

TOTAL SCORE _____

MC _____

EXE 1 _____

EXE 2 _____

Econ 002- INTRO MACRO Prof. Luca Bossi October 29, 2015
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

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) Mary talked to several stockbrokers and made the following conclusions. Which, if any, of her conclusions are correct?

- a. It is relatively easy to reduce firm-specific risk by increasing the number of companies one holds stock in.
- b. Stock prices, are very close to a random walk.
- c. Some people have made a lot of money in the stock market by using insider information, but these cases are not contrary to the efficient markets hypothesis even though they are illegal.
- d. **All of Mary's conclusions are correct.**

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. \$18 billion and \$5 billion, respectively
- b. \$13 billion and \$7 billion, respectively
- c. **\$21 billion and \$4 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) Other things the same, when the interest rate rises, the present value of future revenues from investment projects

- a. rises, so investment spending rises.
- b. falls, so investment spending rises.
- c. rises, so investment spending falls.
- d. **falls, so investment spending falls.**

6) In a closed economy, if Y remained the same, but G rose, T rose by the same amount as G, and C fell but by less than the increase in T, what would happen to private saving and overall national saving?

- a. national saving would fall and private saving would rise
- b. national saving would rise and private saving would fall
- c. **both national saving and private saving would fall**
- d. None of the above is correct.

7) Two economists estimate the government expenditure multiplier and come up with different results. One estimates the multiplier at 0.8, while the other comes up with an estimate of 1.25. Explain why these estimates are different in terms of the assumptions that each economist is making.

- a. Compared to the first economist, the second economist is assuming a longer time frame for the effects of the increased expenditure to be observed.
- b. **Compared to the first economist, the second economist must be either a larger induced increase in consumption, a smaller crowding out effect, or both.**
- c. Compared to the first economist, the second economist must be assuming either a smaller induced increase in consumption, a larger crowding out effect, or both.
- d. Unlike the first economist, the second economist must be assuming that the government expenditure is devoted to useful projects.

8) Fundamental analysis determines the value of a stock based on

- a. dividends.
- b. the expected final sale price.
- c. the ability of the corporation to earn profits.
- d. **All of the above are correct.**

9) All else equal, if there are diminishing returns to labor and diminishing returns to capital, then what happens to productivity if both capital and labor increase by the same amount?

- a. Productivity will definitely fall.
- b. Productivity will definitely be unchanged.
- c. Productivity will definitely rise.
- d. **None of the above are necessarily correct.**

10) A larger budget surplus

- a. **reduces the interest rate and raises investment.**
- b. reduces the interest rate and investment.
- c. raises the interest rate and reduces investment.
- d. raises the interest rate and investment.

11) Which of the following are effects of an increased budget deficit?

- a. **at any interest rate the supply of loanable funds is less; a higher interest rate raises private saving**
- b. the supply of loanable funds does not change; a higher interest rate raises private saving
- c. at any interest rate the supply of loanable funds is less; a higher interest rate reduces private saving
- d. the supply of loanable funds does not change; a higher interest rate reduces private saving

12) Suppose the government were to replace the income tax with a consumption tax so that interest on savings was not taxed. The result would be that the interest rate

- a. **would decrease and investment would increase.**

- b. and investment both would decrease.
- c. would increase and investment would decrease.
- d. and investment both would increase.

13) Suppose the government deficit increases, but the interest rate remains the same. Which of the following things might have happened simultaneously to keep interest rates the same?

- a. The government reduces the amount that people may put into savings accounts on which the interest is tax exempt.
- b. Because they are optimistic about the future of the economy, firms desire to borrow more to purchase physical capital.
- c. **Consumers decide to decrease consumption and work more.**
- d. All of the above could explain why the interest rate would be unchanged.

14) In examining the national income accounts of the closed economy of Nepotocracy you see that this year it had taxes of \$100 billion, transfers of \$40 billion, and government purchases of goods and services of \$80 billion. You also notice that last year it had private saving of \$50 billion and investment of \$70 billion. In which year did Nepotocracy have a budget deficit of \$20 billion?

- a. this year and last year
- b. **this year but not last year**
- c. last year but not this year
- d. neither this year nor last year

15) The slope of the demand for loanable funds curve represents the

- a. positive relation between the real interest rate and investment.
- b. **negative relation between the real interest rate and investment.**
- c. positive relation between the real interest rate and saving.
- d. negative relation between the real interest rate and saving.

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) Which of the following is a certificate of indebtedness?

- a. both stocks and bonds
- b. stocks but not bonds
- c. **bonds but not stocks**
- d. neither stocks nor bonds

18) If companies from foreign countries build and operate factories in China, then most likely China's productivity

- a. **and the wages of Chinese workers increase.**
- b. increases but the wages of Chinese workers decrease.
- c. decreases but the wages of Chinese workers increase.
- d. and the wages of Chinese workers decrease.

19) Suppose that interest rates unexpectedly rise and that Carter Corporation announces that revenues from last quarter were down but not as much as the public had anticipated they would be down. According to the efficient markets hypothesis, which of these things make the price of Carter Corporation Stock fall?

- a. both the interest rate rising and the revenue announcement
- b. neither the interest rate rising nor the revenue announcement
- c. **only the interest rate rising**
- d. only the revenue announcement

20) (Readings: 1 POINT) According to the assigned reading I gave you: “**A game of catch-up**”, the great divergence between the West and the rest of the world lasted for:

- a. One century.
- b. **Two centuries.**
- c. Three centuries.
- d. Four centuries.

21) (Attendance: 2 POINTS) I am repeating a class poll here.

Disposable income can be defined as:

- a. Income left after deducting taxes.
- b. Income left after paying taxes and monthly expenses.
- c. Income earned before expenditures.
- d. **None of the given statements.**

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)

Suppose Kirstenland is an economy with the following production function

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

where Y_t represents output, K_t capital, H_t skilled workers, U_t unskilled workers; and A , α , and β are numbers. Subscripts always represent the time period.

a) (6 POINTS) Is this production function constant returns to scale? Show your work.

b) (6 POINTS) You also know that:

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

where L_t represents the total number of workers and h is the proportion of workers that is skilled.

Find an expression for labor productivity that depends only on capital per capita K/L , the proportion of skilled workers, h , and the parameters A , α , and β of the economy. Show your work.

c) (4 POINTS) Assume $A = 1$, $h = 10\%$, $\alpha = 1/3$, $\beta = 0.7$, and $K/L = 0.55$. Find the labor productivity level for this Kirstenland economy. Use 2 decimals for your computations.

d) (4 POINTS) Assume the total number of original workers in Kirstenland is initially 5 million. Recall from part c) that 10% is the fraction of Kirstenland's original workers that is skilled. To boost productivity, the government of Kirstenland decides to implement a new immigration policy as follow: it will start granting foreigners work visas as long as they are skilled workers (i.e. they can unequivocally prove that they have at least a master degree from a reputable institution). No unskilled workers will be granted permission to work and to immigrate. There are no illegal immigrants in this country. Denote immigrants granted working visas with the im subscripts, then it must be the case that foreign workers in Kirstenland are:

$$L_{im,t} = H_{im,t}$$

The government will continue with this policy up to the point in which the proportion of total skilled workers (original skilled citizens + foreigners allow to immigrate) is brought to 20% of the total new number of workers. How many skilled foreigners need to be granted a working visa to reach that goal?

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Answers:

a) Yes, it is CRS. You need to show that $F(xK_t, xU_t, xH_t) = xF(K_t, U_t, H_t)$.

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

b) Productivity is defined as Y/L :

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

c) Just plug the numbers in the formula

$$\begin{aligned}
\frac{Y_t}{L_t} &= A \left(\frac{K_t}{L_t}\right)^\alpha [h^\beta (1-h)^{1-\beta}]^{1-\alpha} = \\
&= 1(0.55)^{\frac{1}{3}} [0.1^{0.7} (0.9)^{0.3}]^{\frac{2}{3}} = 0.27
\end{aligned}$$

d) The new total number of workers (original skilled citizens + original unskilled citizens + foreigners allow to immigrate) after the policy is implemented is:

$$L_t + L_{im,t} = U_t + H_t + H_{im,t}$$

We need to have:

$$H_t + H_{im,t} = 0.2 * (L_t + L_{im,t})$$

We know that:

$$H_t = hL_t = 0.1 * 5,000,000 = 500,000$$

And also that:

$$L_{im,t} = H_{im,t}$$

So:

$$500,000 + H_{im,t} = 0.2 * (5,000,000 + H_{im,t})$$

Solving for $H_{im,t}$:

$$0.8 * H_{im,t} = 500,000$$

$$H_{im,t} = 625,000$$

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EXERCISE II (20 POINTS)

Private savings and investment in the closed Crossfit economy are characterized by the following equations:

Private Savings: $S_{PR} = (10/3)*r + 10$

Investment: $I = 17.5 - 2.5*r$

Where r is the real interest rate already in percentage form, so if, for example, $r = 10$ then this implies that the interest rate is 10%. We also know that in equilibrium total income is 100, consumption is 60 and transfer payments are zero.

a) (8 POINTS) The government believes that the Crossfit economy is effective when the quantity of loanable funds available in equilibrium is 10. What would be the equilibrium interest rate in this case? What is the level of private saving when the market for loanable funds is in equilibrium? What must government spending (G) be such that the equilibrium quantity of loanable funds is 10? (Assume that government spending is not a function of the interest rate.)

b) (6 POINTS) Consider now the Barbell economy (this is NOT the Crossfit economy so disregard the information above for this part of the exercise) with the following characteristics:

Period	Capital	Adult Population	Labor Force	LFPR	Natural Rate of Unemployment	Current Rate of Unemployment
t	19	40	20	50%	5%	10%

Assume that the production function is given by the Cobb-Douglas expression

$$Y_t = F(K_t, L_t) = K_t^{0.3} L_t^{0.7}$$

Also you know that in Barbell the natural rate of output is:

$$Y_{t,N} = F(K_t, L_{t,N})$$

Where

$L_{t,N}$ = number of workers when the economy is at the natural rate of unemployment

$Y_{t,N}$ = natural rate of output

Find the output gap in period t for the Barbell economy. Use 2 decimals for your computations.

c) (6 POINTS) Now let's continue with the Barbell economy. Suppose that in this economy taxes at time t are 20% of its output. Government spending at time t is 15% of its output. Transfer payments are as follow:

Social Security disbursements = 3% of the natural rate of output.

Unemployment benefits = 2% of the negative of output gap.

Compute the cyclical primary budget deficit/surplus for this economy in 2012. Use 2 decimals for your computations.

(Hint: if you could not figure out what the numbers for the current and natural level of output are in part b) above, please set $Y_t = 1$ and $Y_{t,N} = 2$ for this part and you will not be penalized IF all your other computations and formulas are correct).

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a) We are told that in the market for loanable funds the quantity of Investment in equilibrium needs to be 10 so the Investment equation needs to be equal to 10, the equilibrium quantity. This way we can obtain the equilibrium interest rate in the financial market:

$$10 = 17.5 - 2.5r$$

$$r = 3$$

Note that if $r = 3$, then $S_{PR} = (10/3)(3) + 10 = 20$.

Since the equilibrium quantity of loanable funds is 10, we also know that national savings in equilibrium must be 10, so $S = 10$, and therefore since:

$$S = S_{PR} + S_{PUB}$$

$$10 = 20 + T - G$$

$$G = 20 - 10 + T = 10 + T$$

Now you need to find tax revenues, T to determine G :

You know by the definition of private saving that:

$$S_{PR} = Y - T + Tr - C$$

so

$$T = Y + Tr - C - S_{PR}$$

And you are told that $Y = 100$, $Tr = 0$, and $C = 60$:

$$T = 100 - 60 - 20 = 20$$

Then:

$$G = 10 + T = 10 + 20 = 30$$

b) The output gap is formally defined as $Y_t - Y_{t,N}$.

When the economy is at the natural rate of unemployment, there is 1 unemployed person (5% of labor force which is 20). This means that there are 19 people working (95% of labor force). Hence from the Cobb-Douglas production function: $Y_{t,N} = 19^{0.3} 19^{0.7} = 19$.

However, the current rate of unemployment is 10% so there are only 18 people working currently (90% of labor force). Hence, $Y_t = 19^{0.3} 18^{0.7} = 18.29$.

$$Y_t - Y_{t,N} = -0.71$$

c) In order to compute the cyclical primary budget deficit, we need to compute the actual primary budget deficit, DE_t , and the structural primary budget deficit DE^* for period t (i.e. the deficit that would occur if output at period t were to be at its natural rate). We need to recall the formula for the actual primary budget deficit:

$$DE_t = G_t + Tr_t - T_t$$

So:

$$DE_t = G_t + SS_t + u_t * (Y_{t,N} - Y_t) - \tau_t * Y_t = 0.15 * Y_t + 0.03 * Y_{t,N} + 0.02 * (Y_{t,N} - Y_t) - \tau_t * Y_t$$

$$= 0.15 * 18.29 + 0.03 * 19 + 0.02 * (0.71) - 0.2 * 18.29 = -0.33$$

And for the structural budget deficit we just need to use $Y_t = Y_{t,N}$:

$$DE_t^* = 0.15 * Y_{t,N} + 0.03 * Y_{t,N} + 0 - 0.2 * Y_{t,N} = -0.02 * Y_{t,N} = -0.02 * 19 = -0.38$$

The cyclical primary budget deficit is $DE_t - DE_t^* = -0.33 - (-0.38) = 0.05$

If you did not know/could not find the level of output and natural rate of output from part b) then you should have set:

$$Y_t = 1 \text{ and } Y_{t,N} = 2$$

So:

$$\begin{aligned} DE_t &= G_t + SS_t + u_t * (Y_{t,N} - Y_t) - \tau_t * Y_t = 0.15 * Y_t + 0.03 * Y_{t,N} + 0.02 * (Y_{t,N} - Y_t) - \tau_t * Y_t \\ &= 0.15 * 1 + 0.03 * 2 + 0.02 * (1) - 0.2 * 1 = 0.03 \end{aligned}$$

And for the structural budget deficit we just need to use $Y_t = Y_{t,N}$:

$$DE_t^* = 0.15 * Y_{t,N} + 0.03 * Y_{t,N} + 0 - 0.2 * Y_{t,N} = -0.02 * Y_{t,N} = -0.02 * 2 = -0.04$$

The cyclical primary budget deficit is $DE_t - DE_t^* = 0.03 - (-0.04) = 0.07$

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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) |
| 21. | (A) | (B) | (C) | (D) |