Problem Set 6

Econ 159a/MGT5222a   Ben Polak

Three questions due October 31, 2007

1. Surviving might-see TV. (Grant) [*This question illustrates the difference between simultaneous and sequential settings.*] There are three major-network-affiliate television stations in Hicksville: RBC, CBC and MBC. All three stations have the option of airing the evening network-news program live at 6:00pm or in a delayed broadcast at 7:00pm. By regulation, they may not choose other times. Each station's objective is to maximize its viewing audience to maximize the station's advertising revenue. The tables below (the result of extensive research) give the percentage of Hicksville's total population 'captured' by each station as a function of the times at which each news program is shown. The numbers do not sum to 100 since not everyone always watches TV.

Times Chosen			Audience Capture		
MBC	RBC	CBC	MBC	RCB	CBC
6:00pm	6:00pm	6:00pm	32	14	24
6:00pm	6:00pm	7:00pm	27	8	30
6:00pm	7:00pm	6:00pm	24	30	16
6:00pm	7:00pm	7:00pm	50	13	12
7:00pm	6:00pm	6:00pm	30	16	24
7:00pm	6:00pm	7:00pm	24	30	16
7:00pm	7:00pm	6:00pm	14	30	23
7:00pm	7:00pm	7:00pm	32	14	24

(a) Suppose that the choices of all three stations are made *simultaneously*. Find any Nash equilibria. [Hint: try to set this up so it looks more like a normal-form game. To do this for three players use two 2×2 matrices: let MBC choose the matrix, RBC the row and CBC the column.].

(b) Suppose now that the game is played *sequentially*. MBC moves first. RBC moves second and CBC moves third. Each station can observe all previous moves before making her choice. Explain what you think will happen.

(c) Look at your answers to parts (a) and (b). Give a game-theory intuition why there is, or is not, a difference in the outcome.

2. Rules versus Discretion in Monetary Policy. Suppose that the government of Yaleland can fix the inflation level, $\dot{p}$, by an appropriate choice of monetary policy. The rate of nominal

wage increase, $\dot{W}$, however, is set not by the government but by an employer-union federation. This federation would like *real* wages to remain unchanged; that is, if they could, they would set $\dot{W} = \dot{p}$. Specifically, given $\dot{W}$ and $\dot{p}$, the utility of the federation is given by $u(\dot{W}, \dot{p}) = -\left(\dot{W} - \dot{p}\right)^2$. For reasons that we do not need to go into here (but which might concern a Phillips curve), real output y in Yaleland is given by the equation $y = 30 + (\dot{p} - \dot{W})$. The government, perhaps reflecting its electorate, likes output more than it dislikes inflation. Specifically given y and $\dot{p}$, the government's utility is given by $v(y, \dot{p}) = y - \frac{\dot{p}}{2} - 30$. The government chooses its monetary policy (and hence sets inflation) after observing the nominal wage increases set by the federation. Finally assume that $0 \le \dot{W} \le 10$ and $0 \le \dot{p} \le 10$.

(a) Use backward induction to find the level of inflation $\dot{p}$, nominal wage growth $\dot{W}$, and (hence) output y, that will prevail in Yaleland. For those who have taken or who are taking a macro class, briefly, what is the relation between backward induction and "rational expectations" here?

(b) Suppose that the government could commit to a particular monetary policy (and hence inflation rate) ahead of time. What inflation rate would the government then set? How would the utilities of the government and the federation compare in this case to that in part (a).

(c) In the 'real world' (that strange place beyond the borders of Yaleland), how have governments attempted to commit to particular monetary policies. What might be a downside to fixing monetary policy before the government knows what events (such as the outcomes of wage negotiations) will happen in the economy.

3. A Principal-Agent Problem (Osborne). An absentee landlord owns a farm and hires a laborer to work it. The output of the farm as a function of the effort level, e, of the worker is $\sqrt{e}$. The landlord can *not* directly observe the effort level supplied by the worker, but she does get to write a contract ahead of time, specifying the share α of future output that will be kept by the worker. After observing α, the worker gets to choose his effort level e. Effort is costly to the worker. Given α and e, the landlord's utility is $v(\alpha, e) = (1 - \alpha)\sqrt{e}$ (the output less the worker's share), and the worker's utility (which could, in principle, be negative) is $u(\alpha, e) = \alpha\sqrt{e} - e$ (her share of output minus her effort cost). Assume that $0 \le \alpha \le 1$ and $0 \le e \le 1$.

(a) Use backward induction to find the level of α that the landlord will set, and the effort level e that this will induce.

(b) Suppose that a social planner can set e, the effort level of the worker. Suppose that the planner aims to maximize total utility $v(\alpha, e) + u(\alpha, e)$. What level of e will the social planner choose.

(c) Suppose now that the social planner still wants to maximize total utility but that she cannot specify e (perhaps because she too cannot observe effort). Instead, the social planner only gets to set α. What level of α will the social planner set?