Problem Set 6 - 4910 - Environmental Economics

1. Discounting.

Assume a CRRA utility function with $u_t = 2\sqrt{c_t}$ and suppose consumers maximize $\sum_{t=1}^{\infty} \delta^t u_t$ with $\delta = 0.9$.

(i) What is the discount rate on utility?

(ii) How much should one discount future consumption, if the growth rate of consumption is 2% a year?

(iii) Suppose there are two groups in the society. Half of the population are patient and have $\delta = 0.99$, while the other half is applying discount factor $\delta = 0.90$. Suppose you want to maximize the sum of todays' welfare (present-discounted value). What is the max amount you, as the planner, would be willing to invest/pay today if the value is worth 100 consumption units in 50 years? Which annual discount rate does this correspond to?

(iv) What is the answers to (iii) if instead the 100 consumption units are materialized in 100 years, not 50 years?

(v) Discuss informally how you think your answers would change if there is uncertainty about the consumption growth rate.

(vi) Also discuss how the answers would change if the consumption growth rate is certain, but it is quite uncertain whether the investment will give 100 consumption units.

2. Time inconsistency.

Suppose a generation can choose its consumption level by maximizing $u_0 + \beta \sum_{t=1}^{\infty} \delta^t u_t$, where $\beta = \delta = 0.9$. Suppose there is only three periods, period 0, 1, and 2, and $u_t = c_t - \frac{1}{2} G_t^2$, where $G_t = G_{t-1} + c_t$ and $G_{-1} = 0$.

(i) If one can commit in period 0 to all future consumption levels, what is the optimal c_t for each period?

(ii) If one cannot commit in period 0, what is the equilibrium values of c_t for each period?

(iii) If one cannot comit in period 0, will generation 0 choose c_0 strategically? In which sense, and to influence which choice?