Econ 441 Discussion Section-Handout 7

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1 Problems:

1. **Searching For the Job:** After graduting from UW-Madison hopefully you will start looking for job. It is true that you will need to put some effort on it. Searching intensively enough to find work with probability e generates a utility cost of $c(e) = \frac{1}{\gamma}\frac{e^2}{2}$. If you find a job you will get a utility of $-(2-(W-t))^2$. Where t is the anoying tax the goverment will made you pay. If you do not find a job, you will receive unemployment insurance with associated consumption utility of: $-(2-b)^2$.

   (a) Write down an expression for your expected utility.
   $Max_e - e((2-(W-t))^2) - (1-e)((2-b)^2) - \frac{1}{\gamma}\frac{e^2}{2}$

   (b) Find the optimal job search effort e.
   Taking first order conditions we have that:, $-((2-(W-t))^2) + ((2-b)^2) - \frac{e}{\gamma} = 0$.
   so $e = -\gamma((2-(W-t))^2) + ((2-b)^2)$

   (c) If the government can monitor workers' search effort, then the government can require optimal search in order to receive U.I., and thus may take search effort as a given when choosing the beneffit level b. If e is a fixed number, what level of b maximizes your expected utility?
   $Max_b - e\{2-[W-(\frac{1-e}{e})b]\}^2 - (1-e)(2-b)^2 - \frac{1}{\gamma}\frac{e^2}{2}$,
   thus taking first order conditions we have that $-2e\{2-W+(\frac{1-e}{e})b]\}\frac{1-e}{e} + 2(1-e)(2-b) = 0$,
   so $-2\{2-W+(\frac{1-e}{e})b\}(1-e) = (1-e)[-4+2b]$ or $W-(\frac{(1-e)}{e})b = b$, $b = We$

   (d) If government cannot monitor workers' search effort, then policymakers choosing b must recognize that unemployment generosity can influence search effort. The gov-ernment's balanced budget constraint requires that the revenue raised from taxing the employed (et) equals the total payout to the unemployed $(1-e)b$, so: $t = (\frac{1-e}{e})b$. Substitute this expression for t into the expression for your expected utility, and solve for the optimal b that maximizes your expected utility./
   Now we just need to remmember that, $\frac{dEU}{db} = \frac{\partial EU}{\partial b} + \frac{\partial EU}{\partial T(b)}\frac{d(b)}{dt} + \frac{\partial EU}{\partial e(b)}\frac{de(b)}{db}$. But by the envelope theorem, $\frac{\partial EU}{\partial e(b)} = 0$, hence the problem reduces to
   $Max_b - e\{2-[W-(\frac{1-e(b)}{e(b)})b]\}^2 - (1-e)(2-b)^2 - \frac{1}{\gamma}\frac{e^2}{2}$, so taking first order contions we have that, $-2e\{2-[W-(\frac{1-e(b)}{e(b)})b]\}[\frac{dt}{db}b + (\frac{1-e(b)}{e(b)})] + 2(1-e)(2-b) = 0$,
   thus we need to find $\frac{dt}{db} = \frac{d((\frac{1-e(b)}{e(b)})b)}{db} = \frac{d(\frac{1-e(b)}{e(b)})}{db}b + \frac{1-e(b)}{e(b)}$, Now $\frac{d(\frac{1-e(b)}{e(b)})}{db} = \frac{-e'(b)}{e(b)^2}$, so $\frac{dt}{db} = \frac{1-e(b)}{e(b)} - \frac{e'(b)}{e(b)^2}b = \frac{1-e(b)}{e(b)}[1 - \frac{e'(b)b}{(1-e)e(b)}] = \frac{1-e(b)}{e(b)}[1 + \frac{\epsilon_{1-e,b}}{e(b)}]$.
   Then $-2e\{2-[W-(\frac{1-e(b)}{e(b)})b]\}[\frac{1-e(b)}{e(b)}[1+\frac{\epsilon_{1-e,b}}{e(b)}]b + (\frac{1-e(b)}{e(b)})] + 2(1-e)(2-b) = 0]$. $-2\{2-[W-(\frac{1-e(b)}{e(b)})b]\}[[1+\frac{\epsilon_{1-e,b}}{e(b)}]b + (\frac{1-e(b)}{e(b)})] = -2(2-b)$
   and, $-2\{2-[W-(\frac{1-e(b)}{e(b)})b]\}[[1+\frac{\epsilon_{1-e,b}}{e(b)}]b + (\frac{1-e(b)}{e(b)})] = -U'(unemployed)$, and $-2\{2-[W-(\frac{1-e(b)}{e(b)})b]\}[[1+\frac{\epsilon_{1-e,b}}{e(b)}]b] + U'(employed) = -U'(unemployed)$,

so $\frac{\epsilon_{1-e,b}}{e(b)} = \frac{U'(employed)+U'(unemployed)}{2\{2-[W-(\frac{1-e(b)}{e(b)})b]\}b} - 1$

(e) Make a conjecture as to whether γ would be higher or lower during a recession, and explain why you think might change in this way during a recession. Based on your conjecture, would you recommend more generous or less generous unemployment benets during recessions?, since $e = -\gamma((2-(W-t))^2) + ((2-b)^2)$, then γ has to be higher.

2. **Adverse Selection in the dating market on Freakfest:** Consider a simple model of the dating market during freakfest. Ph.D. students at UW-Madison recently discover a way to avoid future dates with the girl or guy that you meet during freakfest (HOW IS THIS POSSIBLE?, Wear a Mask!!!!). A mask will provide a nice insurance to you. Half of the population attengding Freakfest faces a high risk ($Probability = 1/2$), of meeting someone that you will never date under-regular circumstances (This could happen by an emotions rush generated by Halloween spirits, or a weakness to certain costumes). The other half of the population faces low risk of this to happen ($Probability < 1/2$). There are many price-taking maximizing sellers of masks. I am asking you, to use your a public economics tools to decide wheater or how to regulate this market. This spooky model works as follows:

- First, firms choose how much a mask can cover you (I) and prices per unit of coverage (a).
- Each individual begins with a utility of $U = 1$. If an individual meets someone that is not suitable for future dating, he will suffer a loss in the utility of 1.
- Individuals who wear a mask (i.e. have an insurance) will get I of protection if they meet a nonsuitable partner.

(a) Suppose that the utility of all the attendands is logarithmic, write down the Expected utility maximization problem for bot types of people.

First consider the High Risk guys, $EU_H = \frac{1}{2}Log(1-aI) + \frac{1}{2}Log(I-aI)$, and $EU_L = (1-p)Log(1-aI) + pLog(I-aI)$,

(b) If the sellers of masks are actually good wizzards, they will charge an actuarially fair a. Also since they are wizzards they can tell what kind of person are the clients. What level of I will the high risk type prefeer? What level of I will the low types prefeer? \

For the High types if $a = 1/2$, then F.O.C. $\frac{1}{4(1-\frac{I}{2})} = \frac{1}{2I}$ or $2I = 4(1-\frac{I}{2})$, hence $I = 1$,

For the low guys $a = p$, then F.O.C. $\frac{(1-p)p}{(1-pI)} = \frac{p(I-p)}{(I-Ip)}$, then $I = 1$

(c) In reality, they are not wizzards. So they cannot distiguish how risky are the clients. In lecture we saw that this is known as Adverse Selection, and there are two possible kinds of equilibria. Separating and Pooling. Describe what a pooling equilibrium would look like in the context of this model. Describe what a separating equilibrium would look like in the context of this model.

The pooling equilibirum means that both types choose full insurance at a price $a = \frac{\frac{1}{2}+p}{2} = \frac{2P+1}{4}$. The separating equilibrium will require the high types having full insurance . The high-risk would not prefer the low-risk price with partial insurance over the full insurance contract, and the low-risk do not prefer the high-risk price with full insurance over the partial insurance contract.

(d) In a competitive equilibrium, the sellers earn zero proffits. What prices (values of a) are low-risk and high-risk charged in a separating equilibrium? What prices (values of a) are low-risk and high-risk charged in a pooling equilibrium?Explain why.

Since the firm is having zero profits, $\pi = \frac{1}{2}(a_H - \frac{1}{2}(1)) + \frac{1}{2}(a_H) + \frac{1}{2}(a_L I_l - pI_l) + \frac{1}{2}(a_L) = 0$,
so $\frac{1}{2}(a_H - \frac{1}{2}(1)) + \frac{1}{2}(a_H) = 0$ and $\frac{1}{2}(a_L I_l - pI_l) + \frac{1}{2}(a_L I) = 0$.
That means that $a_H = \frac{1}{2}$, and $a_L = p$

(e) In a separating equilibrium, the sellars sell (partial) coverage to low risk types at a price that is actuarially fair to low-risk individuals, because higher risk types prefer to buy a full mask at a price that is actuarially fair to them. Write down an expression for the expected utility to a high risk type who purchases full insurance at the price that is actuarially fair to high risk types ($hint:\ a = 1/2$). $EU(high$ buyng high, $) = \frac{1}{2}Log(\frac{1}{2}) + \frac{1}{2}Log(\frac{1}{2}) = Log(\frac{1}{2})$

(f) Write down an expression for the expected utility to a high risk type who purchases partial insurance (some level I between 0 and 1) at the price that is actuarially fair to low risk types ($hint\, a = p$)

$EU(high \text{ buyng high, }) = \frac{1}{2}Log(1 - Ip) + \frac{1}{2}Log(I - Ip)$

(g) Now, using these two expressions, write down a condition for when high risk types will prefer to fully insure.

$Log(\frac{1}{2}) > \frac{1}{2}Log(1 - Ip) + \frac{1}{2}Log(I - Ip)$.

(h) In pooling equilibrium, sellers companies are not able to avoid low risk types by offering cheap partial insurance. Write down an expression for the expected utility to a low risk type who purchases full insurance at the price that must prevail in a pooling equilibrium

$EU(low\, full) = (1 - p)Log(1 - \frac{2P+1}{4}) + pLog(1 - \frac{2P+1}{4}) = Log(\frac{2P+5}{4})$

(i) Write down an expression for the expected utility to a low risk type who purchases partial insurance, at a price that is actuarially fair.

$EU_L = (1 - p)Log(1 - pI) + pLog(I - pI)$,

(j) Now, using these two expressions, write down a condition for when low risk types prefer to fully insure in the pooling equilibrium

$Log(\frac{2P+5}{4}) > (1 - p)Log(1 - pI) + pLog(I - pI)$