

TOTAL SCORE _____

MC _____

EXE 1 _____

EXE 2 _____

Econ 002- INTRO MACRO Prof. Luca Bossi November 03, 2016
MIDTERM #2– SOLUTIONS

My signature below certifies that I have complied with the University of Pennsylvania's Code of Academic Integrity in completing this examination. In particular, I declare that I have not used a graphing calculator to complete this exam.

Student Name (printed)

PennID

Your Signature

Your TA Name (printed)

INSTRUCTIONS

The exam is closed book. The exam is composed of 20 multiple choice questions and two exercises. Unless stated otherwise, all multiple choice questions are worth 3 points (the total is 60 points for the multiple choice part). The exercises are worth 20 points each (the total is 40 points for the exercise part). Only the answer sheet for the MC part will be graded for your MC. You can detach the answer sheet for the MC part at the end of the exam if this is more comfortable for you. If that is the case, be sure to put your name on it and to tell your TA to staple it back to the exam when finished. If you do not fill in the MC part on time and request extra time at the end of the exam to write the answers up, a proctor will take your name and you will receive a penalty of 5 points. Please follow the instructions as to how to submit your exam at the end of the 60 minutes. If you do not follow those instructions and/or delay your exam submission, a proctor will take your name and you will receive a penalty that will depend on your (miss)behavior.

ANSWER ALL QUESTIONS. TOTAL POINTS = 100. TOTAL TIME = 60 minutes

Provide your answers on the exam sheet directly. Read all questions very carefully. Write legibly.

EXAM TAKING POLICY

If you need to use the restroom, raise your hand and wait for the proctor to come to you. Only one person can be out of the examination room at a time, and the proctor will hold onto your exam papers while you are out at the restroom.

FOR THE DURATION OF THE EXAM, AND WITH THE EXCEPTION OF YOUR ALLOWED SCIENTIFIC CALCULATOR, YOU HAVE TO TURN OFF EVERYTHING ELSE THAT HAS A POWER BUTTON. NO CELL PHONES. NO BOOKS. NO NOTES. NO HELP SHEETS. NO TALKING TO EACH OTHER. NO ASKING THE PROCTORS ANY QUESTION OR HELP TO SOLVE THE EXAM. YOU CANNOT CONNECT TO THE INTERNET.

WRITE IN PENCIL OR IN PEN AS YOU LIKE, BUT IF YOU WRITE IN PENCIL THERE IS NO POSSIBILITY TO ASK FOR RE-GRADING. PLEASE WRITE YOUR NAME ON THE FIRST PAGE OF THE EXAM AND ON THE MC BUBBLE PAGE.

PLEASE DO NOT START THIS EXAM UNTIL INSTRUCTED TO DO SO.

GOOD LUCK!

MULTIPLE CHOICE QUESTIONS

Identify the letter that best completes the statement or answers the question. Mark your answer (fill in the letter of your choice) in the answer bubble sheet for the MC provided on the last page of the exam.

1) When a closed economy saves a larger portion of its GDP than it did before, it will have

- a. **more capital and higher labor productivity.**
- b. more capital and lower labor productivity.
- c. less capital and higher labor productivity.
- d. less capital and lower labor productivity.

2) We would expect the interest rate on Bond A to be higher than the interest rate on Bond B if the two bonds have identical characteristics except that

- a. the credit risk associated with Bond A is lower than the credit risk associated with Bond B.
- b. Bond A was issued by the city of Philadelphia and Bond B was issued by Red Hat Corporation.
- c. **Bond A has a term of 20 years and Bond B has a term of 2 years.**
- d. All of the above are correct.

3) If the government's expenditures exceeded its receipts, it would likely

- a. lend money to a bank or other financial intermediary.
- b. borrow money from a bank or other financial intermediary.
- c. buy bonds directly from the public.
- d. **sell bonds directly to the public.**

4) Suppose a country imposes new restrictions on how many hours people can work. If these restrictions reduce the total number of hours worked in the economy, but all other factors that determine output are held fixed, then

- a. productivity and output both rise.
- b. **productivity rises and output falls.**
- c. productivity falls and output rises.
- d. productivity and output fall.

5) Suppose that in a closed economy GDP is equal to 11,000, taxes are equal to 2,500 consumption equals 7,500 and government purchases equal 2,000. What are private saving, public saving, and national saving?

- a. 1,500, 1,000, and 500, respectively
- b. **1,000, 500, and 1,500, respectively**
- c. 500, 1,500, and 1,000, respectively
- d. None of the above is correct.

6) The country of Growpaw does not trade with any other country. Its GDP is \$20 billion. Its government purchases \$3 billion worth of goods and services each year, collects \$6 billion in taxes, and provides \$2 billion in transfer payments to households. Private saving in Growpaw is \$4 billion. What is investment in Growpaw?

- a. **\$5 billion**
- b. \$4 billion
- c. \$3 billion
- d. \$2 billion

7) Other things the same, if the government increases transfer payments to households, then the effect of this on the government's budget

- a. will make investment rise.
- b. will make the rate of interest rise.**
- c. will make public saving rise.
- d. All of the above are correct.

8) Over the last ten years productivity grew faster in Oceania than in Freedonia and the population and total hours worked remained the same in both countries. It follows that

- a. real GDP per person must be higher in Oceania than in Freedonia.
- b. real GDP per person grew faster in Oceania than in Freedonia.**
- c. the standard of living must be higher in Oceania than in Freedonia.
- d. All of the above are correct.

9) Educated people may generate ideas that increase production. These ideas

- a. may produce a return to society from education that is greater than the return to the individual.
- b. could justify government subsidies for education.
- c. are external benefits of education.
- d. All of the above are correct.**

10) Janelle offers you \$1,000 today or \$1,500 in 5 years. You would prefer to take the \$1,500 in 5 years if the annual interest rate is

- a. 8 percent.**
- b. 9 percent.
- c. 10 percent.
- d. All of the above are correct.

11) Consider the standard Cobb-Douglas production function we have seen several times in class. If, everything else the same, $1 - \alpha$ -the labor share- were to rise, what would happen?

- a. the level of labor would fall, causing lower output and lower demand for capital.
- b. the productivity of labor would fall, causing lower output and lower demand for labor.**
- c. the productivity of labor would rise, causing higher output and higher demand for labor.
- d. the level of labor would rise, causing higher output and higher demand for capital.

12) Consider three imaginary countries. In Aziria, national saving amounts to \$3,000 and consumption amounts to \$7,000; in Graniva, national saving amounts to \$2,000 and consumption amounts to \$8,000; and in Tanistan, national saving amounts to \$4,500 and consumption amounts to \$10,500. The saving rate is:

- a. higher in Aziria than in Tanistan, and it is higher in Tanistan than in Graniva.
- b. higher in Graniva than in Tanistan, and it is higher in Tanistan than in Aziria.
- c. higher in Tanistan than in Graniva, and it is the same in Graniva and Aziria.
- d. higher in Aziria than in Graniva, and it is the same in Aziria and Tanistan.**

- 13)** Country A and country B both increase their capital stock by one unit. Output in country A increases by 15 while output in country B increases by 12. Other things the same, diminishing returns implies that country A is
- richer than Country B. If Country A adds another unit of capital, output will increase by more than 15 units.
 - richer than Country B. If Country A adds another unit of capital, output will increase by less than 15 units.
 - poorer than Country B. If Country A adds another unit of capital, output will increase by more than 15 units.
 - poorer than Country B. If Country A adds another unit of capital, output will increase by less than 15 units.**
- 14)** The logic behind the catch-up effect is that
- workers in countries with low incomes will work more hours than workers in countries with high incomes.
 - the capital stock in rich countries deteriorates at a higher rate because it already has a lot of capital.
 - new capital adds more to production in a country that doesn't have much capital than in a country that already has much capital.**
 - None of the above is correct.
- 15)** The slope of the demand for loanable funds curve represents the
- positive relation between the real interest rate and investment.
 - positive relation between the real interest rate and saving.
 - negative relation between the real interest rate and investment.**
 - negative relation between the real interest rate and saving.
- 16)** If the best educated and most skilled persons leave a country, then in the short term this country's human capital per worker
- and physical capital per worker will increase.
 - and physical capital per worker will decrease.
 - will increase but physical capital per worker will decrease.
 - will decrease but physical capital per worker will increase.**
- 17)** Tami knows that people in her family die young, and so she buys life insurance. Preston knows he is a reckless driver and so he applies for automobile insurance.
- These are both examples of adverse selection.**
 - These are both examples of moral hazard.
 - The first example illustrates adverse selection, and the second illustrates moral hazard.
 - The first example illustrates moral hazard, and the second illustrates adverse selection.
- 18)** Fundamental analysis shows that stock in Garske Software Corporation has a present value that is higher than its price.
- This stock is overvalued; you should consider adding it to your portfolio.
 - This stock is overvalued; you shouldn't consider adding it to your portfolio.
 - This stock is undervalued; you should consider adding it to your portfolio.**
 - This stock is undervalued; you shouldn't consider adding it to your portfolio.

19) Suppose that Albert can buy a bond for \$1,000 that matures in two years and pays Albert \$1,102.5 with certainty. Today he is indifferent between this bond and one that has some risk but on which the annual interest rate is 3% higher. How much, to the nearest penny, does the riskier bond pay in two years?

- a. **\$1,166.40**
- b. \$1,160.00
- c. \$1,168.65
- d. \$1,169.64

20) (Attendance) When we discussed the deficit and debt, the professor showed in class some data concerning the situation for the US. In particular, he showed you that, according to the latest data, the debt to GDP ratio for the US is approximately:

- a. 200%.
- b. **100%.**
- c. 50%.
- d. 10%.

To get full credits in the exercises below you really need to show your work. If you write just a number as the answer and even if that number is correct you will not get full credits in the exercise unless you show fully the formulas and your work (how you got that number and the steps involved in your computation).

EXERCISE I (20 POINTS TOTAL)

Suppose GDP can be approximated by the following production function

$$Y_t = F(K_t, U_t, H_t) = AK_t^\alpha (H_t^\beta U_t^{1-\beta})^{1-\alpha}$$

where Y_t represents GDP, K_t is physical capital, H_t are skilled workers, U_t are unskilled workers; and A , α , and β are given parameters.

a) (8 POINTS) Is this production function $F(K_t, U_t, H_t)$ constant returns to scale? Using the 3 steps procedure we have seen in class, provide an answer and show your work.

Now you also know that:

$$\begin{aligned} H_t &= hL_t \\ U_t &= (1 - h)L_t \end{aligned}$$

So that:

$$L_t = U_t + H_t$$

where L_t represents the total number of workers (skilled and unskilled) and $0 < h < 1$ is the fraction of workers that is skilled.

b) (8 POINTS) Find an expression for output per worker $\frac{Y}{L}$ that only depends on physical capital per worker $\frac{K}{L}$, the fraction of skilled workers, h , and the parameters A , α , and β of the production function.

c) (4 POINTS) Now suppose that $A=1$, $h=10\%$, $\alpha=1/3$, $\beta=0.7$, and $\frac{K}{L} = 0.55$. Find the level of labor productivity. Use 2 decimal digits precision for your computations.

PAPER FOR YOUR USE

Answers:

a) You need to check whether $F(xK, xU, xH) = xF(K, U, H)$ or not.

$$\begin{aligned} F(xK_t, xU_t, xH_t) &= A(xK_t)^\alpha [(xH_t)^\beta (xU_t)^{1-\beta}]^{1-\alpha} \\ &= Ax^\alpha K_t^\alpha (x^\beta H_t^\beta x^{1-\beta} U_t^{1-\beta})^{1-\alpha} \\ &= Ax^\alpha K_t^\alpha x^{1-\alpha} (H_t^\beta U_t^{1-\beta})^{1-\alpha} \\ &= xAK_t^\alpha (H_t^\beta U_t^{1-\beta})^{1-\alpha} \\ &= xF(K_t, U_t, H_t) \end{aligned}$$

Yes, this production function is CRS.

b)

$$\begin{aligned} \frac{Y_t}{L_t} &= \frac{AK_t^\alpha (H_t^\beta U_t^{1-\beta})^{1-\alpha}}{L_t} \\ &= \frac{AK_t^\alpha [(hL_t)^\beta ((1-h)L_t)^{1-\beta}]^{1-\alpha}}{L_t} \\ &= \frac{AK_t^\alpha [L_t h^\beta (1-h)^{1-\beta}]^{1-\alpha}}{L_t} \\ &= \frac{AK_t^\alpha L_t^{1-\alpha} [h^\beta (1-h)^{1-\beta}]^{1-\alpha}}{L_t} \\ \frac{Y_t}{L_t} &= A \left(\frac{K_t}{L_t}\right)^\alpha [h^\beta (1-h)^{1-\beta}]^{1-\alpha} \end{aligned}$$

c) Just plug the numbers in the above formula (productivity is output per worker):

$$\frac{Y_t}{L_t} = 1 * (0.55)^{\frac{1}{3}} [0.1^{0.7} (1 - 0.1)^{1-0.7}]^{1-\frac{1}{3}} = 0.27$$

PAPER FOR YOUR USE

EXERCISE II (20 POINTS TOTAL)

In Westworld there are no government transfers. Government expenditure, G , represents 10% of RGDP every period. You are told that in 2016 RGDP and debt were 20,800 and 10,916 respectively. Taxes are collected through an income tax, and the income tax rate is always 8%; real interest rate is constant at 4%, and inflation is constant at 1%.

a) (8 POINTS) Suppose RGDP grows at 4% every year. Calculate the debt level for 2017 and 2018 for Westworld. Round to the nearest integer for your computations.

b) (12 POINTS) Assume an amendment to the constitution of Westworld is introduced in 2016: it states that the debt to RGDP ratio can never be above 55%. If the level of this ratio ends up being higher than 55%, then the government must automatically adjust the income tax rate to keep the ratio at 55%. If the level of this ratio ends up being equal or lower than 55%, then the income tax rate stays unchanged. What is going to be the income tax rate in this economy in 2017 and 2018? Use 4 decimal digits precision for your computations.

PAPER FOR YOUR USE

a) The equation that defines Budget Debt is given by

$$B_t = G_t + Tr_t - T_t + (1+i) B_{t-1}$$

You know that $i = r + \text{inflation} = 4\% + 1\% = 5\%$. In our economy G and T are proportions of RGDP, so we need to find GDP in 2017 and 2018 first to compute G and T then. Transfers are fixed at 0. The following table summarizes the calculations.

| Year | RGDP | G | T | B |
|------|--------------------------------|------------------------------|-------------------------------|--|
| 2017 | $1.04 * 20,800 =$ $=21,632$ | $0.1 * 21,632 =$ $=2,163$ | $0.08 * 21,632 =$ $=1,731$ | $2,163 - 1,731 + 1.05 * 10,916$ $=11,894$ |
| 2018 | $1.04 * 21,632 =$ $=22,497$ | $0.1 * 22,497 =$ $=2,250$ | $0.08 * 22,497 =$ $=1,800$ | $2,250 - 1,800 + 1.05 * 11,894$ $=12,939$ |

b) We need first to calculate the proportions of Debt as percentage of RGDP

| Period | B/RGDP |
|--------|----------------------------|
| 2017 | $11,894 / 21,632 = 0.5498$ |
| 2018 | $12,939 / 22,497 = 0.5751$ |

Then, since the constitution amendment is not violated, in 2017 the tax rate stays at 8%, and only in 2018 the government needs to adjust the income tax rate.

In particular, in 2018 we need to have:

$$B_{2018} / \text{RGDP}_{2018} = 0.55$$

And from part a) we know that $\text{RGDP}_{2018} = 22,497$, substituting in the formula above

$$B_{2018} = 0.55 * \text{RGDP}_{2018} = 0.55 * 22,497$$

so it is required that the level of debt in 2018 is $B_{2018} = 12,373.35$.

From the formula of budget debt we also know:

$$B_{2018} = G_{2018} - T_{2018} + (1+i) B_{2017}$$

that is, we need to find an income tax rate τ such that:

$$12,373.35 = 2,250 - \tau * 22,497 + 1.05 * 11,894$$

Solving for τ

$$\tau * 22,497 = 2,365.35$$

$$\tau = 0.1051$$

The tax rate will become 10.51% in 2018.

PAPER FOR YOUR USE

YOUR NAME: _____ YOUR TA's NAME: _____

MARK CLEARLY (FILL IN) THE LETTER OF YOUR CHOICE FOR THE MULTIPLE CHOICE QUESTIONS. ONLY THIS PAGE WILL BE GRADED FOR THE MC PART.

- | | | | | |
|-----|-----|-----|-----|-----|
| 1. | (A) | (B) | (C) | (D) |
| 2. | (A) | (B) | (C) | (D) |
| 3. | (A) | (B) | (C) | (D) |
| 4. | (A) | (B) | (C) | (D) |
| 5. | (A) | (B) | (C) | (D) |
| 6. | (A) | (B) | (C) | (D) |
| 7. | (A) | (B) | (C) | (D) |
| 8. | (A) | (B) | (C) | (D) |
| 9. | (A) | (B) | (C) | (D) |
| 10. | (A) | (B) | (C) | (D) |
| 11. | (A) | (B) | (C) | (D) |
| 12. | (A) | (B) | (C) | (D) |
| 13. | (A) | (B) | (C) | (D) |
| 14. | (A) | (B) | (C) | (D) |
| 15. | (A) | (B) | (C) | (D) |
| 16. | (A) | (B) | (C) | (D) |
| 17. | (A) | (B) | (C) | (D) |
| 18. | (A) | (B) | (C) | (D) |
| 19. | (A) | (B) | (C) | (D) |
| 20. | (A) | (B) | (C) | (D) |