

Econ 102  
Intermediate Macroeconomics  
Instructor: Chao Wei

## Midterm Answer Sheet

### Instructions:

The exam is made up of two parts:

Part I (30 points): Multiple Choice Questions. One point for each question.

Part II (30 points) Problems and Applications

## Part II. Problems and Applications

1. Suppose that the U.S. Congress grants President's Bush's request of \$87 billion for American efforts in Iraq and Afghanistan, and as a result government spending increases by \$87 billion. If the marginal propensity to consume is 0.9, what happens to the following? Do they rise or fall? By what amounts?
  - (a) Public Saving =  $T - G$ . The increase in government spending causes a one-for-one decrease in public saving, therefore public saving decreases by \$87 billion.
  - (b) Private Saving =  $Y - T - C(Y - T)$ . Since  $Y$  and  $T$  do not change in response to an increase in government spending, private saving does not change.
  - (c) National Saving =  $Y - C - G$ . The \$87 billion increase in government spending causes national saving to decrease by \$87 billion.
  - (d) Investment = National Saving. As a result, investment decreases by \$87 billion.
2. Use the neoclassical theory of distribution to predict the impact on the real wage and the real rental price of capital of each of the following events:

- (a) A wave of immigration increases the labor force.

According to the neoclassical theory of distribution, the real wage equals the marginal product of labor. Because of diminishing marginal product of labor, an increase in the labor force causes the marginal product of labor to fall. Hence, the real wage falls. With more workers available to work with the capital stock, an additional unit of capital produces more additional output. This increase in the marginal product of capital leads to an increase in the real rental price of capital.

- (b) The Isabel hurricane destroys some of the capital stock.

The real rental price equals the marginal product of capital. Because of diminishing marginal product of capital, a reduction in

the capital stock causes the marginal product of capital to rise. Hence, the real rental price rises. Now with less capital stock to work with, an additional unit of labor produces less additional output. This decrease in the marginal product of labor leads to a decrease in the real wage.

(c) A technological advance improves the production function.

If a technological advance improves the production function, this is likely to increase the marginal products of both capital and labor. Hence, the real wage and the real rental price both increase.

3. Consider an economy described by the following equations:

$$Y = C + I + G \quad (1)$$

$$Y = 5000 \quad (2)$$

$$G = 1000 \quad (3)$$

$$T = 1000 \quad (4)$$

$$C = 200 + 0.75(Y - T) \quad (5)$$

$$I = 1300 - 50r \quad (6)$$

(a) In this economy, compute private saving, public saving, investment, and the equilibrium interest rate.

$$\begin{aligned}
S^{pr} &= Y - T - C \\
&= 5000 - 1000 - [200 + 0.75(5000 - 1000)] \\
&= 800
\end{aligned}$$

$$\begin{aligned}
S^{pub} &= T - G \\
&= 1000 - 1000 \\
&= 0
\end{aligned}$$

$$\begin{aligned}
I &= S^{pr} + S^{pub} \\
&= 800
\end{aligned}$$

$$\begin{aligned}
I &= 1300 - 50r \\
800 &= 1300 - 50r \\
r &= 10
\end{aligned}$$

- (b) Now suppose firms become very pessimistic about the future, and as a result, equation (6) changes into

$$I = 1000 - 50r, \quad (7)$$

Find the new equilibrium interest rate and investment. Does the amount of investment differ from what you get in (a)? Why or why not?

$$S^{pr} + S^{pub} = I = 1000 - 50r$$

Note that there are no changes in the amount of private saving and public saving, as a result,

$$\begin{aligned}
800 &= 1000 - 50r \\
r &= 4
\end{aligned}$$

$$\begin{aligned}
I &= 1000 - 50r \\
&= 800.
\end{aligned}$$

The amount of investment is the same as what one gets in (a), because there are no changes in national saving despite the change in the investment equation.

- (c) Now consider a more sophisticated consumption function than equation (5) :

$$C = 200 + 0.75 (Y - T) - 50r, \quad (8)$$

what is the rationale here behind the assumption that consumption depends negatively on the real interest rate? Now we have a new economy described by equations (1), (2), (3), (4), (6) and (8), compute the consumption and investment in this new economy.

Because the interest rate is the return to saving (as well as the cost of borrowing), a higher interest rate might reduce consumption and increase saving. If so, the saving schedule would be upward sloping, rather than vertical.

To compute the consumption and investment in the new economy, first we need to derive the function for the national saving,  $S$  :

$$\begin{aligned} S &= Y - C - G \\ &= 5000 - [200 + 0.75 (Y - T) - 50r] - 1000 \\ &= 800 + 50r. \end{aligned}$$

In equilibrium, we have investment equal to national saving, and as a result,

$$\begin{aligned} S &= I \\ 800 + 50r &= 1300 - 50r \\ r &= 5. \end{aligned}$$

Substitute the equilibrium interest rate into consumption and investment functions respectively, we have

$$\begin{aligned} C &= 200 + 0.75(Y - T) - 50r \\ &= 200 + 0.75(5000 - 1000) - 50 \cdot 5 \\ &= 2950 \end{aligned}$$

$$\begin{aligned} I &= 1300 - 50r \\ &= 1050 \end{aligned}$$

- (d) Now consider another economy described by equations (1), (2), (3), (4), (7) and (8), compute the equilibrium interest rate and investment in this case. Does the amount of investment differ from what you get in (c), why or why not?

$$\begin{aligned} I &= Y - C - G \\ 1000 - 50r &= 5000 - [200 + 0.75(Y - T) - 50r] - 1000 \\ r &= 2 \end{aligned}$$

$$\begin{aligned} I &= 1000 - 50r \\ &= 900 \end{aligned}$$

The amount of investment differs from what one obtains in (c). The reason is that we now have an upward sloping, instead of a vertical, saving function. As the equilibrium interest rate decreases as a result of the downward shift in the investment function, both investment and savings decrease.