get sick during the year and need to see the doctor. Suppose the cost of an office visit is $100 and your first dollar coverage pays for all of it. What is the actuarially fair premium for this coverage and does purchasing this coverage increase expected utility in this case? Why or why not?

AFP = $0.01 \times 100 = \boxed{\$1}$

$U(\text{Full Insurance}) = \sqrt{49,999} = 223.605\ldots$ utils

$U(\text{No Insurance}) = 0.99\sqrt{50,000} + 0.01\sqrt{49,900} = 223.605\ldots$ utils

This Insurance does not increase Expected Utility, this is because Very little Consumption is being smoothed..

b. Do you think that first dollar coverage leads to moral hazard? Why or why not? What impact, if any, will this have on premiums in the future?

yes, As nothing is spend out of pocket, except the already paid premium, individuals are likely to overuse their health care. As a result, the premiums are expected to rise in order to cover the additional costs...

c. As you may or may not know, the value of your employer provided health insurance is not subject to taxation. In contrast, the cash wage paid to you is subject to taxation. Suppose the employer offers you two options, a $20,000 increase in cash wage or a first dollar health insurance policy that is worth $20,000. Also, suppose you are in the 39% tax bracket, meaning any increase in your wage will be taxed at a 39% rate. If you choose the raise in the form of cash, how much do you get to keep? If you choose the raise in the form of the first dollar coverage, how much of the dollar value of the policy do you get to keep? Do you think this makes it more or less likely for people to take their compensation in the form of cash or health insurance? Does this lead to moral hazard? Why or why not?

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Cash Option: you take home an additional

$(1-0.39)\times 20{,}000 = \$12{,}200.$

Insurance Option: you get the full value of the $20,000 policy, an additional pay nothing for your health expenditures.

Individuals as a result should value more, and thus be more likely to take, the compensation in the form of health insurance.

This leads to moral hazard as it causes job lock, employees are hesitant to move to new jobs as they loose insurance while unemployed, and additionally makes it harder to find private insurance. As a result, both the employment & private insurance markets operate inefficently, and as an employee you work longer.

d. Suppose instead of first dollar coverage, you buy catastrophic health insurance coverage that kicks in only for major expenses over $10,000. To keep the example simple, let's assume your utility function remains $U = \sqrt{C}$, your income remains at $50,000/yr, and you have a 1% chance of incurring a $10,000 medical expense. What is the actuarially fair premium and does expected utility rise when you buy insurance?

$AFP = 0.01(10{,}000) = \boxed{\$100}$

$U(\text{full Insurance}) = \sqrt{50{,}000} = 223.607\ldots \text{ Utils}$

$U(\text{No Insurance}) = .99\sqrt{50{,}000} + .01\sqrt{50{,}000-10{,}000}$

$= 223.301\ldots \text{ Utils}$

Expected Utility Rises by about 0.3 Utils.

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e. Suppose that the government implements a reform that makes it illegal to deny people health insurance if they have a pre-existing condition. That is, you are allowed to buy insurance at the actuarially fair premium found in part d. *after* you incur the medical expense. What problem does that lead to? How do things work out for the insurance company? To make things more concrete, assume you have a pool of 100 insured. In that pool, there will be 100*0.01 = 1 person who enters the bad state of the world. What is insurance company profit if people are allowed to buy insurance after they enter the bas state-of-the-world? If you want to prevent people from being denied coverage for a pre-existing condition, why do you also have to implement an individual mandate that forces everyone to buy insurance?

If you are predisposed to a medical condition, you are more likely to occur insurance costs.

By letting predisposed individuals into the insurance market at the actuarialy fair premium, you are incentivising individuals to wait until coverage is needed before purchasing it.

If this type of policy is allowed, insurance companies will loose money for each predisposed individual joining in need of coverage.

By forcing individuals to buy insurance, the AFP will accurately represent the expected costs the insurer needs to pay out, Encompasing the predisposed. As a result, premiums may rise for all..

3. Suppose there are two type of drivers in the world: Clueless drivers and Cannonball Run drivers. Cannonball Run drivers, while they drive fast, are safe drivers with a low probability of accidents. Clueless divers are risky drivers who have a high probability of an accident. Suppose the probability that a Clueless driver gets into an accident is 0.05 in a year while the probability that a Cannonball Run driver gets into an accident is 0.01. Suppose the car insurance pool contains 500 Clueless drivers and 500 Cannonball Run drivers. Suppose the cost of an accident is $50,000 in terms of medical bills and a replacement car that the claim will cover

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a. What is the actuarially fair premium for each driver?

AFP(Clueless) = 0.05(50,000) = $2500

AFP(CannonBall) = 0.01(50,000) = $500

b. Suppose the insurance company has full information on each type of driver. What are total premiums, total claims, and profit for the insurance company?

Total Premiums = 500(2500) + 500(500) = $1,500,000

Total Claims = [500(0.01) + 500(0.05)] × $50,000

30 × $50,000 = $1,500,000

Total Profit = Total Premiums − Total Claims

= $1,500,000 − $1,500,000 = $0

c. Suppose the insurance company has no information regarding the type of driver someone is and just asks its customers to self-report if they are a Clueless or Cannonball Run driver. What will happen? What will this do to insurance company premiums, claims, and profit?

CannonBall Drivers will accurately report their type, while many Clueless drivers will miss-claim to be CannonBall drivers.

Premiums: Will decrease.
Claims: Will Stay Constant.
Profit: Will decrease.

Profit: Will decrease.

d. Suppose the insurance company just decides to charge everyone the same premium. What is the size of the premium? What potential problem does this lead to?

If Everyone pays the same premium, the premium will increase for Cannon Ball drivers, & decrease for Clueless drivers.

This leads to less Cannon Ball Drivers on the road, as they are no longer incentivised to be so. Additionally it leads to more clueless drivers, as they are now incentivised to be one.

As a result, we could expect higher future claims & premiums.

e. Perhaps the insurance company states that they will deny any claims where the insured claimed to be a Cannonball Run driver but was really a Clueless diver. We said that such a situation could lead to a "Good Samaritan Dilemma." How might that happen here?

If a Clueless driver reports to be a Cannon Ball driver, they are still paying premiums, but at a lower rate.

If they get in an accident, then it would be frowned upon to deny them coverage.

As a result, the individual is covered, and rates

rise.

This is a Samaritan's Dilema, as the Cannon Ball drivers are typically not fond of the Clueless drivers, and are now footing the bill on their behalf.