

Exercise 4, ECON 303-Winter 2018

1. Consider the intertemporal consumption-labor model. Suppose the lifetime utility function is given by $v(BC_1, N_1, BC_2, N_2) = u(BC_1, N_1) + u(BC_2, N_2)$, with B the preference shifter in both period one and period two. In each of the two periods the function u takes the form

$$u(BC_t, N_t) = \ln(BC_t) - \frac{1}{2}N_t^2,$$

where $L_t + N_t = 1$. Note the t subscripts – $t = 1, 2$ depending on which period we are considering. Suppose that the government in order to finance its spending has access to only distortionary labor income taxes in periods 1 and 2, denote by τ_1 and τ_2 , respectively. Finally, for simplicity assume that the initial assets of the household are zero and also the household receives no non-labor income.

- Write down the life time budget constraint of the household.
 - Construct the marginal rate of substitution functions between consumption and leisure in each of period one and period two.
 - Construct the marginal rate of substitution function between period-one consumption and period-two consumption.
 - Derive the optimal values of C_1, C_2, N_1 , and N_2 as functions of τ_1, w_1, τ_2 , and w_2 .
2. Consider a two-period macroeconomic model with a representative household, a representative firm, and a government. The representative household makes consumption-saving and labor supply decisions. The representative firm makes labor demand and investment decisions.

- Define the comp. equilibrium for this economy.
- Suppose that there is a significant decline in the depreciation rate of capital during period 1. Use the model to study the effects of this decline on current aggregate output and current employment. Explain your results. (you should use supply and demand curves in the relevant markets to justify your explanations).
- It is often argued that shocks are persistent. A persistent shock is a shock that is strongest when it first occurs, but also has a subsequent impact as it fades out only slowly. In the context of our model, a positive persistent TFP shock increases Z_1 (period 1 TFP), but also increases Z_2 (period 2 TFP) albeit by a smaller amount. What difference does an increase in the 'persistence' of the TFP shock make to the responses of consumption, investment and the real interest rate relative to what you found in part (b)? You should assume that higher persistence implies a bigger change in future TFP. (you should use supply and demand curves in the relevant markets to justify your explanations).

3. **Tobin's q :** James Tobin, a famous Keynesian economist and Nobel Laureate, argued that firms would continue to invest as long as the value of their shares of stock (treat it like capital) exceeded the replacement cost of their assets. The ratio of the market value of a firm to the net replacement cost of the firm's assets is known as Tobin's q , in other words, q is the stock market value of the firm per unit of capital. Explain why $q > 1$ means that a firm should continue to invest. Next, show that $q > 1$ is equivalent to marginal product of capital being greater than user cost of capital: $MP_{K_2} > r + \delta$.