

Graduate Macroeconomics I: Midterm

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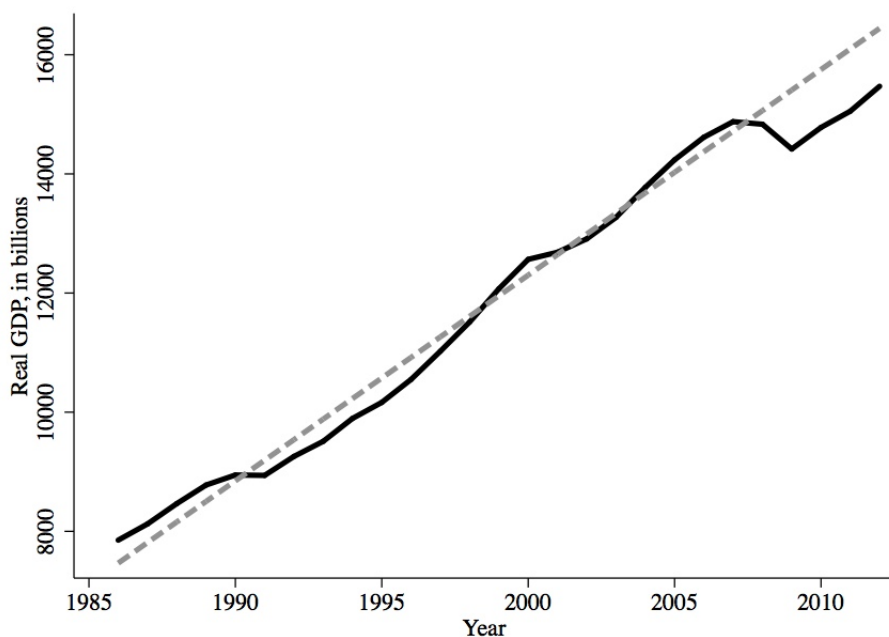
Instructions: Write your answers on blank paper. Start each problem on a new sheet. Write your name and the problem number of EVERY page. Number every page.

Read the whole problem before you start answering. Make sure you answer all the parts of each problem. If the problem asks you to graph something, graph it and label the axes correctly.

You have 90 minutes for the exam. Make sure you at least right down some ideas about how the problem should be answered if you cannot figure out a mathematical answer. You will need a calculator.

There are a total of 100 points.

Problem 1 (25 points): The following figure shows the path of real GDP (Y) in the United States over the last roughly the last 30 years. Assume that the U.S. economy is described by a Ramsey model, with population growth of n and some trend productivity growth of g .



- (A) Give me a reasonable explanation, in the context of the Ramsey, for the shift you see around 2008 to a lower path for GDP.
- (B) Draw a figure showing the time path of the return on capital, r , that is consistent with your explanation.

Problem 2 (25 points): Use a standard OLG model for individuals who live two periods, work only in the first, have log utility with a time preference rate of β , and with a production function of $y_t = k_t^\alpha$. Population grows at rate n , and recall that depreciation is $\delta = 1$ in the OLG.

- (A) Under what conditions on β will the steady state of the OLG model, k^* , be *larger* than the Golden Rule capital stock k^{GR} .
- (B) The government wants to push the economy to the Golden Rule. To do this, they are going to intervene in factor markets. Rather than having labor earn $(1 - \alpha)$ of output, they are going to mandate that labor earns ϕ of output. What value of ϕ will ensure the economy has a steady state of $k^* = k^{GR}$?
- (C) Is the value of ϕ bigger than or smaller than $(1 - \alpha)$? Give some intuition for your answer.

Problem 3 (25 points): You have a production function that is linear in capital, but involves a fixed cost to start producing, $Y = (K - \underline{K})$, where \underline{K} is the fixed amount of capital that must be used in order to produce anything. Capital K depreciates at the rate δ , and there is no population growth. The savings rate is s .

- (A) Under what conditions does this economy have a steady state $k^* > 0$ What is that steady state value of k^* ?
- (B) Assume those conditions hold. Is this steady state stable?
- (C) Assume that the economy starts at the steady state, and then aliens land and give the economy more capital. Plot the time path of output per capita after this gift.

Problem 4 (25 points): You have a typical Ramsey model. The economy is in steady state at time zero, and has a time preference rate of β^H . At time 10, the time preference rate shifts to $\beta^L < \beta^H$. After it shifts, it will stay at β^L forever.

- (A) Imagine that the shift is a surprise to people at time 10. Draw figures showing the time path of consumption and capital per worker over time, from time zero forward.
- (B) Now imagine that people are told in period 5 that the shift will take place in period 10. Draw figures showing the time path of consumption and capital per worker over time, from time zero forward.
- (C) Imagine that the shift is a surprise to people at time 10, but now the shift down in β will only last until period 20, at which point it will go back up to β^H . In period 10, people are told that this will happen. Draw figures showing the time path of consumption and capital per worker over time, from time zero forward.