

### Homework #1

- 1- Go to <https://fred.stlouisfed.org/> and find the graphs of two variables: percent changes in real GDP (GDPC1) and percent changes in aggregate consumption (PCECC96). How do they differ? Is this consistent with the consumption smoothing implied by optimizing consumers?
- 2- How does the savings function of a consumer depend on  $\beta$ ? Why is this the case?
- 3- Suppose that there are  $T$  periods to maximize over. Show that the intertemporal budget constraint is
 
$$c_1 + \frac{c_2}{1+r} + \frac{c_3}{(1+r)^2} + \dots + \frac{c_T}{(1+r)^{T-1}} = y_1 + \frac{y_2}{1+r} + \frac{y_3}{(1+r)^2} + \dots + \frac{y_T}{(1+r)^{T-1}}$$
- 4- In 1978, when Bob Hall first derived the random walk hypothesis of consumption, he tested statistically whether past economic variables could predict changes in consumption. He found that stock prices had some (statistically significant) power to predict subsequent changes in consumption. What does this tell us about the random walk hypothesis?
- 5- Suppose that a consumer has marginal utility of the form  $MU(C)=1/C$ . Suppose that this consumer gets 2 units of income in the first period and 4 units in the second period.
  - a) Derive his intertemporal budget constraint (ITBC). Use the tangency condition and the ITBC to solve for his optimal consumption and saving functions.
  - b) Suppose also that  $\beta=1$  and  $1+r=1$ . Solve for his consumption and saving each period.
  - c) Suppose instead that  $\beta=0$  and  $1+r=1$ . Solve for his consumption and saving each period.
  - d) Based on your answers to b) and c), which agent is richer at the beginning of the second period? How is this related to  $\beta$ ?
- 6- Suppose that a consumer has marginal utility in the first period of the form  $MU(C_1)=1/C_1$  but marginal utility in the second period is given by  $MU(C_2)=1$ . Suppose that this consumer receives 2 units of income in the first period and 4 units in the second. Suppose also that  $\beta=1$  and  $1+r=1$ . Solve for his optimal consumption and income allocation. Explain how it differs from part b) of question 5.
- 7- Suppose that a consumer has marginal utility of the form  $MU(C)=1/C$ . Suppose that this consumer gets 2 units of income in the first period and 4 units in the second period. Assume  $\beta=1$ . Solve for his optimal consumption allocation each period for the case  $1+r=1$  and  $1+r=2$ . What happens to the agent's consumption as the interest rate rises.