Queen Mary
University of London

May/June Examination Period 2025

ECN346 Business Cycles Duration: 2 hours

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Answer FOUR questions. ONE question from each SECTION

If you answer more questions than specified, only the <u>first</u> answers (up to the specified number) will be marked. Cross out any answers that you do not wish to be marked

Calculators are not permitted in this examination.

Complete all rough workings in the answer book and cross through any work that is not to be assessed.

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Examiners: Dr Roman Sustek

Section A

Question 1

Explain how we can use data on housing expenditures to determine the functional form of a utility function for consumption and housing.

[20 marks]

Question 2

Explain how you would proceed if you were to use the real business cycle model to quantitatively simulate the behaviour of the economy on a computer.

[20 marks]

Section B

Question 3

Consider an overlapping generations model that has a constant stock of some asset A, originally held by the initial old. Population is constant. The utility function of future generations is $\log(c_{1t}) + \beta \log(c_{2,t+1})$, where $\beta > 0$. When young, people get a random endowment $y_t = y + \varepsilon_t$, where y is a deterministic part and ε_t is an iid innovation drawn from some distribution. When old, people do not get any endowment. Obtain the general equilibrium price of the asset.

[25 marks]

Question 4

Suppose that a developer combines a structure and land to form a house according to the production function: $y_h = x_l^{\phi} x_s^{1-\phi}$, where y_h is newly constructed housing, x_l is land, x_s is a structure, and $\phi = [0, 1)$. The developer is a price taker in both the markets for the two inputs and the market for newly constructed houses. The price of newly constructed houses is p_h and the prices of land and structures are, respectively, p_l and p_s. There is a unit mass of the perfectly-competitive developers, with each developer maximising profits. The price of structures is given by the productivity of the construction sector and there is a fixed amount of residential land available each period on which houses can be built. Discuss how the size of ϕ determines the extent to which demand for housing affects house prices.

[25 marks]

Section C

Question 5

Consider the following real business cycle model based on a two-period lives OLG model with constant population. Set the number of young in a given cohort to one. Preferences of future generations over consumption are $\log c_{1t} + \beta \log c_{2,t+1}$, where $\beta > 0$. When young, agents supply one unit of labour at a wage rate w_t. When old, agents are unable to supply labour. The only asset available for saving is capital k_{t+1}, which is rented to firms in old age at a net rental rate r_{t+1}. A fraction δ of capital depreciates when rented out to firms. Capital and labour are used by firms, of which there is a measure one, to produce a single good according to a production function $Y_t = A_t K_t^{\alpha} N_t^{1-\alpha}$, where A_t is an exogenous stochastic level of TFP, N_t is labour, K_t is capital, and $\alpha \in (0, 1)$. Firms maximise their profits. Markets are competitive (all agents are price takers). Derive the equilibrium law of motion for capital (that is, as a function of the state variables A_t and K_t). With the help of a diagram discuss the behaviour of capital over time.

[30 marks]

Question 6

Consider an economy in which people live for two periods. The economy lives forever. Normalize the number of young in a given cohort to one. When young, people supply one unit of time to perfectly competitive firms, of which there is a measure one, at the wage rate w_t. When old, people do not have any productive time endowment. There is a fixed stock of housing in the economy, denoted by H, originally held by the initial old, which does not depreciate. There is also a perishable good produced by firms. The preferences of future generations are $\log c_{1t} + \beta \log c_{2,t+1} + \theta \log h_t$, where c_{1t} is consumption of the good when young, $c_{2,t+1}$ is consumption of the good when old, h_t is consumption of housing, and $\beta > 0$ and $\theta > 0$ are parameters. Denote by q_t the relative price of housing in terms of the good. Each firm produces the good according to the production function, $\exp(z)n_t$, where z is the level of technology and n_t is the total amount of time hired from the young. Firms maximise profits. Derive the equilibrium price of housing. Discuss how we can capture various socio-demographic factors by the model parameters and how such factors affect the equilibrium price of housing.

[30 marks]

Section D

Question 7

Explain the Analogy Principle and describe how it can be applied to calibration/estimation of the real business cycle model.

[25 marks]

End of Paper