

HOWARD UNIVERSITY
DEPARTMENT OF ECONOMICS

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SEPTEMBER 2, 2020

FALL 2020 M.A. 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 ON CAMERA 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.
9. PLEASE SUBMIT A PICTURE OF EACH PAGE TO GPRITCHETT@HOWARD.EDU AND CONFIRM THAT THE PICUTRE WAS RECEIVED BEFORE EXITING THE EXAM.

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1. Bring your pens, pencils, calculators and rulers.
2. No briefcases, cell phones, book bags or sacks, no handbags larger than 10 x 6 of any form are to be near you when taking the exam.
3. No books, notes or other study material are to be near you when taking the exam.
4. You can only use an unopened pack of paper that is opened on camera.
5. You must show a video of your sitting area before you can be approved to take the exam. This will confirm that the testing area is clear. Your video must remain on the entire time. Turn off any virtual background.
6. Use *private* Zoom chat to ask questions of the proctor.
7. During the Examination there is to be no communication between or amongst students or anyone for any purpose. All questions must be directed to and channeled through the faculty member conducting the examination.
8. Students are not expected to leave their chairs before completing their examination and turning it in to the proctor.
9. NO FOOD OR SMOKING is permitted during the exam.
10. The student may have a drink with them during the exam.
11. If you get disconnected for any reason, please call the proctor. Upon reentry to the test, you must verify that your area is clear again. In the event that you cannot reconnect, please contact the Associate Chair of the department to monitor the remainder of the exam via phone.
12. EXAMINATION ZOOM INFORMATION WILL ONLY BE GIVEN TO STUDENTS WHO ARE REGISTERED.

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Honor Code

I agree not to access any material in taking this exam and understand that if I do, I will be given an immediate fail on the exam.

X _____

CODE NUMBER _____

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

QUESTIONS	PAGE NUMBERS
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

FALL 2020 M.A. MACROECONOMIC THEORY COMPREHENSIVE EXAMINATION

PART A. ANSWER ALL THREE (3) QUESTIONS 1-3.

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

- (a) Steady-state equilibrium
- (b) Human Capital
- (c) Golden rule
- (d) Real Wage
- (e) Closed Economy
- (f) National Income Identity
- (g) Recession

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

- (a) What is the national income identity for a closed economy with no government?
- (b) What is the capital accumulation equation? How do we interpret this equation.
- (c) Suppose an economy's production function is given by $F(k_t) = k_t^\alpha$, where $1 > \alpha > 0$, why do we assume $k_t \geq 0$?
- (d) For the production function provided in (c), show that $F'(k_t) > 0$ for any $k_t > 0$.
- (e) For the production function provided in (c), show that $F''(k_t) < 0$ for any $k_t > 0$.

3. Be sure to use diagrams as well as a written explanation when answering this question. According to the IS-LM model and Aggregate Demand and Supply model, what happens to the interest rate, income, consumption, investment, prices, and unemployment rate in the short run and long run under the following scenarios:

Answer questions (a)-(c).

- (a) The Fed decides to pursue expansionary monetary policy to combat COVID-19 by increasing the money supply.
- (b) Congress decides to reduce taxes to combat COVID-19.
- (c) Congress decides to reduce government expenditure to combat rising deficits.

PART B. ANSWER ANY TWO (2) QUESTIONS FROM QUESTIONS 4-8.

4. Suppose that the following equations describe the closed economy of Washington, DC:

$C(Y - T) = 4000 + 0.5(Y - T)$	Consumption Function
$I(r) = 500 - 50r$	Investment Function
$T = 200$	Taxes
$G = 200$	Government Spending
$L(r, Y) = .5Y - 50r$	Demand for Real Money Balances
$M = 4,000$	Money Supply
$P = 4$	Price Level

Answer questions (a)-(c).

- (a) Given the information above, drive an equation for the IS curve for Washington.
Express the IS curve as $r(Y)$.
 - (b) Given the above equations, drive an equation for the LM curve for Washington.
Express the LM curve as $r(Y)$.
 - (c) Solve for the equilibrium interest rate and output using the IS curve derived in (a) and the LM curve derived in (b).
- 5. Assume that an economy's production function is described by $F(k_t) = k_t^\alpha$. In addition, we assume that the aim of the central planner is to maximize the present value of current and future utility,**

$$\max_{\{c_{t+s}, k_{t+s}\}} V_t = \sum_{s=0}^{\infty} \beta^s \log c_{t+s} \text{ and } \beta = \frac{1}{1 + \theta}$$

and the production function is given by $F(k_t) = Ak_t^\alpha$, where $1 > \theta > 0$, $A > 0$, and $1 > \alpha > 0$.

Answer questions (a)-(d).

- (a) Write the resource constraint for a closed economy with no government.
- (b) Define the Lagrangian for the centralized economy.
- (c) Determine the first order conditions for (b).
- (d) Derive the optimal long-run, i.e. steady state, solution for capital, k , consumption, c , and investment, i .

6. Assuming that households can now decide between work, n_t , and leisure, l_t , in period t , normalizing the sum of work hours and leisure hours to one, i.e. $1 = n_t + l_t$. The economy's production function is given by:

$$y_t = k_t^\alpha n_t^{1-\alpha}$$

and the central planner's objective to maximize household utility given by:

$$V_t = \sum_{s=0}^{\infty} \beta^s [\log(c_{t+s}) + \log(l_{t+s})] \text{ and } \beta = \frac{1}{1+\theta}$$

where y_t is output, c_t is consumption, k_t is the capital stock. The parameters α and θ are assumed to be nonnegative.

Answer questions (a)-(d).

- (a) Define the Lagrangian for the centralized economy.
- (b) Determine the first order conditions for
- (c) Derive the optimal long-run, i.e. steady state, solution for capital, k , consumption, c , labor, n , and leisure, l .

7. Suppose a closed private economy's production function is given by

$$Y_t = K_t^\alpha (A_t N_t)^{1-\alpha}$$

where total capital stock and size of the population are denoted by K_t and N_t , respectively. The level of technological progress at time t is given by:

$$A_t = (1 + \mu)^t$$

where growth rate of technology is denoted by μ . Population size is determined by

$$N_t = (1 + n)^t$$

where n is the population growth rate. Following the Solow-Swan model, let us assume the savings rate is constant.

$$s_t = s.$$

Answer questions (a)-(e).

- (a) Write the production function in per effective worker terms.
- (b) Write the capital accumulation equation in per effective worker terms.
- (c) Define the equilibrium relationship between savings and investment

- (d) Define the equilibrium relationship between savings and investment both in per effective worker terms
- (e) Provide the relationship between the savings rate, s , and national income and consumption per effective worker, \hat{y}_t and \hat{c}_t .
- (f) Using (a-e), determine the balanced growth path levels of capital, \hat{k} , output, \hat{y} , and consumption, \hat{c} , per effective worker.

8. Suppose we allow for technological progress, the utility and production function are given by

$$U(C_t) = \ln C_t \text{ and } Y_t = K_t^\alpha (A_t N_t)^{1-\alpha}.$$

In addition, capital accumulation, labor, and technology are given by

$$\Delta K_{t+1} = I_t - \delta K_t$$

$$N_t = (1 + n)^t$$

$$A_t = (1 + \mu)^t$$

The parameters μ , α , δ and n are assumed to be nonnegative.

Answer questions (a)-(d).

- (a) Write the utility function, production function, and capital accumulation equation in terms of per effective worker terms.
- (b) Using (a) define the Lagrangian for the centralized closed economy.
- (c) Determine the first order conditions for (b).
- (d) Using (c), determine the Euler equation.