

Econ 102 - UCLA - Spring 2018

Last Name: \_\_\_\_\_

Instructor: François Geerolf

Midterm Exam

First Name: \_\_\_\_\_

April 30, 2018

Time Limit: 1 hour 15 minutes

Teaching Assistant: \_\_\_\_\_

Student ID Number: \_\_\_\_\_

Signature \_\_\_\_\_

---

## Midterm Solution

This exam contains 11 pages (including this cover page). You can earn 100 points.

### Instructions:

1. Print your Last name, First Name, Teaching Assistant Name (as a reminder, teaching assistants are: Maria Alejandra Amado Garfias, Paula Beltran Saavedra, Huifeng Chang, Conor Foley, Benjamin Freyd, Yunfan Gu, Kun Hu, Ivan Lavrov), Student ID Number and Signature at the top of this page.
2. The only items which should be on your desk are pencils and/or pens. NO other items are allowed. Place any other item UNDER your desk. Calculators are NOT allowed.
3. Once the exam begins, you are not allowed to leave the room until you hand in your exam.

**Good luck ! Budget your time wisely ! (skip the question or even the exercise if you get stuck)**

**Do not write below this line (Grader use only)**

Question	Points	Score
1	40	
2	20	
3	20	
4	20	
Total:	100	

---

## 20 Multiple Choice Questions (40 points)

1. (40 points) Each multiple choice question has only one right answer. Use the Scantron to mark your answers.
  - (1) (2 points) In 2014, what was the fraction of US GDP in total world output?
    - A. 13%
    - B. 23%**
    - C. 33%
    - D. 43%
  
  - (2) (2 points) In 2014, output per capita in the US was approximately equal to :
    - A. \$15,000
    - B. \$35,000
    - C. \$55,000**
    - D. \$75,000
    - E. None of these answers are correct.
  
  - (3) (2 points) What is the largest component of national income?
    - A. Corporate profits
    - B. Proprietors' income
    - C. Rental income of persons
    - D. Compensation of employees**
    - E. Indirect taxes
  
  - (4) (2 points) In the formula  $C(Y_D) = c_0 + c_1 Y_D$ , what is the MPC?
    - A.  $C(Y_D)$
    - B.  $Y_D$
    - C.  $c_0$
    - D.  $c_1$**
  
  - (5) (2 points) For the US economy, which of the following represents the largest component of GDP?
    - A. imports
    - B. investment
    - C. government spending
    - D. exports
    - E. none of the above: there exists a component of GDP that is greater than all the above in the US economy**

- (6) (2 points) What is an endogenous variable?
- A. **A variable that depends on other variables in the model**
  - B. A parameter
  - C. A variable not explained within the model but that is instead taken as given
  - D. A consumption function
- (7) (2 points) Which of the following statements is false?
- A. Aggregate data suggests that the MPC is between 0.58 and 0.66.
  - B. The MPC may be estimated using individual-level data on saving behavior, or proprietary data from major credit card companies.
  - C. **The level of the MPC is a matter of strong consensus among economists.**
  - D. Depending on the value for the MPC, stimulus policy may be more or less effective.
- (8) (2 points) Which of the following will cause the money multiplier (the ratio  $M^d/H^d$ ) to become smaller?
- A. an increase in high powered money
  - B. a decrease in the ratio of reserves to checkable deposits
  - C. an increase in the public's preference for checking deposits as opposed to holding currency
  - D. a reduction in high powered money
  - E. **none of the above**
- (9) (2 points) Which of the following is a characteristic of bonds?
- A. pay zero nominal interest
  - B. can be used for transactions
  - C. **are sold for a price that varies inversely with the interest rate**
  - D. all of the above
  - E. none of the above
- (10) (2 points) Which of the following is a component of money?
- A. coins held by the nonbank public
  - B. bills held by banks
  - C. checkable deposits
  - D. **all of the above**

- (11) (2 points) The money demand curve will shift to the left when which of the following occurs?
- A. a reduction in the interest rate
  - B. an increase in the interest rate
  - C. an open market sale of bonds by the central bank
  - D. an increase in nominal income
  - E. none of the above**
- (12) (2 points) Which of the following is an asset of a central bank?
- A. currency
  - B. bonds**
  - C. reserves
  - D. none of the above
- (13) (2 points) Suppose investment spending is not very sensitive to the interest rate. Given this information, we know that
- A. the IS curve should be relatively flat.
  - B. the IS curve should be relatively steep.**
  - C. the LM curve should be relatively flat.
  - D. the LM curve should be relatively steep.
  - E. neither the IS nor the LM curve will be affected.
- (14) (2 points) For this question, assume that the Phillips curve equation is represented by the following:  $\pi_t - \pi_{t-1} = (m + z) - \alpha u_t$ . Which of the following will cause a reduction in the natural rate of unemployment?
- A. an increase in  $m$
  - B. an increase in  $z$
  - C. an increase in  $\alpha$**
  - D. an increase in actual inflation
  - E. an increase in expected inflation
- (15) (2 points) Which of the following best defines the IS curve?
- A. the combinations of  $i$  and  $Y$  that maintain equilibrium in the goods market**
  - B. illustrates the effects of changes in  $i$  on investment
  - C. illustrates the effects of changes in  $i$  on desired money holdings by individuals
  - D. the combinations of  $i$  and  $Y$  that maintain equilibrium in financial markets

- (16) (2 points) Which of the following individuals would be considered unemployed?
- A. an individual who works only part-time
  - B. an individual who works full-time in a family business, but is not paid
  - C. an individual who is not working and is not looking for work
  - D. all of the above
  - E. none of the above**
- (17) (2 points) In the Phillips curve equation, which of the following will cause an increase in the current inflation rate?
- A. an increase in the expected inflation rate
  - B. a reduction in the unemployment rate
  - C. an increase in the markup,  $m$
  - D. all of the above**
  - E. none of the above
- (18) (2 points) Which country was first used to illustrate the relationship between unemployment and inflation (i.e., the original Phillips curve)?
- A. France
  - B. United States
  - C. Canada
  - D. Germany
  - E. none of the above**
- (19) (2 points) Since approximately 1970, the most stable Phillips-type relationship for the United States has been between which of the following?
- A. the rate of inflation and the change in the unemployment rate
  - B. the unemployment rate and the change in the rate of inflation**
  - C. the change in the unemployment rate and the change in the rate of inflation
  - D. the inverse of the unemployment rate and the rate of inflation
  - E. the unemployment rate and the rate of inflation
- (20) (2 points) The original Phillips curve implied or assumed that:
- A. the markup over labor costs was zero.
  - B. the expected rate of inflation would be zero.
  - C. the actual and expected rates of inflation would always be equal.
  - D. all of the above
  - E. none of the above**

## Exercise 1 (20 points)

2. (20 points) Consider the basic goods market model of Lecture 2: consumption is linear in disposable income, disposable income is income minus taxes, investment is exogenous and equal to  $\bar{I}$ , and taxes are exogenous as well. However, government spending depends on the level of output. For example, the government systematically spends more when GDP is higher (it builds new roads, hires new teachers, etc.), and conversely when GDP is lower (it then stops construction projects, fires teachers, etc.). Thus, government spending is given by the following equation, with  $g_1 > 0$ :

$$G = g_0 + g_1 Y$$

- (a) (4 points) Solve for equilibrium output.

**Solution:** We write that Output = Demand:

$$\begin{aligned} Y &= Z = C + \bar{I} + G \\ Y &= c_0 + c_1(Y - T) + \bar{I} + g_0 + g_1 Y \\ Y &= (c_0 - c_1 T + g_0 + \bar{I}) + (c_1 + g_1) Y \\ \Rightarrow & \boxed{Y = \frac{1}{1 - c_1 - g_1} (c_0 - c_1 T + g_0 + \bar{I})}. \end{aligned}$$

- (b) (4 points) If  $g_1 + c_1 < 1$ , what is the value of the tax multiplier? (the tax multiplier is equal to the increase in output following from a \$1 decrease in taxes) If  $g_1 > 0$ , is the multiplier higher or lower than when government spending does not depend on GDP ( $g_1 = 0$ )? What is the intuition for this?

**Solution:** The tax multiplier is given by:

$$\Delta Y = -\frac{c_1}{1 - c_1 - g_1} \Delta T$$

Therefore, if  $\Delta T = -\$1$ , the change in output is  $\frac{c_1}{1 - c_1 - g_1}$ . Therefore:

$$\boxed{\text{Tax Multiplier} = \frac{c_1}{1 - c_1 - g_1}}.$$

The multiplier is higher in this economy than when government spending does not depend on GDP since:

$$\frac{c_1}{1 - c_1 - g_1} > \frac{c_1}{1 - c_1}.$$

The intuition is that government spending automatically increases when GDP increases, which increases demand further. Thus, the multiplier is higher.

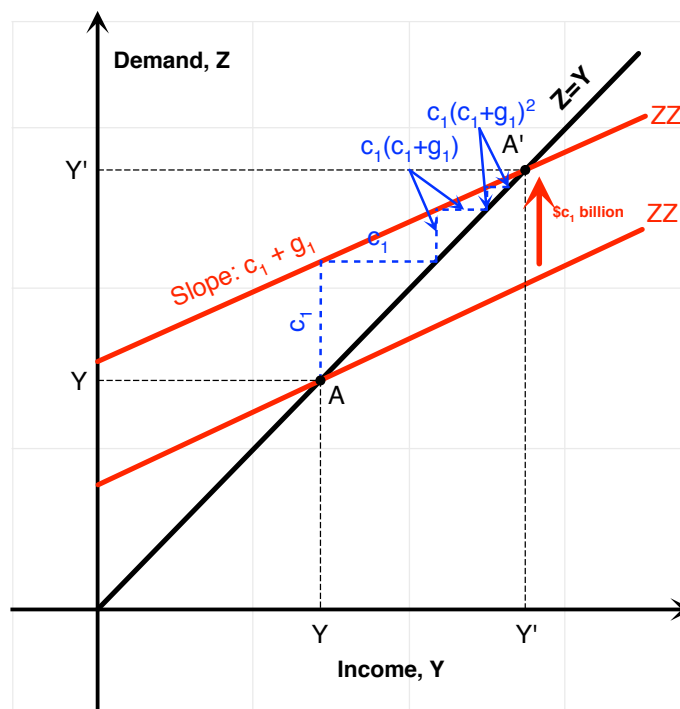
- (c) (8 points) Give both a graphical as well as an algebraic justification for the value of the multiplier.

**Solution:** The (ZZ) curve in this problem has a slope equal to  $c_1 + g_1$ . The impulse to autonomous spending is given by  $\$c_1$ , since one dollar of decreased taxes leads to an increase in consumption equal  $c_1$ . This increase leads to a second round of increased consumption and investment  $c_1(c_1 + g_1)$ , and so on:

$$\begin{aligned} \text{Tax Multiplier} &= c_1 + c_1(c_1 + g_1) + c_1(c_1 + g_1)^2 + \dots + c_1(c_1 + g_1)^n + \dots \\ &= c_1 (1 + (c_1 + g_1) + (c_1 + g_1)^2 + \dots + (c_1 + g_1)^n + \dots) \end{aligned}$$

$$\text{Tax Multiplier} = c_1 \sum_{i=0}^{+\infty} (c_1 + g_1)^i = \frac{c_1}{1 - c_1 - g_1}$$

The graphical interpretation is below.



- (d) (4 points) What happens if  $g_1 + c_1 > 1$ ? Explain using the multiplier intuition.

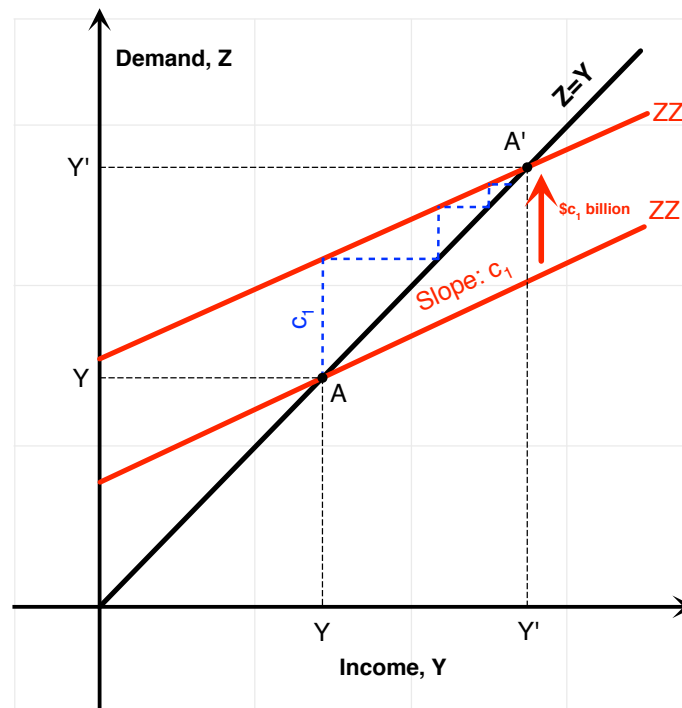
**Solution:** If  $g_1 + c_1 > 1$ , then each new round of spending leads to an even greater new round of new income and new spending. Therefore, the above infinite sum is then infinite, and the tax multiplier is infinite:

$$\text{Tax Multiplier} = c_1 \sum_{i=0}^{+\infty} (c_1 + g_1)^i = +\infty.$$

## Exercise 2 (20 points)

3. (20 points) Consider the basic goods market model of Lecture 2: consumption is linear in disposable income, disposable income is income minus taxes, investment is exogenous and equal to  $\bar{I}$ , and government spending and taxes are exogenous as well. Recall that in the basic goods market model, we define taxes,  $T$ , as net of transfers. In other words:  $T = \text{ Taxes } - \text{ Transfer Payments }.$
- (a) (5 points) Suppose that the government increases transfer payments to private households, but these transfer payments are not financed by tax increases. Instead, the government borrows to pay for the transfer payments. Show using the (YY-ZZ) diagram how this policy affects equilibrium output. Explain.

**Solution:** Using  $T = \text{ Taxes } - \text{ Transfer Payments }.$ , an increase in transfer payments is equivalent to a reduction in taxes  $T$ . If the government borrows to pay for this transfer payment, this means that the government is not changing  $G$  to offset the potential impact on  $T - G$  of this reduction in net taxes. Therefore, output increases directly because of the increase in disposable income  $Y - T$  which raises consumption and thus, demand  $Z$ , and indirectly because the higher output further stimulates consumption through  $C = c_0 + c_1(Y - T)$ . The direct as well as the multiplier effect are shown in the diagram below, if the increase in transfer payments is given by \$1 billion. Then the impulse to autonomous spending is \$ $c_1$  billion, and the total impact on output is \$ $c_1/(1 - c_1)$  billion.





- (b) (5 points) Suppose instead that the government pays for the increase in transfer payments with an equivalent increase in taxes. How does the increase in transfer payments affect equilibrium output in this case?

**Solution:** Since  $T = \text{Tax} - \text{Transfer Payments}$ , if the change in transfer payments equals the change in taxes then there is no change in  $T$ . Since there is no change in  $T$ , our basic model suggests that there is no effect on aggregate consumption or aggregate output.

All that we have done is to change how much different people are consuming, based on how much taxes they are paying and how much transfers they are receiving, but since they all have the same Marginal Propensity to Consume the only thing that matters is **aggregate net taxes**, which are unaffected by the change.

- (c) (5 points) Now suppose that the population includes two kinds of people: those with high propensity to consume (the poor) and those with low propensity to consume (the rich). Suppose that the transfer policy increases taxes on those with low propensity to consume to pay for transfer to people with high propensity to consume. How does this policy affect equilibrium output? Explain. (without any algebra)

**Solution:** When we transfer \$1 of spending from a low MPC person (with  $c_1^L$ ) to a high MPC person (with  $c_1^H > c_1^L$ ), the immediate effect is that we increase consumption by  $c_1^H - c_1^L > 0$ . In addition, this initial increase in output is then magnified by the typical multiplier effect. In equilibrium, output increases under this transfer policy.

- (d) (5 points) Is the following logic correct: "if we redistribute income from the poor to the rich, then this will increase aggregate saving, and therefore raise investment"? Explain.

**Solution:** The introduction of this section says that investment is fixed, thus by construction it cannot increase. However appealing the above reasoning is, it is incorrect in the context of the present model. The reason is that the increase in individual saving is offset by a reduction in income which comes from lower aggregate consumption, and therefore lower aggregate demand. In equilibrium, the direct effect of more saving because of anti-redistributive policies is offset by a fall in aggregate income.

### Exercise 3 (20 points)

4. (20 points) Consider the basic goods market model of Lecture 2: consumption is linear in disposable income, disposable income is income minus taxes, investment is exogenous and equal to  $\bar{I}$ , and government spending is exogenous as well. However, taxes depend on the level of output, according to:

$$T = t_0 + t_1 Y.$$

- (a) (4 points) Solve for equilibrium output.

**Solution:**

$$\begin{aligned} Z &= C + \bar{I} + G \\ &= c_0 + c_1(Y - T) + \bar{I} + G \\ &= c_0 + c_1(Y - t_0 - t_1 Y) + \bar{I} + G \\ Z &= (c_0 - c_1 t_0 + \bar{I} + G) + ((1 - t_1) c_1) Y \end{aligned}$$

Thus, using  $Z = Y$ :

$$Y = \frac{1}{1 - c_1(1 - t_1)} (c_0 - c_1 t_0 + \bar{I} + G)$$

- (b) (4 points) What is the multiplier? Does the economy respond more to changes in autonomous spending when  $t_1$  is 0 or when  $t_1$  is positive? Explain.

**Solution:** The tax multiplier is  $\frac{c_1}{1 - c_1(1 - t_1)}$ , and the government multiplier is  $\frac{1}{1 - c_1(1 - t_1)}$ :

$$\begin{aligned} \Delta Y &= -\frac{c_1}{1 - c_1(1 - t_1)} \Delta t_0 \\ \Delta Y &= \frac{1}{1 - c_1(1 - t_1)} \Delta G \end{aligned}$$

- (c) (2 points) Why is a tax and transfer scheme like the one discussed here called a stabilizer?

**Solution:** Given a change in  $c_0$ , the change in output is lower. Such a tax and transfer scheme is called a stabilizer because taxes mechanically increase and act as a drag on demand when GDP increases. Conversely, taxes decrease when GDP declines, which provides a boost to aggregate demand. **Overall, this is as a stabilizing force.**

- (d) (2 points) What is "automatic" about this stabilizer?

**Solution:** This stabilizer is said to be "automatic" because it occurs mechanically, without any change in legislation. It does not require any discretionary action from the government, which is appealing given the lags in getting a new budget approved through congress.

- (e) (4 points) Solve for taxes in equilibrium. By how much do taxes change if there is a decline of \$1 in  $c_0$ ?

**Solution:** Taxes are given by:

$$\begin{aligned} T &= t_0 + t_1 Y \\ &= t_0 + \left( \frac{t_1}{1 - c_1(1 - t_1)} \right) (c_0 - c_1 t_0 + \bar{I} + G) \\ &= \frac{1 - c_1}{1 - c_1(1 - t_1)} t_0 + \left( \frac{t_1}{1 - c_1(1 - t_1)} \right) (c_0 + \bar{I} + G) \end{aligned}$$

Taxes change by:

$$\Delta T = \frac{t_1}{1 - c_1(1 - t_1)} \Delta c_0$$

Therefore, if  $\Delta c_0 = \$ - 1$ , then:

$$\Delta T = \$ - \frac{t_1}{1 - c_1(1 - t_1)}.$$

- (f) (4 points) Suppose that the government cuts spending in order to keep the budget balanced. What will be the effect on  $Y$  of such an adjustment? Does the cut in spending required to balance the budget counteract or reinforce the effect of the drop in  $c_0$  on output? (Don't do the algebra, give the intuition using words.)

**Solution:** We saw the effect of  $c_0$  on output after allowing for the multiplier effect along with the dampening effect from the automatic stabilizers in the tax and transfer system. Since we already saw that taxes fell, we know that in order for the budget to remain balanced we need  $G$  to fall (recall that maintaining the budget balanced means  $\Delta G = \Delta T$ , so that public saving  $T - G$  stays constant as well).

The decline in  $G$  will **further reduce the level of output** (and taxes), leaving the economy in an even lower equilibrium than it would have been without the balanced budget rule.