ECONOMICS TRIPOS PART IIA

MOCK EXAMINATION 2020

Paper 2 MACROECONOMICS - **3 HOUR EXAMINATION**

This paper is divided into three sections – A, B and C.

Answer **ALL FOUR** questions in SECTION A.

Answer **ONE** question from SECTION B.

Answer **ONE** question from SECTION C.

Section A carries 50% of the marks, with each question weighted equally.

Section B and C each carry 25% of the total marks for the paper.

Students are permitted to use an approved calculator.

SECTION A

A.1 Suppose an economic agent faces the following optimisation problem:

$$U = \max_{c,\,L}\{\ln(c) + \ln(1 - L)\}$$

$$\text{s.t.} \quad c = wL - T,$$

where c denotes consumption, L labour supply, $1 - L$ leisure, w the real wage, and T lump-sum taxes.

(a) Derive the optimal choice of consumption c and labour supply L. Compute c, L and total utility U for $w = 1$ and $T = 0$.

(b) Suppose there is an increase in the wage from $w = 1$ to $w = 4$. Explain *only the substitution effect* of this wage increase and illustrate it using a diagram with leisure on the horizontal axis and consumption on the vertical axis.

(c) Show mathematically that increasing the wage from $w = 1$ to $w = 4$ and simultaneously increasing taxes from $T = 0$ to $T = 2$ leaves the agent indifferent. Use this result to compute the substitution effect of the wage increase on both consumption c and labour L.

A.2 Consider the following McCall search model in which the reservation wage, w_r, is determined by

$$w_r - b = \underbrace{\frac{\beta}{1 - \beta} \sum_{w \in W} \max\{w - w_r, 0\}\Pr(w)}_{h(w_r)}$$

where β is the intertemporal discount factor, b denotes unemployment benefits, $W = \{w_1, w_2, w_3\}$ denotes the set containing the possible wage offers, and $\Pr(w)$ denotes the probability of wage offer w. Suppose that $\beta = \frac{5}{6}$, $W = \{2, 4, 6\}$, and $\Pr(w_1) = \frac{1}{5}$, $\Pr(w_2) = \frac{3}{5}$, and $\Pr(w_3) = \frac{1}{5}$.

(a) Carefully draw the function $h(w_r)$ with w_r on the horizontal axis and $h(\cdot)$ on the vertical axis.

(b) Suppose that $b = 1$. Compute the reservation wage w_r.

(c) Now suppose that unemployment benefits rise to $b = 2$. Explain how that affects the reservation wage w_r.

A.3 Last autumn, the United States experienced severe strain in the repo market and interbank market for reserves, such that the overnight repo rate jumped to 10% and the federal funds rate reached the 2.25% ceiling of its target range on 17 September 2019. Against this background, show and briefly explain the effects on the Federal Reserve's balance sheet of each of the following changes (ceteris paribus):

(i) The US Treasury issues $55 billion in US Treasuries to the US private sector.

(ii) US companies pay $30 billion in taxes to the US Treasury by bank transfer.

(iii) The Federal Reserve engages in an open market purchase of $75 billion of US Treasury bills in the secondary market.

In addition, explain how these changes affect the federal funds rate.

A.4 On 30 January 2020 the Monetary Policy Committee of the Bank of England announced that it had decided to keep Bank Rate at 0.75% and maintain its stock of asset purchases, while significantly reducing its output growth forecasts. In response, the British pound appreciated by 0.4% against the US dollar. Explain whether this could be consistent with the asset market model of the exchange rate.

SECTION B

B.1 Suppose that a representative, price-taking firm faces the following optimisation problem:

$$\max_{k_t,\, l_t}\{y_t - w_t l_t - (r_t + \delta)k_t\}$$

$$\text{s.t.} \quad y_t = A_t k_t^{\alpha} l_t^{1-\alpha}$$

where y_t denotes output, A_t productivity, k_t capital, l_t labour, w_t the real wage, r_t the real interest rate, and the subscript t refers to the time period. The depreciation rate satisfies $\delta \in [0,1]$ and the production technology parameter $\alpha \in (0,1)$.

(a) Derive the firm's first order conditions, and use these to find expressions for the factor prices r_t and w_t. Provide an economic interpretation of the results.

Assume for the remainder of this question that $l_t = 1$ and $\delta = 1$.
The representative household's optimisation problem is given by

$$\max_{c_0,\, c_1,\, b_1} \{\ln c_0 + \beta \ln c_1\}$$

$$\text{s.t.} \quad w_0 + (1 + r_0)b_0 = c_0 + b_1$$

$$w_1 + (1 + r_1)b_1 = c_1$$

where c_t denotes consumption, b_t bond holdings, with $b_0 > 0$ given, and $\beta \in (0,1)$ the intertemporal discount factor.

(b) Derive the Euler equation for the household's optimisation problem. Provide an intuitive explanation of the result.

(c) Market clearing implies that $b_t = k_t$ for $t = 0, 1$. Using the expressions for r_t and w_t in part (a), show that the representative household's constraints yield $y_0 = c_0 + I_0$ and $y_1 = c_1$ in equilibrium, where $I_0 = k_1$ denotes investment. In addition, derive the optimal equilibrium outcomes of c_0 and k_1 as a function of k_0.

(d) Suppose that agents know that there will be an increase in A_1. Explain how that affects consumption c_0 and investment I_0. Provide an intuitive explanation and illustrate the effects on equilibrium outcomes in a diagram with output y_0 on the horizontal axis and the real interest rate r_1 on the vertical axis.

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B.2 Consider the following Bernanke-Blinder model. Banks are assumed to hold bonds B, loans L and reserves R as assets, and have deposits D as liabilities, so that the representative bank's balance sheet is:

$$B + L + R = D$$

Reserves are equal to the minimum reserve requirement $R = \tau D$ with required reserve ratio $\tau = \frac{1}{2}$. The demand for deposits is given by

$$D^d = Y - \frac{1}{3}i_B$$

where Y is real aggregate output and i_B the bond interest rate. The demand for loans is described by

$$L^d = \frac{1}{2}Y - i_L + i_B$$

where i_L is the loan interest rate. The supply of loans is given by

$$L^s = \frac{1}{2}(D - R)$$

Goods market equilibrium is described by

$$Y = 75 - i_L - i_B$$

(a) Derive the equilibrium bond interest rate i_B in the money market in terms of output Y and reserves R; and derive the equilibrium loan interest rate i_L in the loan market in terms of Y, R and i_B. Explain intuitively how i_B and i_L are affected by Y and R.

(b) Derive the level of output Y in terms of R and i_B such that there is equilibrium in both the goods market and the loan market. Explain intuitively how this level of output depends on i_B and R.

(c) Assume that 'quantitative easing' by the central bank leads to an increase in reserves from $R = 15$ to $R' = 30$. Compute the initial and new equilibrium levels of output Y, the bond interest rate i_B and the loan interest rate i_L. Give an intuitive explanation of the effects.

(d) Suppose the central bank would like to raise the required reserve ratio τ to improve the financial stability of the banking system. Analyze how a higher required reserve ratio τ would affect the equilibrium levels of output Y and the bond interest rate i_B, and the effectiveness of 'quantitative easing' in this model.

SECTION C

C.1   In the early 1980's both Europe and the United States experienced a marked decline in inflation and a pronounced increase in unemployment. The unemployment rate in the United States subsequently fell back towards its long-run average, while the European unemployment rate remained high. To which extent is this pattern consistent with the NAIRU theory, and which other explanations may contribute to our understanding of this period?

C.2   "A dollar spent by the government is a dollar taxed, either in the present or in the future. How can then government spending stimulate the economy, let alone private demand?" Discuss to what extent this argument is correct, and to what extent it is not.

C.3   The outbreak of the new coronavirus during the first few months of 2020 had sizeable effects on financial markets, including:
   (i)   Sharp drops in equity prices (e.g. more than 10% in late February).
   (ii) Government bond yields hitting record lows and the global amount of negative-yielding debt rising significantly (e.g. to more than $14 trillion in early March).
   (iii) A significant depreciation of Asia-Pacific currencies (e.g. the Australian dollar and Thai baht depreciated around 4.5% during the first six weeks of 2020).
   Use economic theory to analyze the short-run impact of bad news about the coronavirus outbreak on equity prices, bond prices and exchange rates, and explain the three empirical facts above.

C.4   After the exit of the United Kingdom (UK) from the European Union (EU) on 31 January 2020, the UK government has stated that the UK will no longer be able to engage in frictionless trade with the EU after the transition period that lasts until the end of 2020. Analyze the short-run effects that this is likely to have on the UK economy in 2021, including aggregate output, consumption, investment, the current account, the nominal interest rate and the nominal exchange rate. In addition, analyze the likely short-run effects on the EU economy in 2021, taking into account international macroeconomic interdependence. Carefully explain the effects, specifying and discussing the assumptions you make for your analysis.

END OF PAPER