Bachelor Business Administration and Economics 6th Semester

## Macroeconomics and Behaviour

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Klaus Wälde (lecture) and Alexey Cherepnev (tutorial) www.macro.economics.uni-mainz.de version - July 24, 2014

Problem Set 6

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## Question 1 (O'Donoghue and Rabin (1999))

The present-biased preferences are given by:

$$U_t = u_t + \beta \sum_{\tau=t+1}^T \delta^{\tau-t} u_{\tau}, \qquad (1)$$

where the time discount factors are 1,  $\beta\delta$ ,  $\beta\delta^2$ , ...,  $\beta\delta^{T-t}$  with  $\delta \leq 1$  and  $\beta < 1$ .

Suppose an agent have to take a one-period action in  $\tau \in [t, T]$ . This action leads to costs  $c_{\tau}$  in this period (immediate costs). However the agent is rewarded in the last period T, i.e. his utility increases by value v.

We denote the utility function of an individual who takes the action in period  $\tau$  by  $\bar{U}_t(\tau)$ . Normalizing  $\delta = 1$ , find  $V_t(\tau) = \bar{U}_t(\tau) - U_t$  in the case when action is taken in period  $\tau = t$  and in  $\tau > t$ , i.e.

$$V_t(\tau) = \begin{cases} \beta v - c_t, & \text{if } \tau = t\\ \beta v - \beta c_\tau, & \text{if } \tau > t \end{cases}$$
(2)