TOTAL SCORE_____ **MC____**
EXE 1____
EXE 2____

Econ 002 – INTRO MACRO – Prof. Luca Bossi – October 28, 2014
MIDTERM #2 SUGGESTED 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 **Date** **Your TA Name (printed)**

INSTRUCTIONS

The exam is closed book. 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. 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) 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) 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.

3) 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.

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 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.

6) 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.

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.

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) 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.

13) 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.
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.

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

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/video I gave you: **"Playing Without Protection: Solving Football's Concussion Crisis"** to reduce Moral Hazard and injuries to players the NFL should

a. Ditch the helmets.
b. Ditch cleats.
c. Ditch shoulder pads.
d. Ditch mouth guards.

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

Michael Hillegas was

a. The first Treasurer of the US in 1777
b. The first Treasurer of the US in 2000 – 333
c. The first Treasurer of the US in 1500 + 277
d. Michael who??

EVERYONE GETS ONE POINT HERE. ☺

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)

In the Final Four Economy for 2013, government spending is 1,500, transfers are 500 and the total tax revenue is 1,000. The GDP for 2013 is 20,000. The real interest rate is 5% and there is no inflation. 2012 debt was 10,000.

a) (5 POINTS) What is 2013 year's debt for the Final Four Economy?

b) (5 POINTS) In 2014, the deficit is 10% of GDP. GDP grew by 10% from 2013. What is the 2014 debt going to be (assuming the same real interest rate and no inflation) in the Final Four Economy?

c) (5 POINTS) In 2015, the inflation rate is going to be 1% and the real interest rate will stay the same. In year 2013, the population was 5,000. The population growth rate is constant at 6% per year. The nominal GDP continues to grow at 10% from 2014 and the deficit is still 10% of nominal GDP. What is the 2015 debt per person in the Final Four Economy?

d) (5 POINTS) In 2016, the inflation rate increases to 5%. The real interest rate stays the same. Because of the inflation, the government decides to decrease the deficit to 2% of GDP. GDP will decrease by 2% from the previous year. What is the 2016 debt per person?

PAPER FOR YOUR USE

Answers:

a) $DE_{2013} = G_{2013} + Tr_{2013} - T_{2013} = 1{,}500 + 500 - 1{,}000 = 1{,}000$

We know that the nominal interest rate is the real interest rate plus the inflation rate. So the nominal rate is 5% + 0%. 2013 debt is:

$B_{2013} = DE_{2013} + (1+i)* B_{2012} = 1{,}000 + 1.05*10{,}000 =$ **11,500**

b) We know the GDP from year 2013 is 20,000. If it grows at 10%, GDP in year 2014 is 1.1*20,000 = 22,000. The deficit in year 2014 is .1*22,000 = 2,200. Therefore the debt in year 2014 is:

$B_{2014} = DE_{2014} + (1+i)* B_{2014} = 2{,}200 + 1.05*11{,}500 =$ **14,275**

c) The population in year 2013 is 5,000. The population in year 2015 is $5{,}000*(1.06)^2$ since the population growth rate is 6%. $Pop_{2015} = 5{,}618$. **GDP in year 2015 is 1.1*22,000 = 24,200, therefore deficit is 0.1*24,200 = 2,420. The nominal interest rate is 5%+1% = 6%. Therefore the debt in year 2015 is**

$B_{2015} = DE_{2015} + (1+i)* B_{2014} = 2{,}420 + 1.06*14{,}275 = 17{,}551.50$

So the debt per person is 17,551.5/5,618 = **3.12**

d) Now the nominal rate is 5% + 5% = 10%. The GDP in year 2016 is 24,200*.98 = 23,716 so the deficit in year 2016 is .02*23,716 = 474.32. Therefore the debt in year 2016 is

$B_{2016} = DE_{2016} + (1+i)* B_{2015} = 474.32 + 1.1*17{,}551.5 = 19{,}780.97$

And the debt per person is 19,780.97/(1.06*5,618) = **3.32**

We multiply 5,618 by 1.06 because the population is still growing by 6%.

EXERCISE II (20 points)

Consider the Solow model we have seen and studied in class. Assume that the production function is given by the Cobb-Douglas expression

$$Y_t = AK_t^{\alpha}L_t^{1-\alpha}$$

a) (5 POINTS) Write down the 5 basic equations that characterize the Solow model.

b) (10 POINTS) Now recall that the fundamental equation of the Solow model (in per capita terms) is:

$$k_{t+1}(1+n) = sy_t + (1-d)k_t$$

Where:

k_{t+1}= physical capital per person in period t+1

n = population growth rate

s = saving rate

y_t= output per person in period t

d = depreciation rate of capital

k_t = physical capital per person in period t.

A criticism that the Solow model is subject to is that the whole population works and that all the workers are all the same. Suppose now we want to tweak that. In particular, we want to have a situation where workers can exert different work efforts. We model this by assuming that in the production function A = 1 when workers exert regular work effort, whereas A = 2 when workers exert high work effort.

Find the expression for the steady state level of physical capital per person when all workers exert high work effort and the expression for the steady state level of physical capital per person when all workers exert regular work effort. (**Hint:** you need to find the expression of output per person first, and then use the fundamental equation given above with A = 1 and A = 2). Show your work.

c) (5 POINTS) Assume now that $\alpha = \frac{1}{2}$, n = 0.1, d = 0.15, and s = 0.2. Compute the percentage change of the steady state level of capital per person between an economy with all workers exerting high work effort and an economy with all workers exerting regular work effort. Show your work.

PAPER FOR YOUR USE

Solution:

a) The five equations are

$$\mathbf{1)}\ Y_t = AK_t^{\alpha}L_t^{1-\alpha}$$
$$\mathbf{2)}\ S_t = sY_t$$
$$\mathbf{3)}\ I_t = S_t$$
$$\mathbf{4)}\ K_{t+1} = I_t + (1-d)K_t$$
$$\mathbf{5)}\ L_{t+1} = (1+n)L_t$$

b) Output per person is:

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

With the small caps convention the expression above becomes:

$$y_t = A(k_t)^{\alpha}$$

Using this into the fundamental equation that was given to you:

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

In steady state we know that:

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

Plug this into the fundamental equation to obtain:

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

Solving for $\bar{k}$:

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

This is the steady state level of physical capital per person.
When all workers exert low work effort simply plug A = 1 into the expression above.

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

Let's re-label for convenience this expression $\bar{k}_{LO}$

$$\bar{k}_{LO} = \left(\frac{s}{n+d}\right)^{\frac{1}{1-\alpha}}$$

When all workers exert high work effort simply plug A = 2 into the expression for steady state level of physical capital per person:

$$\bar{k} = 2^{\frac{1}{1-\alpha}}\left(\frac{s}{n+d}\right)^{\frac{1}{1-\alpha}}$$

Let's re-label for convenience this expression $\bar{k}_{HI}$

$$\bar{k}_{HI} = 2^{\frac{1}{1-\alpha}}\left(\frac{s}{n+d}\right)^{\frac{1}{1-\alpha}}$$

c) The growth rate is given by:

$$100 * \frac{\bar{k}_{HI} - \bar{k}_{LO}}{\bar{k}_{LO}}$$

Before starting to compute anything you can notice that the expression $\left(\frac{s}{n+d}\right)^{\frac{1}{1-\alpha}}$ is present in both $\bar{k}_{LO}$ and $\bar{k}_{HI}$ hence it will not affect the growth rate as we can factor it out and simplify. Thus the only parameters that matter for this part really are the values of A and α.

$$100 * \frac{\bar{k}_{HI} - \bar{k}_{LO}}{\bar{k}_{LO}} = 100 * \frac{\left(2^{\frac{1}{1-\alpha}} - 1\right)\left(\frac{s}{n+d}\right)^{\frac{1}{1-\alpha}}}{1 * \left(\frac{s}{n+d}\right)^{\frac{1}{1-\alpha}}} =$$

$$= 100 * \left(2^{\frac{1}{0.5}} - 1\right) = 100 * (4-1) = 300\%$$

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

1.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
2.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
3.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
4.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
5.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
6.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
7.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
8.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
9.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
10.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
11.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
12.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
13.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
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18.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
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20.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
21.	Ⓐ	Ⓑ	Ⓒ	Ⓓ