HOWARD UNIVERSITY

DEPARTMENT OF ECONOMICS

CODE NUMBER _____ **TOTAL NUMBER OF PAGES _____**

August 29, 2023

FALL 2023 PH.D. MACROECONOMIC THEORY COMPREHENSIVE EXAMINATION

Examiners:

1. Dr. Mika Kato, Chairperson
2. Dr. Gerald Daniels
3. Dr. Tingting Xiong

1. The examination is scheduled between the hours: 9:30 a.m-1.00 pm

   ALL STUDENTS ARE TO BE SEATED BY 9:25 a.m.
2. YOU ARE REQUIRED TO ANSWER ONLY FIVE (5) QUESTIONS.

   Any additional questions answered over the required number from each category will NOT receive credit.
3. Correct answers to questions NOT asked will receive NO credit.
4. Be sure to write the Code Number assigned to you in the TOP LEFT HAND CORNER OF THIS SHEET AND ON EACH ANSWER SHEET. DO NOT WRITE YOUR NAME ON ANY SHEET OF THE EXAMINATION.
5. Begin each question on a new page. Number each page used in sequence. Write only on one side of the paper.
6. Write clearly and illustrate your answers with graphs whenever and wherever possible.
7. USE ONLY BLACK INK PENS.
8. At the end of the examination, please indicate the total number of pages being submitted in the space provided in the TOP RIGHT HAND CORNER of this sheet.

CODE NUMBER _____

STUDENTS: PLEASE CIRCLE ONLY THE QUESTIONS ANSWERED AND PROVIDE THE PAGE NUMBERS.

QUESTIONS	**PAGE NUMBERS**
1.	
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1. Bring your pens, pencils, calculators and rulers.
2. No briefcases, book bags or sacks, no handbags larger than 10 x 6 of any form are to be brought into the examination room.
3. No books, notes or other study material are to be brought into the examination room.
4. During the Examination there is to be no communication between or amongst students for any purpose. All questions must be directed to and channeled through the faculty member conducting the examination.
5. Only the scrap paper provided by the proctor is to be used for the examination. Scrap paper should bear the code number assigned to each student, and be handed over to the proctor along with the examination.
6. Students are not expected to leave the examination room before completing their examination and turning it in to the proctor.
7. NO FOOD OR SMOKING is permitted in the examination room.
8. It is the student's responsibility to remove any coffee or water containers taken into the examination room.
9. NO CELL PHONES ARE ALLOWED.
10. EXAMINATION RESULTS WILL ONLY BE GIVEN TO STUDENTS WHO ARE REGISTERED.

FALL 2023 PH.D. MACROECONOMIC THEORY COMPREHENSIVE EXAMINATION

PART A. ANSWER ANY TWO (2) QUESTIONS FROM QUESTIONS 1-3.

1. Write short definitions for (a)-(e). Use diagrams and/or equations where appropriate.

(a) Efficiency-wage hypothesis.
(b) Knowledge spillover.
(c) Relative risk aversion.
(d) Failure of Phillips curve.
(e) Golden-rule level of capital.

2. Answer questions (a)-(c).

(a) The Solow-Swan model predicts the so-called conditional convergence. Explain.
(b) How can we give an empirical test of conditional convergence? Write down your idea and an econometric model.
(c) Quah (1996, 1997) has shown that the world distribution of per-capita income is becoming more and more "twin peaked". Can conditional convergence explain this fact? Explain.

3. Consider a closed economy described by

$Y = E(Y, r, G, T); \quad 0 < E_Y < 1, E_r < 0, E_G > 0, E_T < 0$ **(IS)**

$r = r(Y, \pi); \quad r_Y > 0, r_\pi > 0$ **(Taylor rule)**

Answer questions (a)-(d).

(a) Show the multiplier effect, i.e., $\left.\frac{\partial Y}{\partial G}\right|_{IS} > 1$, using the given IS equation.
(b) Why it is said that Taylor rule is more realistic than the traditional LM equation as a description of money market.
(c) Analyze the effect of an inflation rise on the equilibrium output and real interest rate using the IS-MP diagram.
(d) Derive the aggregate demand (AD) equation from the above model and show that the AD curve is negatively sloped.

PART B. ANSWER ANY THREE (3) QUESTIONS FROM QUESTIONS 4-8.

4. Suppose that the economy's production function is

$$\boldsymbol{Y = K^{\frac{2}{3}}(LA)^{\frac{1}{3}}}$$

where K is capital, L is labor, and A is the state of technology.
Suppose that the saving rate (s) is equal to 6%, the rate of depreciation of capital (δ) is equal to 5%, the number of workers grow at 5% per year and the rate of technological progress is 4%.

Answer questions (a) and (b).

(a) Find the steady state values of:
   i. capital stock per effective worker
   ii. output per effective worker
   iii. growth rate of output per effective worker
   iv. growth rate of output per worker
   v. growth rate of output

(b) Suppose that the saving rate increases. Study its short-run and the long-run effect on the *growth rate* of per-capita output.

5. Consider the IS-LM model. where both consumption and investment decisions very much depend on expectations of future income and interest rates. Goods-market equilibrium requires that output be equal to aggregate spending:

$$Y = A(Y, T, r, Y^e, T^e, r^e) + G$$

where A stands for aggregate private spending -- the sum of consumption spending and investment spending and the superscript e denotes an expectation.

Equilibrium in financial markets requires that the supply of money be equal to the demand for money:

$$(M/P) = YL(r)$$

Now, suppose that the economy is a recession, and the Fed decides to increase the money supply. Answer questions (a) and (b).

(a) Assume that this expansionary monetary policy does not change expectations of either the future interest rate or future output. Show how IS and LM curves shift and explain the effects of the Fed policy on the economy in words.
(b) Once changes in expectations are taken into account, how do IS and LM curves shift? Explain the effects also in words.

6. Consider a closed economy described by the following equations:

$$C_t = 100 + 0.9(Y - T) \quad \text{Consumption function}$$
$$I = 100 \quad \text{Investment function}$$

Answer questions (a) and (b).

(a) Compute the government-spending multiplier when taxes are levied in a lump-sum way as $T = 100$.
(b) Compute the government-spending multiplier when income is taxed at the same rate as $T = 0.2Y$.

7. Consider a Ramsey-Cass-Koopmans model where a representative agent consumes and engages in production for $t \in [0, \infty)$. The agent's utility depends on its current consumption $u(c_t)$ and its production technology is $y_t = f(k_t)$. Both functions have usual properties.

Answer questions (a)-(d).

(a) Write down the representative agent's problem to find the optimal consumption to maximize the present-value of utility when its subjective discount rate is ρ and the depreciation rate of capital is δ.
(b) Show the first-order necessary conditions for maximization.
(c) Using a phase diagram, show that there is a unique steady state and that the steady state is stable.
(d) Show that the golden rule capital stock is not guaranteed in the steady state.

8. Suppose that the economy can be described by the following three equations:

$$u_t - u_{t-1} = -0.4(g_{yt} - 3\%) \quad \text{Okun's law}$$
$$\pi_t - \pi_{t-1} = -(u_t - 5\%) \quad \text{Phillips curve}$$
$$g_{yt} = g_{mt} - \pi_t \quad \text{Aggregate demand}$$

where u_t is unemployment, π_t is inflation, g_{yt} is income growth, and g_{mt} is money growth in year t. Assume initially that $u_t = u_{t-1} = 5\%$, $g_{mt} = 13\%$ and $\pi_t = 10\%$. Now suppose that this year's money growth is permanently reduced from 13% to 0%. Answer questions (a) and (b).

(a) Compute the impact on unemployment and inflation this year and next year.
(b) Compute the values of unemployment and inflation in the medium run.