

Name: _____ Number: _____

Nova School of Business and Economics
Macroeconomics, 1103 - 1st Semester 2013-2014
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TAs: João Vaz, Paulo Fagandini, and Pedro Freitas

Midterm 2

Maximum points: 20. Time: 1h. Pages: 10. The exam is closed books, closed notes. No calculators are allowed. You may write on the back of the pages if you need space.

1. (2 pts) When an economy opens for trade, welfare increases because consumption of all goods increase. True or False? Explain.

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2. (2 pts) Select the best answer.

a. According to the data, consumption, investment and average labor productivity are variables, respectively, (procyclical, procyclical and procyclical / countercyclical, procyclical and countercyclical / procyclical, procyclical and countercyclical / procyclical, countercyclical and countercyclical).

b. In the New Keynesian model, (monetary policy is neutral / money is fixed / monetary policy has real effects).

c. If the interest rate target fluctuates, the New Keynesian model predicts that consumption and average labor productivity are variables, respectively, (countercyclical and countercyclical / countercyclical and procyclical / procyclical and countercyclical / procyclical and procyclical).

d. In the Friedman-Lucas money surprise model, a surprise increase in money supply growth increases inflation (less than in proportion / in an equal proportion / more than in proportion) to the growth rate of the money supply.

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3. (2 pts) From the Solow growth model, we obtained the following relation:

$$k_{t+1} (1 + n) = szf(k_t) + (1 - d) k_t. \quad (1)$$

This equation follows the notation used in class. That is, k_t is capital per capita in period t , n is the population growth rate, s is the savings rate, $zf(k_t)$ is production per capita, z is productivity, and d is the rate of depreciation of capital.

Use equation (1) and diagrams to show that an increase in the savings rate generates an increase in the level of capital per capita but does not generate an increase in the long-run growth rate of capital per capita. Justify.

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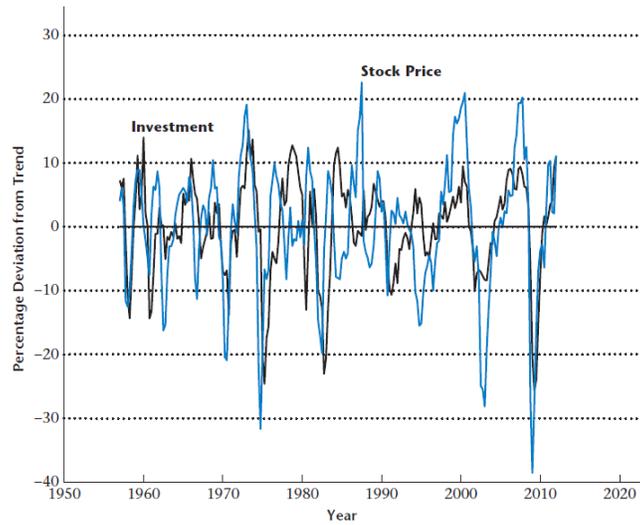
4. (6 pts) An economy receives the information that future productivity z' will increase.
 - a. (4 pts) Obtain the effects of this increase in z' on wages, employment, interest rates and production. Use diagrams $w \times N$ and $r \times Y$. Justify.

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b. (2 pts) Consider the figure below, with data on stock prices and investment. Does the evidence in the figure agree with your predictions obtained in *a*? Explain.



Number: _____

5. (8 pts) Consider an increase in current government expenditures, G .
- a. (4 pts) What will be the effect of the increase in G on real wages, hours worked, real interest rates, and GDP? Use the diagrams $w \times N$ and $r \times Y$. Justify.

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b. (4 pts) Compare two ways of financing the increase in G : (1) with an increase in current taxes and (2) with an issue of government bonds. Is the effect on private savings different with (1) or (2)? Show the effects with a graph $r \times I, S$. Does the method (1) or (2) matter for your results on item a ? Explain.

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SOLUTION SKETCH

Question 1

1. (2 pts) When an economy opens for trade, welfare increases because consumption of all goods increase. True or False? Explain.

Answer

False. Welfare increases because agents can consume and produce a different combination of goods. Consumption of some goods may decrease while consumption of other goods increase.

Question 2

2. (2 pts) Underline the best answer.

a. According to the data, consumption, investment and average labor productivity are variables, respectively, (**procyclical, procyclical and procyclical** / procyclical, procyclical and countercyclical / procyclical, countercyclical and countercyclical).

b. In the New Keynesian model, (monetary policy is neutral / money is fixed / **monetary policy has real effects**).

c. If the interest rate target fluctuates, the New Keynesian model predicts that consumption and average labor productivity are variables, respectively, (countercyclical and countercyclical / countercyclical and procyclical / **procyclical and countercyclical** / procyclical and procyclical).

d. In the Friedman-Lucas money surprise model, a surprise increase in money supply growth increases inflation (**less than in proportion** / in an equal proportion / more than in proportion) to the growth rate of the money supply.

Question 3

3. (2 pts) From the Solow growth model, we obtained the following relation:

$$k_{t+1} (1 + n) = szf(k_t) + (1 - d) k_t. \quad (1)$$

This equation follows the notation used in class. That is, k_t is capital per capita in period t , n is the population growth rate, s is the savings rate, $zf(k_t)$ is production per capita, z is productivity, and d is the rate of depreciation of capital.

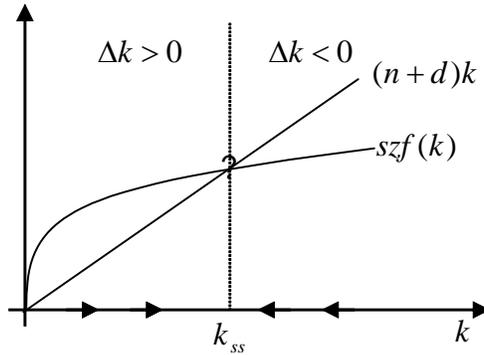
Use equation (1) and diagrams to show that an increase in the savings rate generates an increase in the level of capital per capita but does not generate an increase in the long-run growth rate of capital per capita. Justify.

Answer

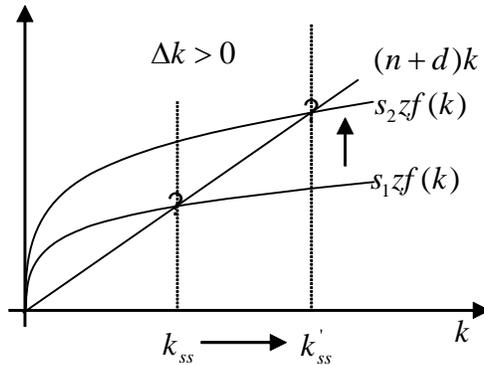
Subtracting $k_t(1+n)$ from equation (1), we obtain

$$\begin{aligned}
 k_{t+1}(1+n) - k_t(1+n) &= szf(k_t) + (1-d)k_t - k_t(1+n) \\
 \Rightarrow \Delta k_{t+1}(1+n) &= szf(k_t) - (n+d)k_t, \tag{2}
 \end{aligned}$$

where $\Delta k_{t+1} = k_{t+1} - k_t$. Therefore, if $szf(k_t) > (n+d)k_t$ then capital per capita increases through time, $\Delta k_{t+1} > 0$. If $szf(k_t) < (n+d)k_t$ then capital per capita decreases, $\Delta k_{t+1} < 0$. Capital per capita is in equilibrium if $szf(k_t) = (n+d)k_t$. In this case, $\Delta k_{t+1} = 0$. The figure below summarizes the conclusions obtained with equation (2). Notice that the production function has decreasing marginal productivity of capital. Therefore, $f(k)$ is concave as shown in the figure.



When s increases, the curve $szf(k)$ shifts upward. The previous steady state k_{ss} is not an steady state anymore under the higher savings rate. For s_1 , $s_1zf(k_{ss,1}) > (n+d)k_{ss,1}$. As a result capital per capita increases toward $k_{ss,2}$. The new steady state will be with $k_{ss,2}$. The figure below shows these results.



Capital per capita increases to a new, higher value. However, the long-run growth rate is equal to zero as the economy converges to a new steady state. Therefore, the increase in the savings rate increases the level of k but does not increase its long-run growth rate.

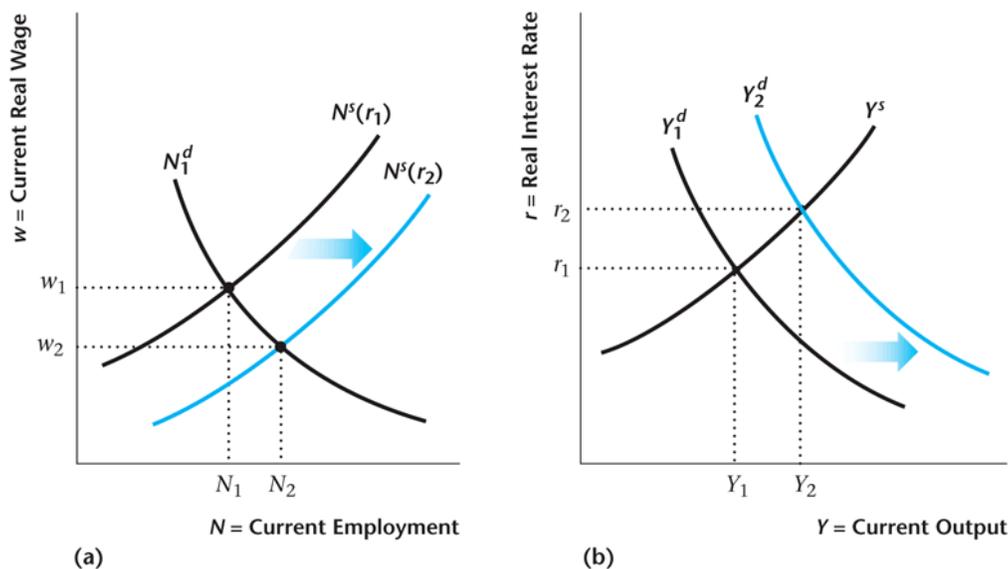
Question 4

4. (6 pts) An economy receives the information that future productivity z' will increase.

a. (4 pts) Obtain the effects of this increase in z' on wages, employment, interest rates and production. Use diagrams $w \times N$ and $r \times Y$. Justify.

Answer

The effects of this shock is described in the textbook, pages 436-438 (5th ed.). See these pages for the answer. Figure 11.26, reproduced below, summarizes the main conclusions.



b. (2 pts) Consider the figure below, with data on stock prices and investment. Does the evidence in the figure agree with your predictions obtained in a? Explain.

Answer

The idea is that stock prices reflect information about future prospects of the economy. Better expectations, as a result, imply higher stock prices. So, expectations of higher future productivity are related to higher stock prices.

The evidence in the figure shows a positive correlation between stock prices and investment. Therefore, better expectations about future productivity are related to higher investment. This evidence agrees with the predictions in *a*.

Question 5

5. (8 pts) Consider an increase in current government expenditures, G .

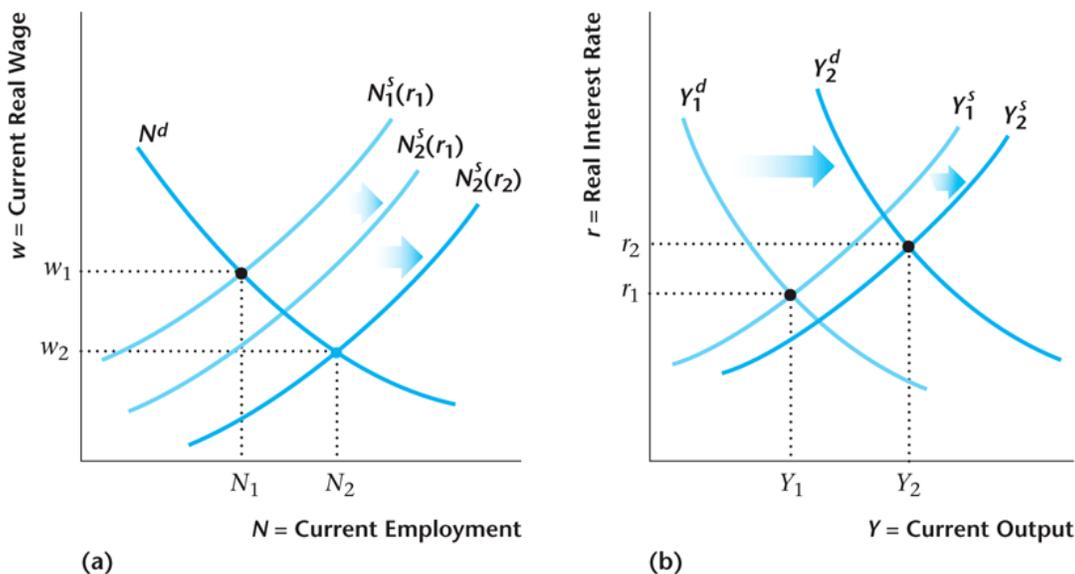
a. (4 pts) What will be the effect of the increase in G on real wages, hours worked, real interest rates, and GDP? Use the diagrams $w \times N$ and $r \times Y$. Justify.

Answer

An increase in G implies higher present value of taxes. By a negative income effect, therefore, consumers decrease their demand for leisure, which implies an increase in labor supply from $N_1^s(r_1)$ to $N_2^s(r_1)$. This increase in labor supply implies a rightward shift in Y^s .

Moreover, an increase in G implies that $Y^d = C + G + I$ increases as there is no reason for a shift in I and because C decreases but by a smaller quantity than G . C decreases by less than the increase in G because agents can smooth the decrease in consumption over several periods. Even if I shifts, the changes in I will not be as strong as the increase in G . So, Y^d shifts to the right. This is a relevant change, stronger than the change in Y^s , as the effects of the increase in G apply directly to Y^d . The interaction of Y^d and Y^s implies an increase in the interest rate. This change implies a further increase in labor supply, from $N_2^s(r_1)$ to $N_2^s(r_2)$.

Therefore, as shown in the figure below (fig. 11.22 of the book), wages decrease, employment increases, interest rates increase, and output increases.



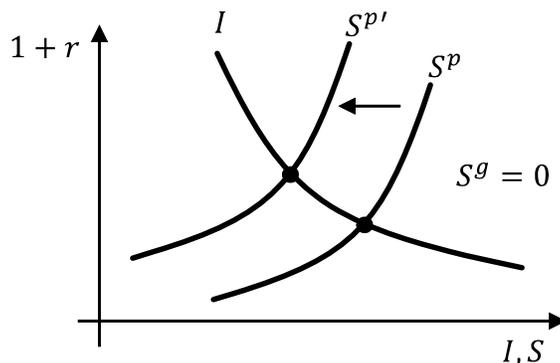
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b. (4 pts) Compare two ways of financing the increase in G : (1) with an increase in current taxes and (2) with an issue of government bonds. Is the effect on private savings different with (1) or (2)? Show the effects with a graph $r \times I, S$. Does the method (1) or (2) matter for your results on item a ? Explain.

Answer

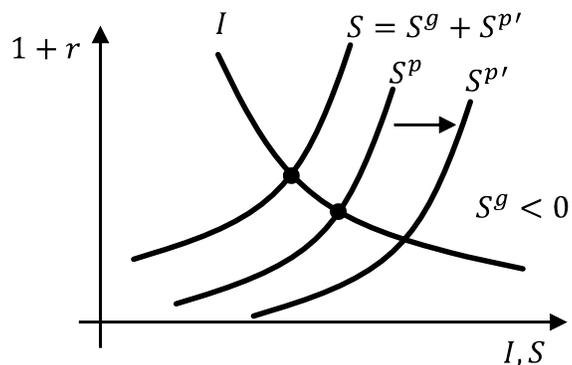
Yes, the behavior of private savings is different depending on the way in which the government finances itself. First, notice that the analysis above implies that interest rates increase and, as a result, investment decreases. As $I = S$ in equilibrium, aggregate savings decrease.

However, considering that the economy is closed, aggregate savings can be decomposed as $S = S^g + S^p$, where S^g is government savings and S^p is private savings. We have that $S^g = T - G$. Under method (1), the government increases T . Let us say that $S^g = 0$ before and after the increase in G . As aggregate savings decrease, S^p will decrease after the increase in G . This is described in the figure below.



Under method (2), the government issues bonds to cover the increase in G . Then S^g after the increase in G becomes smaller than S^g before the change, as T doesn't change and G increases. Let us say the $S^g = 0$ before the change and that $S^g = -\Delta G < 0$ after the change. Agents purchase the new issue of bonds, so private savings increase. As a result, private savings increases but we still have that $S = S^g + S^p$ decreases, as shown in the figure below.

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As a first approximation, the financing methods do not affect the results in *a*. What matters is the present value of the government expenditures. This is the result of the Ricardian equivalence. It can be the case that the financing methods affect the economy by additional distortions caused by the method itself, such as higher distortions caused by higher taxes, or by existing distortions in the economy, such as borrowing constraints. For the main effects, however, the financing method will not affect the results.