— FINAL EXAM (FALL 2017) —
ECOM-G313 MACROECONOMICS 2
HECER, DECEMBER 19, 2017

INSTRUCTIONS
Answer all questions. Write your *name, student ID, and the name of your university* on this paper and on each answer sheet. You may answer in English, Finnish or Swedish. Good luck!

QUESTION 1. INTERPRETATION OF IMPULSE RESPONSES OF THE REAL BUSINESS CYCLES MODEL
The figure 1 portrays the impulse responses of the real business cycle model to the persistent technology shock. The shock is a positive shock to the persistent technology process

$$a_t = 0.95a_{t-1} + \varepsilon_t, \quad \varepsilon_t \sim \text{iid}(0, \sigma^2).$$

The size of the shock is $\varepsilon_0 = 0.01$.

The symbols are as follows: y output, c consumption, k capital stock, i investments, n labour/hours, y_l average labour productivity (Y_t/N_t), a level of technology, r real interest rate, and w real wages.

The calibration is the following

Parameter	β	θ	α	δ	ρ	σ
Value	0.99	1.75	0.33	0.023	0.95	0.01

Answer *shortly* to the following questions.

(a) Why is the response of the level technology to the shock persistent? Why is the response of the output positive?

(b) Explain the response of the real interest rate?

(c) Explain why the shape of the consumption response is different from the others.

(d) Why real wages rise?

(e) What are the forces that affect to the response of employment/hours?
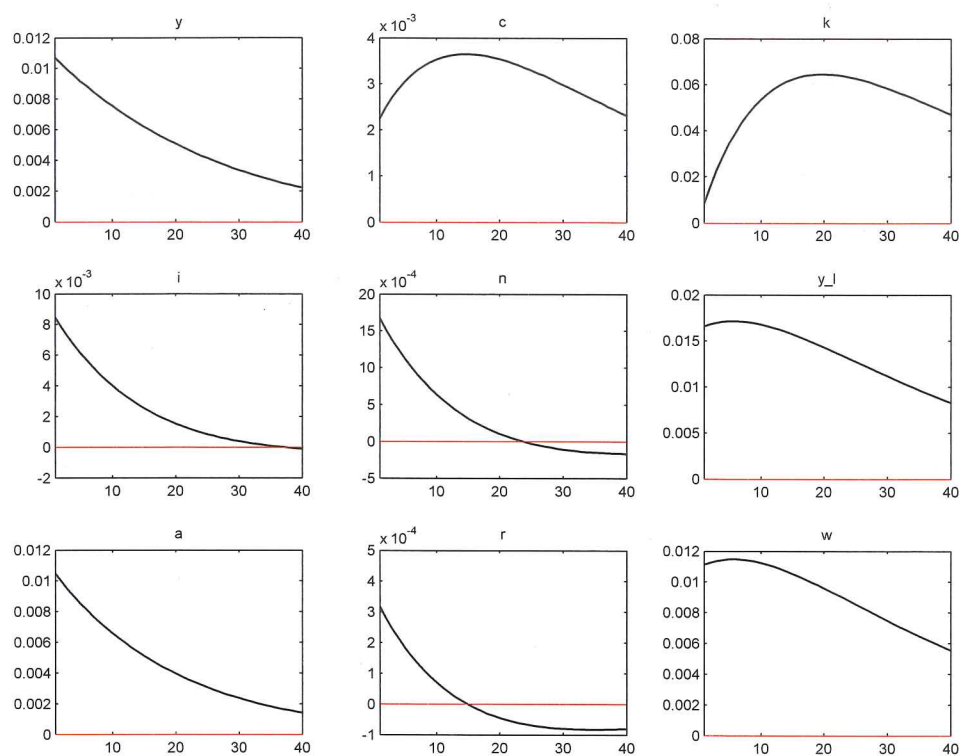
Figure 1: Impulse responses of the RBC model to the persistent technology shock

QUESTION 2. CONSUMPTION-SAVING DECISIONS AND PUBLIC SECTOR TRANSFERS
An individual lives two periods: In period 1 she is "young" and studies, and gains no income. She will consume c_1. In period 2 she works and earns labour income w and consumes c_2. Then she dies with empty pockets.

She maximises her life-time utility that is given by

$$U = (c_1^\rho + \beta c_2^\rho)^{1/\rho},$$

where $0 < \beta < 1$ and $\rho > -1$.

In period 1, government subsidises her studies by giving her a transfer $b \geq 0$. She can also finance her first period consumption by borrowing (=negative savings) with interest rate r. Let s denote the savings such that it is negative for a borrower.

Government taxes the second period income with a proportional tax rate τ such that the second period after-tax income is $(1-\tau)w$. In the first period government can borrow B with the interest rate r and in the first period the government gives a transfer b to the households.

(a) Write down flow (period by period) household budget constraint and derive the intertemporal (life-cycle) budget constraint.

(b) Write down the government period by period budget constraints and then the intertemporal budget constraint.

(c) Calculate the optimal consumption for each period 1 and 2.

(d) How the real interest rate affects consumption? How does its effect depend on the value of ρ?

(e) What is the role of government here?

QUESTION 3. DEMAND SHOCK IN THE NEW-KEYNESIAN MODEL
Consider an economy whose behaviour is characterized by the following version of the New-Keynesian model.

New-Keynesian Phillips Curve:

$$\pi_t = \beta\, E_t\, \pi_{t+1} + \kappa \tilde{y}_t, \quad t \geq 0 \tag{1}$$

where π_t denotes inflation at period t, $0 < \beta < 1$ is the discount rate and $\kappa > 0$ the coefficient ("loading") of the output gap $\tilde{y}_t$.

Expectation-augmented IS curve:

$$\tilde{y}_t = -\frac{1}{\sigma}(i_t - E_t\, \pi_{t+1} - \rho) + E_t\, \tilde{y}_{t+1} + g_t, \tag{2}$$

where i_t is the nominal interest rate (1 period bond rate), $\sigma > 0$ is the (inverse of) intertemporal elasticity of substitution, $\rho = -\log \beta$ is the steady state real interest rate, and g_t is a demand shock that is characterized by the following AR(1) process

$$g_t = \gamma g_{t-1} + \varepsilon_t, \quad \varepsilon_t \sim NID(0, \sigma_\varepsilon^2) \tag{3}$$

where $0 < \gamma < 1$ is the persistence parameter and the innovation ε_t is Gaussian iid process.

Assume further that monetary policy follows the *strict inflation targeting*:

$$i_t = \rho + \phi_\pi \pi_t, \tag{4}$$

where $\phi_\pi > 1$.

Finally, E_t is the conditional expectation based on the information set $\mathcal{F}_t = \{\varepsilon_t, \varepsilon_{t-1}, \dots\}$.

(a) Describe shortly, how the assumption $\phi_\pi > 1$ is related to Taylor principle?

(b) Solve the model characterized by (1)–(4) using the method of undetermined coefficients.

(c) Suppose the economy is hit by a positive demand shock, i.e. $\varepsilon_0 = 1$. What is the sign of the response of inflation and output gap in period 1 to this shock? Explain briefly what happens in the following periods?

4