

# Midterm Exam : Solutions

## Macro Economics

Institute for Financial Management & Research (Batch: 2018-20)

23 October, 2018

**Maximum Points:** 60

**Duration:** 150 minutes

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### Instructions and Advice:

- The question paper is divided in two sections- Part A and Part B.
  - You need to answer 7 questions in all. [2 from Part A, and 5 from Part B]
  - You can choose between Question 1 and Question 2, and between Question 3 and Question 4.
  - All other questions are compulsory.
  - Please be brief and precise in your answers. Unnecessarily lengthy answers will attract penalty.
  - At no point of this examination you are allowed to ask clarificatory questions. Make reasonable assumption if you have doubts and proceed to answer the question.
  - You are **not allowed** to use calculator in the exam.
  - There is plenty of time. Use it wisely, do not rush.
  - All the best!
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## Part A

1. (4 points) Suppose that instead of cooking dinner for an hour, you decide to work an extra hour, earning an additional ₹1,000. You then purchase some Chinese food, which costs you ₹500

- (a) (2 points) By how much does the measured GDP increase?

**Solution:** Measured GDP goes up by ₹1,000 + ₹500 = ₹1,500

- (b) (2 points) Do you think the increase in measured GDP accurately reflect the effect of your decision to work on output? Explain briefly.

**Solution:** No, the true value of the decision to work should be less than ₹1,500. Had you not worked, the economy would have produced a (unmeasurable) meal. The additional output from the decision to work is the value generated in that work plus the difference between the Chinese food that you bought and the value of meal that you would have cooked.

Or

2. (4 points) Consider the following economy.

- i A silver mining company pays its workers \$200,000 to mine 75 pounds of silver. The silver is then sold to a jewellery manufacturer for \$300,000.
- ii The jewellery manufacturer pays its workers \$250,000 to make silver necklaces, which are then sold directly to consumers for \$1,000,000.

- (a) (2 points) Compute the GDP using the production of final goods approach.

**Solution:** The final good = jewellery sold to consumers = \$1,000,000

- (b) (2 points) What is the value added at each stage of production? What is the GDP using this approach.

**Solution:**

Stage 1: \$300,000

Stage 2: \$1,000,000 - \$300,000 = \$700,000.

3. (6 points) Recall from the class on Phillips Curve that

$$u_n = \frac{(m + z)}{\alpha}$$

- (a) (3 points) Suppose that  $m = 0.04$  and  $z = 0.02$ . Calculate the natural rate of unemployment when  $\alpha = 1$  and when  $\alpha = 2$ . Explain your answer.

**Solution:**

$$\alpha = 1: u_n = 6\%$$

$$\alpha = 2: u_n = 3\%$$

$\alpha$  measures wage flexibility. As wages become more flexible, supply shocks impact wages more and natural unemployment rate less.

- (b) (3 points) Suppose that there is an oil price hike and  $m$  rises to 0.06. Calculate the new natural unemployment rate when  $\alpha = 1$  and when  $\alpha = 2$ . Explain your answer.

**Solution:**

$$\alpha = 1: u_n = 8\%$$

$$\alpha = 2: u_n = 4\%$$

Higher oil price effects could be less severe if wages are more flexible, and therefore we won't see large rise in natural rate of unemployment.

**Or**

4. (6 points) Suggest a policy mix to achieve each of the following in the short run:

- (a) Increase  $Y$  while keeping  $i$  constant.

**Solution:** Reduce  $T$  or increase  $G$  ( $IS$  curve shifts to the right), and then the central bank employs an expansionary monetary policy ( $LM$  curve shifts downwards).  
[An accompanying graph would be nice here.]

- (b) Decrease budget deficit while keeping  $Y$  constant.

**Solution:** Reduce  $G$  or increase tax rates  $T$ . This shifts  $IS$  curve to the left. Now, the RBI increases  $M^s$ , which shifts the  $LM$  curve downwards. The interest rate fall. Investments might go up (hopefully) offsetting the contractionary fiscal policy effects.  
[A graph will make things clear.]

## Part B

5. (10 points) Suppose the economy is characterized by the following behavioural equations

$$C = 100 + 0.6Y_D$$

$$I = 300 + 0.2Y$$

$$G = 200$$

$$T = 100$$

- (a) (2 + 3 points) Solve for equilibrium output. What is the value of the multiplier?

**Solution:**

$$\begin{aligned} Y &= C + I + G \\ &= 100 + 0.6(Y - 100) + 300 + 0.2Y + 200 \\ &= 540 + 0.8Y \end{aligned}$$

$$Y^* = 2700$$

$$\begin{aligned} Y &= C + I + G \\ &= c_0 + c_1(Y - T) + b_0 + b_1Y + G \\ &= (c_0 + b_0) + (c_1 + b_1)Y + (G - c_1T) \end{aligned}$$

$$Y = \frac{1}{1 - (c_1 + b_1)} [(c_0 + b_0) + (G - c_1T)]$$

$$c_1 = 0.6, b_1 = 0.2$$

$$\text{Multiplier} = \frac{1}{1 - (c_1 + b_1)} = \frac{1}{0.2} = 5$$

- (b) (1 + 1 + 3 points) Suppose that now business confidence is up, and there is a shift in the investment equation.

$$I = 500 + 0.3Y$$

Compute the change in equilibrium output, the change in investment, and the change in private savings.

**Solution:** The old equilibrium:  $Y_1^* = 2700$ ,  $C_1^* = 1660$ ,  $I_1^* = 840$ ,  
 $S_1^* = Y_1^* - C_1^* - T = 2700 - 100 - 1600 = 940$

With new investment equation:

$$Y_2^* = 7400$$

$$C_2^* = 2820$$

$$S_2^* = 7400 - 100 - 2820 = 2820$$

$$I_2^* = 500 + 0.3 * 7400 = 2720$$

$$\text{Change in output, } \Delta Y^* = Y_2^* - Y_1^* = 7400 - 2700 = 4700$$

Change in investment,  $\Delta I^* = I_2^* - I_1^* = 2720 - 840 = 1880$

Change in private savings,  $\Delta S^* = S_2^* - S_1^* = 2820 - 940 = 1880$

Change in private savings must match the change in the investments.

6. (10 points) Consider two economies, each with 100 people, divided into 25 households, each composed of four people. In each household, one person stays at home and prepares the food, two people work in the nonfood sector, and one person is unemployed. Assume that the workers outside food preparation produce the same actual and measured output in both economies.

In the first economy, *EatIn*, the 25 food-preparation workers (one per household) cook for their families and do not work outside the home. All meals are prepared and eaten at home. The 25 food-preparation workers in this economy do not seek work in the formal labor market (and when asked, they say they are not looking for work). In the second economy, *EatOut*, the 25 food-preparation workers are employed by restaurants. All meals are purchased in restaurants.

Calculate measured employment, unemployment and the measured labour force for each economy. Calculate the measured unemployment rate and participation rate for each economy. Which of the two economies has higher measured GDP?

**Solution:**

<b>EatIn</b>		<b>EatOut</b>	
Population	100	Population	100
Labor Force	75	Labor Force	100
Employment	50	Employment	75
Unemployment	25	Unemployment	25
Unemployment Rate	33%	Unemployment Rate	25%
Participation Rate	75%	Participation Rate	100%

**Eatout**, it seems, has better measured participation rate. Therefore, it has higher measured GDP.

**NOTE:** Participation and employment rates are one and the same.

7. (10 points) Consider the following production function:

$$Y = \sqrt{K}\sqrt{L}$$

(a) (1 point) Compute output when  $K = 16$  and  $L = 25$ .

**Solution:**  $Y(K = 16, L = 25) = 4 * 5 = 20$

(b) (2 + 1 points) If both labour and capital double, compute the percentage change in output? Does this production function exhibit constant returns to scale?

**Solution:**  $Y(K = 32, L = 50) = 2 * 4 * 5 = 40$

$$\Delta Y = 100\%$$

The production function does exhibit CRS.

(c) (1 point) Rewrite the production function as a relation between output per worker and capital per worker.

**Solution:**

$$y = \sqrt{k}$$

where  $y = \frac{Y}{L}$ , and  $k = \frac{K}{L}$

(d) (1 point) Let  $K/L = 4$ . What is  $Y/N$ ? Now double  $K/L$  to 8. Compute the percentage change in output per worker.

**Solution:** Assume that  $N = L$ .

When  $K/L = 4$ ,  $y = 2$ .

When  $K/L = 8$ ,  $y = 2\sqrt{2}$

Percentage change in  $y = 41.4\%$

(e) (2 points) Does the relation between output per worker and capital per worker exhibit constant returns to scale?

**Solution:** No, when we doubled  $k$ , the change in  $y$  is no longer 100%.

(f) (2 points) Are your answers for the second half of part (b) and part (e) same? Why or why not?

**Solution:** The answers are different. In part (e), we are essentially looking at what happens to output when we increase capital only, not capital and labour in equal proportion. There are decreasing returns to capital.

8. (10 points) Assume the following:

- i . The public holds no currency.
- ii . The ratio of reserves to deposits is 0.1
- iii . The demand for money is given by

$$M^d = Y(0.8 - 4i)$$

Initially, the monetary base is ₹100 billion, and nominal income is ₹5 trillion.

(a) (2 points) Compute the demand for central bank money.

**Solution:** The demand for central bank money equals demand for reserves. Therefore, demand for central bank money will be

$$H^D = 0.1 * Y * (0.8 - 4i)$$

(b) (2 points) Find the equilibrium interest rate.

**Solution:**

$$100 = 0.1 * (5000) * (0.8 - 4i)$$

Answer:  $i = 15\%$ .

(c) (2 points) Estimate the overall money supply.

**Solution:**  $M^S = M^D$

Answer:  $M^S = 1,000$  billion.

(d) (2 points) What is the impact on the interest rate if central bank money is increased to ₹300 billion?

**Solution:** Answer:  $i = 5\%$ .

(e) (2 points) If the overall money supply goes up by 10%, estimate the change in the interest rate.

**Solution:** Assuming that the nominal income remains the same:

$$M_{new}^S = M^S + 0.1M^S = 1,100$$

$$i_{new} = 14.5\%$$

Answer: Fall in interest rate by 0.5 percentage points.

9. (10 points) Suppose the economy begins with output equal to its 'natural' level. Then, there is a reduction in income taxes.

- (a) (5 points) Using the  $AS - AD$  model, show the impact of this policy decision on the position of the  $AD$ ,  $AS$ ,  $IS$ , and  $LM$  curves in the medium run. Illustrate your answer graphically.

**Solution:**

	Impact of Tax Reduction			
	AS	AD	IS	LM
Short Run	up	right	right	up
Medium Run	up further	no change	no change	up further

One or more pretty (and correctly labelled) graphs explaining the above will fetch you full points.

NOTE: Technically, in the short run, AS or LM curve won't move. It is only after inflationary pressure sets in that you get to see the two curves moving.

- (b) (5 points) What happens to output, the interest rate, and the price level in the medium run? What happens to consumption and investment in the medium run?

**Solution:**

Output( $Y$ ) returns to its unchanged natural level.

The interest rate ( $i$ ) and the price level ( $P$ ) increase.

With reduced taxes and income returning to its unchanged natural level, disposable income is still higher and, therefore, consumption( $C$ ) should be up in the medium run.

Investment( $I(Y, i)$ ) falls because interest rate ( $i$ ) is up, but the output has remained unchanged.