

MC \_\_\_\_\_  
EXE I \_\_\_\_\_  
EXE II \_\_\_\_\_  
TOTAL \_\_\_\_\_

## Econ 002 – INTRO MACRO – Prof. Luca Bossi – October 30, 2013

### 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

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Signature

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Date

#### INSTRUCTIONS

The exam is composed of 21 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). 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.

**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 EVERY SINGLE PAGE OF THE EXAM.**

**PLEASE FOLLOW THE INSTRUCTIONS AS TO HOW TO SUBMIT YOUR EXAM AT THE END OF THE 60 MINUTES.**

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

**GOOD LUCK!**

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**MULTIPLE CHOICE QUESTIONS.**

**Identify the letter of the choice that best completes the statement or answers the question. Write your answer in the answer page for the MC provided on the last sheet of the exam.**

**1)** Alice says that the present value of \$700 to be received one year from today if the interest rate is 6 percent is less than the present value of \$700 to be received two years from today if the interest rate is 3 percent. Beth says that \$700 saved for one year at 6 percent interest has a smaller future value than \$700 saved for two years at 3 percent interest.

- a. Both Alice and Beth are correct.
- b. Both Alice and Beth are incorrect.
- c. Only Alice is correct.
- d. **Only Beth is correct.**

**2)** Consider three imaginary countries. In Mainland, saving amounts to \$4,000 and consumption amounts to \$8,000; in Upland, saving amounts to \$2,000 and consumption amounts to \$15,000; and in Lowland, saving amounts to \$6,000 and consumption amounts to \$11,000. The national saving rate is

- a. higher in Mainland than in Lowland, and it is higher in Lowland than in Upland.
- b. **higher in Lowland than in Mainland, and it is higher in Mainland than in Upland.**
- c. higher in Lowland than in Upland, and it is the same in Upland and Mainland.
- d. higher in Mainland than in Upland, and it is the same in Mainland and Lowland.

**3)** The country of Bienmundo does not trade with any other country. Its GDP is \$30 billion. Its government purchases \$5 billion worth of goods and services each year, collects \$7 billion in taxes, and provides \$3 billion in transfer payments to households. Private saving in Bienmundo amounts to \$5 billion. What are consumption and investment in Bienmundo?

- a. **\$21 billion and \$4 billion, respectively**
- b. \$18 billion and \$5 billion, respectively
- c. \$13 billion and \$7 billion, respectively
- d. There is not enough information to answer the question.

**4)** In 2009, Modern Electronics, Inc. produced 60,000 calculators, employing 80 workers, each of whom worked 8 hours per day. In 2010, the same firm produced 76,500 calculators, employing 85 workers, each of whom worked 10 hours per day. Productivity at Modern Electronics

- a. **decreased by 4%**
- b. remained constant.
- c. increased by 8.33%
- d. increased by 27.50%

**5)** The Eye of Horus incense company has \$10 million in cash which it has accumulated from retained earnings. It was planning to use the money to build a new factory. Recently, the rate of interest has increased. The increase in the rate of interest should

- a. not influence the decision to build the factory because The Eye of Horus doesn't have to borrow any money.

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- b. not influence the decision to build the factory because its stockholders are expecting a new factory.
- c. make it more likely that The Eye of Horus will build the factory because a higher interest rate will make the factory more valuable.
- d. **make it less likely that The Eye of Horus will build the factory because the opportunity cost of the \$10 million is now higher.**

**6)** If Germany goes from a small budget deficit to a large budget deficit, it will reduce

- a. private saving and so shift the supply of loanable funds left.
- b. investment and so shift the demand for loanable funds left.
- c. **public saving and so shift the supply of loanable funds left.**
- d. None of the above is correct.

**7)** Suppose that there are diminishing returns to capital and constant returns to scale. Suppose also that two countries are exactly the same except one has less capital and so less real GDP per person. Suppose that both increase their saving rate from 3 percent to 4 percent. It follows that

- a. both countries will have permanently higher growth rates of real GDP per person, and the growth rate will be higher in the country with more capital.
- b. both countries will have permanently higher growth rates of real GDP per person, and the growth rate will be higher in the country with less capital.
- c. both countries will have higher levels of real GDP per person, and the temporary increase in growth in the level of real GDP per person will have been greater in the country with more capital.
- d. **both countries will have higher levels of real GDP per person, and the temporary increase in growth in the level of real GDP per person will have been greater in the country with less capital.**

**8)** If over a short period of time there is an increase in the number of people retired and a decrease in the number of people working, then productivity

- a. and real GDP per person rise.
- b. **rises but real GDP per person falls.**
- c. falls and real GDP per person rises.
- d. and real GDP per person fall.

**9)** Which of the following is consistent with the catch-up effect?

- a. The United States had a higher growth rate before 1900 than after.
- b. After World War II the United States had lower growth rates than war-ravaged European countries.
- c. Although the United States has a relatively high level of output per person, its growth rate is rather modest compared to some countries.
- d. **All of the above are correct.**

**10)** Despite its status as one of the richest countries in the world, Japan

- a. has a very low level of productivity.
- b. **has few natural resources.**
- c. has very little human capital.
- d. engages in a relatively small amount of international trade.

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**11)** Some poor countries appear to be falling behind rather than catching up with rich countries. Which of the following could explain the failure of a poor country to catch up?

- a. The poor country has outward-oriented trade policies.
- b. The poor country allows foreign direct investment.
- c. **The poor country has poorly developed property rights.**
- d. All of the above are correct.

**12)** Most entrepreneurs do not have enough money of their own to start their businesses. When they acquire the necessary funds from someone else,

- a. **their investments are being financed by someone else's saving.**
- b. their consumption expenditures are being financed by someone else's investment.
- c. their consumption expenditures are being financed by someone else's saving.
- d. their saving is being financed by someone else's investment.

**13)** The bond market

- a. is a financial market, whereas the stock market is a financial intermediary.
- b. is a financial intermediary, whereas the stock market is a financial market.
- c. **is a financial market, as is the stock market.**
- d. is a financial intermediary, as is the stock market.

**14)** For a closed economy, GDP is \$11 trillion, consumption is \$7 trillion, taxes are \$3 trillion and the government runs a surplus of \$1 trillion. What are private saving and national saving?

- a. **\$1 trillion and \$2 trillion, respectively**
- b. \$1 trillion and \$1 trillion, respectively
- c. \$4 trillion and \$1 trillion, respectively
- d. \$4 trillion and \$5 trillion, respectively

**15)** Suppose a country has a consumption tax that is similar to a state sales tax. If its government were to eliminate the consumption tax and replace it with an income tax that includes an income tax on interest from savings, what would happen?

- a. There would be no change in the interest rate or saving.
- b. The interest rate would decrease and saving would increase.
- c. **The interest rate would increase and saving would decrease.**
- d. None of the above is correct.

**16)** Suppose you will receive \$500 at some point in the future. If the annual interest rate is 7.5 percent, then the present value of the \$500 is

- a. \$411.26 if the \$500 is to be received in 5 years and \$338.95 if the \$500 is to be received in 10 years.
- b. **\$348.28 if the \$500 is to be received in 5 years and \$242.60 if the \$500 is to be received in 10 years.**
- c. \$291.11 if the \$500 is to be received in 5 years and \$272.89 if the \$500 is to be received in 10 years.
- d. \$291.11 if the \$500 is to be received in 5 years and \$236.49 if the \$500 is to be received in 10 years.

**17)** The efficient markets hypothesis says that

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- a. only individual investors can make money in the stock market.
- b. it should be easy to find stocks whose price differs from their fundamental value.
- c. **stock prices follow a random walk.**
- d. All of the above are correct.

**18)** A soup manufacturer unexpectedly announces that it has hired a new manager. It is widely believed that this manager will raise the profitability of the corporation. At the same time interest rates unexpectedly rise. Which of the above would tend to make the price of the stock rise?

- a. **the announcement but not the rise in interest rates**
- b. the announcement and the rise in interest rates
- c. the rise in interest rates, but not the announcement
- d. neither the announcement nor the rise in interest rates

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

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

**20) (2 POINTS)** According to the assigned reading I gave you: **“Behavioral economics show that women tend to make better investments than men”** in their financial decisions

- a. Women are less loss averse than men, more emotionally unattached and are far quicker to unload losers.
- b. **Women are more loss averse than men, more emotionally unattached and are far quicker to unload losers.**
- c. Women are more loss averse than men, less emotionally unattached and are far quicker to unload losers.
- d. Women are more loss averse than men, more emotionally unattached and are far slower to unload losers.

**21) (1 POINT) CAREFUL!! CHOOSE THIS ONE WISELY 😊😊 (Department of the Treasury style)**

In which year was the US Department of Treasury established?

- a. 1789
- b. 1700 + 89
- c. 1800 - 11
- d. All of the above

**EVERYONE GETS ONE POINT HERE. 😊**

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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 reasoning involved in your computation).

**EXERCISE I (20 points)**

This exercise is divided in 2 sub-parts that are totally separate from each other.

**Part A) (10 POINTS)** In February of 2013 Google introduced a new product: Google's Chromebook Pixel. When you pay \$1300 for this ultrabook (i.e. super slim computer), Google also offers 1TB of Google Drive cloud storage for 3 years. The regular price for 1TB of Google Drive cloud storage is \$550/year to be paid each year before the service starts. If the 5% annual interest rate is compounded monthly, is the pricing scheme of Google's Chromebook Pixel profitable? Give a very brief economic explanation of why or why not it might make economic sense to have such pricing scheme. Use 3 decimals for your computations.

Use the following formula  $FV = PV \left(1 + \frac{r}{m}\right)^{m*T}$  repeatedly to find the PV of 3 years of 1TB Google Drive Storage:

$$550 + \frac{550}{\left(1 + \frac{0.05}{12}\right)^{12*1}} + \frac{550}{\left(1 + \frac{0.05}{12}\right)^{12*2}} = 1,570.995$$

The ultrabook price is \$1,300 so it does not seem profitable for Google to offer this deal, at first thought.

On a second thought though, we do not know the amount of profits/costs Google faces on the storage only option. The profit margin is probably quite high on that option (just look at the average price of 1 TB external hard drive which can be found for less than 100\$ on Amazon). Also, the average person without buying the ultrabook may not decide otherwise to have a 1TB storage with Google because the average person does not usually need that much cloud storage capacity. Lastly Google will make profits on the ultrabook purchaser through online ads for using its services. So it makes perfect economic sense to adopt this pricing scheme. Google is extracting surplus from Loki!

**Part B) (10 POINTS)** In 1992 several European countries signed the so-called "Maastricht Treaty" to form a Currency Union (i.e. setup the Euro). Among many, two key economic criteria were setup for countries to meet so that they could prove to others how virtuous their situation from the public finance point of view was:

- 1) The ratio of government debt relative to GDP, cannot exceed 60% at the end of the preceding fiscal year.
- 2) The ratio of the government deficit relative to GDP, cannot exceed 3%.

Fast forward to 2013 and consider the case of Italy. Italy does not meet the first criteria outlined above: the debt to GDP ratio is 132% in 2013. Italy does however meet the second criteria precisely (3%). If the nominal interest rate in Italy is 5%, the growth rate of GDP is 0% and these variables are projected to stay the same for the next 3 years, and if Italy is projected to meet the second criteria outlined above for the next foreseeable future, can you predict the debt to GDP ratio of Italy in 2016? Use 2 decimals for your computations.

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You just need to use the formula for budget debt to GDP ratio:

$$\frac{B_t}{Y_t} = \frac{DE_t}{Y_t} + \frac{(1+i) * B_{t-1}}{(1+o) * Y_{t-1}}$$

Recursively:

$$\frac{B_{2014}}{Y_{2014}} = \frac{DE_{2014}}{Y_{2014}} + \frac{(1+i) * B_{2013}}{(1+o) * Y_{2013}}$$

$$\frac{B_{2015}}{Y_{2015}} = \frac{DE_{2015}}{Y_{2015}} + \frac{(1+i) * B_{2014}}{(1+o) * Y_{2014}}$$

$$\frac{B_{2016}}{Y_{2016}} = \frac{DE_{2016}}{Y_{2016}} + \frac{(1+i) * B_{2015}}{(1+o) * Y_{2015}}$$

You are told that:

$$\frac{B_{2013}}{Y_{2013}} = 1.32$$

$$\frac{DE_{2014}}{Y_{2014}} = \frac{DE_{2015}}{Y_{2015}} = \frac{DE_{2016}}{Y_{2016}} = 0.03$$

The key information is that the interest rate (i) in the formula is the nominal interest rate which is equal to 5% and that the growth rate of GDP is represented in the formula by o and is equal to zero.

Solving:

$$\frac{B_{2014}}{Y_{2014}} = 0.03 + 1.05 * 1.32 = 1.42$$

$$\frac{B_{2015}}{Y_{2015}} = 0.03 + 1.05 * 1.42 = 1.52$$

$$\frac{B_{2016}}{Y_{2016}} = 0.03 + 1.05 * 1.52 = 1.63$$

Under this scenario, Italy will reach a debt to GDP ratio of 163% by 2016.

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**EXERCISE II (20 points)**

The country of Asgard has an economy that follows strictly the standard Solow model we have studied in class. There is only one modification we are going to make to the standard five equations that define the model. The production function in Asgard is given by:

$$Y_t = AK_t^\alpha (BL_t)^{1-\alpha}$$

Where B is just a constant and  $0 < B < 1$ . You know that in this economy the number of workers (the warriors) is less than the total population. Specifically you know that:

$$B * L_t = \text{workers}$$

$$L_t = \text{population}$$

Since  $0 < B < 1$  then it immediately follows that workers < population.

**a) (12 POINTS)** Derive the expression of the steady state level of physical capital per person for Asgard. Show your work.

**Output per person in this case is:**

$$\frac{Y_t}{L_t} = \frac{AK_t^\alpha (BL_t)^{1-\alpha}}{L_t} = \frac{AB^{1-\alpha} K_t^\alpha L_t^{1-\alpha}}{L_t} = AB^{1-\alpha} \left(\frac{K_t}{L_t}\right)^\alpha$$

**With the small caps convention the expression above becomes:**

$$y_t = AB^{1-\alpha} (k_t)^\alpha$$

**Using this into the fundamental equation that you can derive with the usual procedure:**

$$k_{t+1}(1+n) = sAB^{1-\alpha} (k_t)^\alpha + (1-d)k_t$$

**In steady state we know that:**

$$k_{t+1} = k_t = \bar{k}$$

**Plug this into the fundamental equation to obtain:**

$$0 = sAB^{1-\alpha} (\bar{k})^\alpha - (n+d)\bar{k}$$

**Solving for  $\bar{k}$ :**

$$\bar{k} = B \left(\frac{sA}{n+d}\right)^{\frac{1}{1-\alpha}}$$

**b) (8 POINTS)** You are given the following information for the economy of Asgard:  $\alpha = 0.5$ ,  $n = 2\%$ ,  $A = 2$ ,  $d = 18\%$ ,  $s = 10\%$  and  $B = 0.5$ . Where n stands for the population growth rate, A is technology; d is the depreciation rate, s is the saving rate.

Find the steady state level of consumption per worker. Show your work. Use 2 decimals for your computations.

**Here I will give the shortest/fastest answer. This way the actual value of B is redundant in the exercise.**

**Output per worker in Asgard is:**

$$\frac{Y_t}{BL_t} = \frac{AK_t^\alpha (BL_t)^{1-\alpha}}{BL_t} = \frac{AB^{1-\alpha} K_t^\alpha L_t^{1-\alpha}}{BL_t} = AB^{-\alpha} \left(\frac{K_t}{L_t}\right)^\alpha$$

**Output per worker in steady state with our small cap convention that denotes per capita variables then is:**



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$$\frac{\bar{y}}{B} = AB^{-\alpha}(\bar{k})^{\alpha}$$

Using the physical capital per person of steady state formula we got in part a) above:

$$\frac{\bar{y}}{B} = AB^{-\alpha}\bar{k}^{\alpha} = AB^{-\alpha}B^{\alpha}\left(\frac{sA}{n+d}\right)^{\frac{\alpha}{1-\alpha}} = A\left(\frac{sA}{n+d}\right)^{\frac{\alpha}{1-\alpha}}$$

Consumption per worker is

$$\frac{C_t}{BL_t} = (1-s)\frac{Y_t}{BL_t}$$

And in steady state, using our small cap convention that denotes per capita variables it becomes:

$$\frac{\bar{c}}{B} = (1-s)\frac{\bar{y}}{B} = (1-s)A\left(\frac{sA}{n+d}\right)^{\frac{\alpha}{1-\alpha}}$$

Plugging the values

$$= (1-0.1)2\left(\frac{0.1*2}{0.02+0.18}\right)^{\frac{0.5}{1-0.5}} = 0.9*2*1 = 1.8$$

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**ANSWER PAGE FOR MC**

**WRITE THE LETTER OF YOUR CHOICE FOR THE MULTIPLE CHOICE QUESTIONS HERE;  
ONLY THIS PAGE WILL BE GRADED FOR THE MC PART.**

- |    |     |     |     |
|----|-----|-----|-----|
| 1) | 6)  | 11) | 16) |
| 2) | 7)  | 12) | 17) |
| 3) | 8)  | 13) | 18) |
| 4) | 9)  | 14) | 19) |
| 5) | 10) | 15) | 20) |
|    |     |     | 21) |