AFRICAN ECONOMIC RESEARCH CONSORTIUM

Collaborative PhD Programme in Economics for Sub-Saharan Africa

COMPREHENSIVE EXAMINATIONS IN CORE AND ELECTIVE FIELDS

FEBRUARY 10 – FEBRUARY 29, 2016

MACROECONOMICS

Time: 08:00 – 11:00 GMT **Date: Wednesday, February 10, 2016**

INSTRUCTIONS:

Answer a total of FOUR questions: ONE question from Section A, ONE question from Section B, and TWO questions from Section C.

The sections are weighted as indicated on the paper.

SECTION A: (15%)

Answer only ONE Question from this Section

Question 1

Provide brief explanation of the following:

(a) Okun's law **[5 Marks]**

(b) Ricardian equivalence **[5 Marks]**

(c) Great moderation **[5 Marks]**

Question 2

Provide brief explanations of the following Macro Concepts:

(a) Phillips Curve **[5 Marks]**

(b) Crowding Out **[5 Marks]**

(c) Policy Ineffectiveness Proposition **[5 Marks]**

SECTION B: (25%)

Answer only ONE Question from this Section

Question 3

(a) Suppose an individual lives for 2 periods in an economy where money exists and is valued. Utility maximization problem for this individual who is born at time *t*, $t \geq 0$, is written as,

$$Max.\, u(C_{1t}, C_{2t+1})$$

Subject to $P_t(1 - C_{1t}) = M_t^d$ and $P_{t+1}C_{2t+1} = M_t^d$,

where M_t^d is the nominal individual's demand for money

(i) Explain how this individual should consume in both periods. **[4 Marks]**

(ii) If there is no intrinsic uncertainty in this model, and so a perfect foresight is assumed, which means the actual and expected prices at time $t + 1$ are the same, write the first order condition for utility maximization of this individual and explain what it means. **[5 Marks]**

(b) Suppose you are given a discrete-time version of the firm's problem as $\tilde{\Pi} = \sum_{t=0}^{\infty} \frac{1}{(1+r)^t} [\pi(K_t)\kappa_t - I_t - C(I_t)]$, where $\tilde{\Pi}$ denotes aggregate lifetime discounted profits of the firm, $\pi(K_t)\kappa_t$ is a profit function with K_t = industry wide capital and κ_t = firm's capital; while I_t represents investment, $C(I_t)$ capital adjustment cost, and *r* denotes interest rate. The evolution of the firm's capital stock is given as $K_{t+1} = K_t + I_t$. If λ_t denotes Lagrangian multiplier, and $q_t = (1 + r)^t \lambda_t$ (which shows the value to the firm of an additional unit of capital at time *t*+1 in time-*t* prices):

(i) Derive the firm's investment first-order condition in period *t*; and then express q_t as a subject of your expression and write its intuition. **[5 Marks]**

(ii) Write the firm's first-order condition for capital in period *t*; and then explain the marginal revenue product of capital as a function of *only* q_t, Δq_t, and r to write its intuition. **[7 Marks]**

(iii) Write down and briefly explain the *transversality* condition of capital investment and explain. **[4 Marks]**

Question 4

Briefly explain each of the following monetary transmission mechanisms.

(i) Tobin's *q* theory of investment **[6.5 Marks]**

(ii) Wealth effect on consumption **[6 Marks]**

(iii) The bank lending channel (BLC) **[6 Marks]**

(iv) Balance sheet channel (BSC) **[6.5 Marks]**

SECTION C: (60%)

Answer TWO Questions from this Section,

AT LEAST one of which must be Question 5 OR 6

Question 5

The OLG model has been used for analysing various pension schemes that allow for a different treatment of young and old. In the case where there is no state pension scheme, the model may be structured to show that pension payments to the old are made out of voluntary savings of the young. In this case, one could relate the rate of savings to the changes in the capital stock (in per-capita terms),

$$s_t = (1 + n)k_{t+1}$$

where s_t is savings, n is population growth and k_{t+1} is the capital stock.

(a) In the case of a fully funded state pension scheme, government is able to impose a tax of τ_t on the young generation. After investing these contributions, government is then able to pay the pension p_{t+1}, such that,

$$p_{t+1} = (1 + r_{t+1})\tau_t$$

After including taxes, the voluntary savings, $\dot{s}_t$, for the young generation is,

$$\dot{s}_{1,t} = \omega_t - c_{1,t} - \tau_t$$

where ω_t refers to real wages and $c_{1,t}$ is consumption for the younger generation.

Consumption when old would then be given as,

$$c_{2,t+1} = (1 + r_{t+1})\dot{s}_t + p_{t+1}$$

What would be the effect of the introduction of such a state pension scheme on voluntary savings? To motivate your answer, derive an expression for the rate of savings in a fully funded state pension scheme? **[14 Marks]**

(b) In the case of an unfunded (pay-as-you-go) state pension scheme, payments to the older generation are made from current tax receipts. This implies that government the budget constraint could be written as,

$$\tau_t\left(N_{1,t} + N_{2,t}\right) = p_t N_{2,t}$$

where $N_{1,t}$ and $N_{2,t}$ refer to the population sizes of the young and old generation, respectively. Since, $N_{2,t} = N_{1,t-1} = N_{1,t} / (1+n)$ where n is the population growth, the pension after tax is,

$$p_t - \tau_t = (1 + n)\tau_t$$

Since the tax rate for the older and younger generation is the same, consumption when old could then be described as,

$$c_{2,t+1} = (1 + r_{t+1})s_t + (p_{t+1} - \tau_t)$$

where savings is once again given as, $S_t = \omega_t - c_{1,t} - \tau_t$.

(i) What is the steady state solution for given constant taxes, τ_t and interest rates r_t? **[8 Marks]**

(ii) How does this compare to what was previously derived? **[8 Marks]**

Question 6

Consider a consumer with preferences

$$U = \int_0^{\infty} e^{-\rho t} u(c_t)\, dt,$$

where ρ is the subjective discount rate, c is consumption, and $u(c) = \ln c$. She receives an exogenous flow of income y and can borrow or lend freely at a constant interest rate r, subject to a no-Ponzi-game condition that rules out infinite debt. Her flow budget constraint is

$$\dot{a} = r(a + y - c),$$

where a represents financial wealth and a_o is the initial value.

(a) Derive the first order condition for optimal consumption. **[5 Marks]**

(b) At what rate does consumption grow? Interpret its sign. **[10 Marks]**

(c) Derive the optimal decision rule for consumption. Provide interpretation for the case $\rho = r$. **[15 Marks]**

Question 7

Assume that the no-shirking condition in the Shapiro-Stiglitz unemployment model is specified as $w = \bar{w} + \bar{e} + \left(\frac{e}{q}\right)\left[\frac{bN}{(N-L)} + r\right]$ and the aggregate labour demand curve in the economy is $F'(L)$ (Where: L = total employment; N = total number of workers or total labour supply; e = effort exerted by labour; $\bar{e}$ = limit of effort level; b = the probability of job-quit rate; q = the probability that a worker who shirks will be detected; w = wage rate; $\bar{w}$ = unemployment benefits; and r = is the rate of time preference or the discount rate).

(a) Explain the equilibrium wage and employment levels. **[6 Marks]**

(b) Describe how each of the following affects equilibrium employment and wage. Draw the relevant diagram in each case.

(i) An increase in the job quit rate, b **[6 Marks]**

(ii) A decrease in the monitoring intensity, q **[6 Marks]**

(iii) A decline in labour demand **[6 Marks]**

(iv) A positive multiplicative shock to production function (that is, suppose the production is $AF(L)$ and consider an increase in A) **[6 Marks]**

Question 8

Assume that the government finances its expenditures through lump-sum taxes T_t and debt b_t but there is a cost of collecting taxes given by

$$\Phi(T_t) = \phi_1 T_t + \tfrac{1}{2}\phi_2 T_t^2, \qquad \Phi'(T_t) \geq 0$$

If the national income identity and the government budget constraint are

$$y_t = c_t + g_t + \Phi(T_t)$$

$$\Delta b_{t+1} + T_t = g_t + rb_t + \Phi(T_t),$$

where output y_t and government expenditures g_t are exogenous, and the aim is to maximize

$$\sum_{s=0}^{\infty} \beta^s U(c_{t+s}) \text{ for } \beta = \tfrac{1}{1+r}.$$

(a) Find the optimal solution for taxes. **[10 Marks]**

(b) What is the household budget constraint? **[5 Marks]**

(c) Analyze the effects of taxes, debt and consumption on:

(i) a temporary increase in government expenditure in period *t*, **[10 Marks]**

(ii) an increase in output **[5 Marks]**