

HOWARD UNIVERSITY
DEPARTMENT OF ECONOMICS

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JANUARY 26, 2021

SPRING 2021 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 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.	
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SPRING 2021 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) Failure of Phillips curve.
- (b) Relative risk aversion.
- (c) Creative destruction.
- (d) Arrow (1962)'s learning by doing.
- (e) Efficiency wage hypothesis.

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

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

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

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.
- (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. 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.

5. Consider a policymaker whose objective function is to minimize the social-welfare loss,

$$L = \frac{1}{2}(y - y^*)^2 + \frac{1}{2}a(\pi - \pi^*)^2; a > 0,$$

where y is the output, π is the inflation rate, y^* and π^* are their target levels respectively. A Phillips curve relationship is given by

$$y = y^n + b(\pi - \pi^e); b > 0 \text{ and } y^n < y^*,$$

where y^n is the natural output and π^e is the expected inflation.

Answer questions (a)-(f).

- (a) How do you interpret the parameter a in the loss function? What does a larger value of a mean?
- (b) Assume that the policy maker makes a binding commitment about inflation. Derive the policy maker's optimal response function.
- (c) What are the levels of inflation and output in the economy under the policy by rule?
- (d) Now assume that the policy maker sets inflation by discretion. Derive the policy maker's optimal response function.
- (e) What are the levels of inflation and output in the economy under the policy by discretion?
- (f) Do the economic outcomes obtained in (c) and (e) imply that there is a dynamic inconsistency problem? Explain.

6. Given the following production function:

$$Q = F(K, L) = BK^\alpha L^{1-\alpha},$$

where $B > 0$ and $0 < \alpha < 1$ and with output Q divided between consumption and investment. The fraction of income devoted to investment is s , a constant, capital depreciates at the rate δ , and labor grow at a constant rate n .

Answer questions (a)-(d).

- (a) Write Q in an intensive (per capita) form, q .
- (b) Find the equation that describes the evolution of the capital stock per unit of labor, k .
- (c) Find the steady-state levels, k^* and q^* .
- (d) If the population growth rate increases show what happens to the equilibrium consumption. You may use a diagram.

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

- (a) What is the engine of growth in Romer (1990)'s product variety growth theory and in the Schumpeterian growth theory?
- (b) Compare it to the element driving endogenous growth in the neoclassical theory. What does this comparison imply in terms of pro-growth policy design in both settings?
- (c) Both the product-variety and the Schumpeterian models predict scale effects, namely, that a larger population (a larger population of researchers) would predict faster growth. Is this prediction problematic? How would you empirically test this prediction?

8. Suppose that the economy's production function is

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

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.