

Macroeconomics: Economic Cycles, Frictions and Policy

One-period Model of the Macroeconomy

Practice Problems

September 2019

Computing general equilibrium in the one-period model of the macroeconomy: Assume that the representative individual has preferences for consumption and leisure given by:

$$U(C, l) = \log C + \phi \log l. \quad (1)$$

where C denotes consumption and l leisure. The representative individual has one unit of time that can be used either for work (n) or leisure (l). The individual's income consists of labor income, and dividends, (π), which she obtains from holding shares of the representative firm.

There is one final good that can be consumed by the representative individual or the government. We assume that the government purchases an exogenous amount G of the final good, and that it finances this purchase by levying a lump-sum income, (T) tax on the individual. We assume that the government runs a balanced budget, i.e. $G = T$.

There is a representative firm that produces using the consumption good using capital (K) and labor (N) as inputs:

$$Y = zK^\alpha N^{1-\alpha}, \quad \alpha \in (0, 1), \quad (2)$$

where z denotes total factor productivity. Since this is a one-period, we assume that capital stock is fixed at a level \bar{K} . The firm is a price-taker in the labour market, and hires workers at a wage w .

- (a) State the utility maximization problem faced by the individual. Find the optimal consumption and leisure bundle (and labor supply) as a function of the model's parameters, taken as given the level of dividends and the prevailing wage.
- (b) Assume now that $w = 1$, $\pi - T = 2$ and $\phi = 1/3$.
 - (i) Draw the budget constraint for the individual. Label both axis and be explicit about the values that the budget constraint takes (e.g. if there is a kink in the budget constraint, label the point where it happens explicitly).
 - (ii) Suppose that the individual is consuming at the point $(\hat{C}, \hat{l}) = (5/2, 1/2)$. Is this consumption-leisure bundle feasible (i.e. can the consumer afford it)?
 - (iii) Calculate the marginal rate of substitution at that point. Is $(\hat{C}, \hat{l}) = (5/2, 1/2)$ optimal? If not, find an alternative consumption-leisure bundle that is both feasible and that provides higher utility than (\hat{C}, \hat{l}) .
 - (iv) Let now $\phi = 3/4$, while the value of all other parameters remain the same as above. What is the optimal consumption-leisure bundle for the individual? What is the marginal rate of substitution at the optimum? Provide an economic intuition for your results.
- (c) State the profit maximization problem faced by the representative firm. Find the firm's optimal labor demand as a function of the wage, total factor productivity, the stock of capital and model parameters.
- (d) Define the general equilibrium of the model.
- (e) What happens to consumption, leisure and output when:
 - (i) Government expenditure increases
 - (ii) A natural disaster destroys a fraction of the capital stock

Provide an economic intuition for your findings.