

ECONOMICS TRIPOS Part IIB

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Tuesday 26 May 2009      1.30 to 4.30

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Paper 2

ECONOMIC PRINCIPLES AND PROBLEMS II

*Answer **four** questions only.*

*Write your number **not** your name on the cover sheet of **each** booklet.*

STATIONERY REQUIREMENTS	SPECIAL REQUIREMENTS
<i>20 Page Booklet</i>	<i>Approved calculators allowed</i>
<i>Rough Work Pads</i>	
<i>Tags</i>	

<p><b>You may not start to read the questions printed on the subsequent pages of this question paper until instructed that you may do so by the Invigilator</b></p>
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1. Explain the role of real and nominal rigidities for generating fluctuations in output and in other macroeconomic variables.
2. (a) Explain why higher saving rates are not necessarily associated with higher levels of GDP in an economy with perfect capital mobility, but they are in a closed economy. Does this mean that a higher saving rate implies higher welfare in a closed economy?  
(b) Consider the basic Solow model. Suppose that the economy is closed and that the capital stock in this economy is lower than the capital stock implied by international interest rates. Assume that at some period  $t$ , the economy internationally integrates its capital market. Describe the effects of such policy on output per capita and consumption per capita.
3. Is the potential for sudden stops in short-term international capital flows such that emerging market economies are inherently prone to financial crisis?
4. Assess the empirical plausibility of the Real Business Cycle model.
5. Can a monetary union internalise inflation spillovers and consequently diminish the incentive to increase inflation as a means for stimulating output at the expense of neighbouring countries? Explain in the context of a monetary union model with an independent central bank, where the fiscal authority has a first move advantage.
6. Consider a simple monetary model where the demand for real money balances is decreasing in the nominal interest rate.
  - (a) What is the optimal rate of inflation? Show diagrammatically.
  - (b) What is the Taylor Principle?
  - (c) Given your answers to (a) and (b) what difficulties might a Central Bank face pursuing the optimal inflation rate? Show diagrammatically.
  - (d) What factors might persuade a Central Bank to pursue a different inflation target?

7. Consider the Lucas model of imperfect information in log-linear terms. Assume that aggregate demand is given by  $y = m - p$ , where  $m \sim N(E(m), \sigma_m^2)$  is the exogenously given money supply and  $p$  is the aggregate price index. Moreover, assume that demand for good  $i$  is given by

$$q_i^d = y + z_i - r_i$$

where  $y$  is aggregate output,  $z_i \sim N(0, \sigma_z^2)$  is an idiosyncratic shock such that  $cov(z_i, z_j) = cov(z_i, m) = 0$  for  $i \neq j$ , and  $r_i$  is the relative price of good  $i$ . Producers can observe their own price  $p_i$  but not the aggregate price index  $p$ , i.e. they cannot observe their relative price  $r_i = p_i - p$ . Suppose then that the supply of producer  $i$  is given by

$$q_i^s = E(r_i | p_i)$$

where  $E(r_i | p_i)$  is the expected relative price of good  $i$  given the observed price  $p_i$ .

- (a) Derive the Lucas supply curve, making appropriate assumptions about the distributions of aggregate and relative prices.
- (b) What happens to the slope of the Lucas supply curve as the idiosyncratic shocks become more volatile relative to the aggregate monetary shock?
- (c) What is the empirical evidence in relation to this prediction of the Lucas model?

**(TURN OVER)**

8. Consider a modified version of the continuous-time Solow growth model where the aggregate production function depends also on land, which is a production factor in fixed supply. The production technology is given by a constant returns to scale Cobb-Douglas function:

$$F(K, L, \bar{Q}) = K^\alpha L^\beta \bar{Q}^{1-\alpha-\beta}, \quad \alpha, \beta \in (0, 1), \text{ and } \alpha + \beta < 1,$$

where  $K$  is the capital stock, which depreciates at rate  $\delta$ ,  $L$  is labour, and  $\bar{Q}$  is land, available in fixed inelastic supply. Households save a constant fraction of income,  $s \in (0, 1)$ . The economy is closed and there is no technological change.

Suppose that there is no population growth.

- (a) Find the steady-state capital per capita. Does the economy converge to this steady-state equilibrium for any initial capital per capita  $k_0 > 0$ ? What is the speed of convergence around the steady-state? Does it depend on the stock of land? Explain.

Next, suppose that there is population growth at rate  $n$ , that is,  $\frac{\dot{L}}{L} = n$ .

- (b) What happens to the capital-labour ratio and to output per capita as  $t \rightarrow \infty$ ?
- (c) What happens to returns to land and the wage rate as  $t \rightarrow \infty$ ? Would you expect the population growth rate  $n$  to change over time in this economy? Explain.

9. Consider the following two-country ( $i = 1, 2$ ) monetary policy coordination model

$$L_i = (x_i - x_i^*)^2 + \psi(\pi_i - \pi_i^*)^2 \quad (1)$$

where  $L_i$  is the loss function for country  $i$ ,  $x_i \equiv y_i - \bar{y}$  is country  $i$ 's output gap,  $\pi_i$  is its inflation rate and it is assumed that  $x_i^* = 0$  and  $\pi_i^* = 0$ . Inflation and the output gap in country  $i$  are given by

$$\pi_i = \beta m_i + (1 - \beta)m_j, \quad i \neq j \quad (2)$$

$$x_i = \gamma(m_i - m_i^e) - u, \quad \gamma > 0 \quad (3)$$

where  $m_i$  and  $m_i^e$  are money growth and expected money growth respectively for country  $i$ ,  $i = 1, 2$  and  $u$  is an aggregate supply shock which is distributed iid  $(0, \sigma_u^2)$ .

- (a) Provide economic intuition for equations (1)-(3). What is each country's bliss point in  $(\pi, x)$  space?
- (b) Derive each country's non-cooperative policy reaction function and explain how its slope is influenced by spillovers from the other country.
- (c) Derive each country's Nash equilibrium inflation-output gap combination and comment on whether it is Pareto-efficient.
- (d) Assuming country 1 can use both policy instruments  $m_1$  and  $m_2$ , show that it can attain its bliss point.
- (e) Briefly explain how you would modify loss function (1) for a cooperative policy game.

**(TURN OVER)**

10. Assume that:

$$y_t = -\lambda r_t + \eta_t, \quad \lambda > 0 \quad (4)$$

$$\pi_t = \pi_t^e + \theta y_t + \varepsilon_t, \quad \theta > 0 \quad (5)$$

where  $y_t$  is the output gap,  $r_t = i_t - \pi_t$  is the real interest rate,  $i_t$  is the nominal interest rate and  $\pi_t^e$  is the expected inflation rate. The random shocks  $\eta_t$  and  $\varepsilon_t$  have zero mean, and are independent and serially uncorrelated with variances  $\sigma_\varepsilon^2$  and  $\sigma_\eta^2$  respectively. The Central Bank minimises the quadratic loss function

$$L_t = \delta y_t^2 + (\pi_t - \pi^*)^2, \quad \delta > 0 \quad (6)$$

Assume that the inflation target,  $\pi^*$  is zero and expectations are rational.

First suppose that the Central Bank can observe the shocks perfectly.

- (a) Provide a brief explanation for equations (4) to (6).
- (b) What is the optimal rule for the real interest rate? Comment briefly on the properties of this rule.
- (c) What are the equilibrium processes for output and inflation? What does this imply for the volatilities of output and inflation?

Assume now that the shock to demand,  $\eta_t$ , is no longer observed perfectly. Instead the Central Bank relies on two independent forecasters to provide estimates of the demand shock. These unbiased estimates are:

$$\tilde{\eta}_{1t} = \eta_t + \zeta_t \quad (7)$$

$$\tilde{\eta}_{2t} = \eta_t + \psi_t \quad (8)$$

where  $\zeta_t$  and  $\psi_t$  have zero mean and are independent and serially uncorrelated with variances  $\sigma_\zeta^2$  and  $\sigma_\psi^2$  respectively. The Central Bank decides to combine these estimates using a weighted average of the two estimates of the form

$$\eta_t^c = (1 - \kappa)\tilde{\eta}_{1t} + \kappa\tilde{\eta}_{2t} \quad (9)$$

- (d) How should the Central Bank determine  $\kappa$ , that is the weight to attach to each estimate?

**END OF PAPER**