

EE312 Macroeconomic Theory
Semester 2/2016
Mid-Term Examination

Date: Wednesday 8 March 2017
 Time: 11:00 – 13:00 hr.

Instructions

1. There are three essay questions with a total of 30 points.
2. Write your answers in the provided booklets.
3. Books, notes, calculators and electronic devices are not allowed.
4. Use pens to write your answers; pencils are allowed for drawings only.
5. Explain the chain of effects among variables correctly. Describe your analysis in words and use diagrams accordingly.

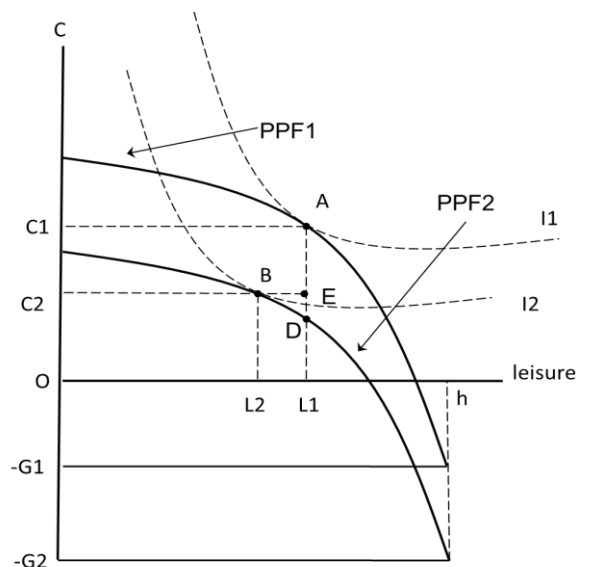
Questions

1. Suppose the government decides to increase its current spending. Use **the Closed-Economy, One-Period Macroeconomic Model** to determine the effects of the increase in current government spending on aggregate output, consumption, employment and the real wage. (10 points)

Answer

The initial competitive equilibrium is at point A where the firm's PPF1 touches the consumer's highest indifferent curve I1. At A, the firm maximizes profit and the consumer maximizes utility at the real wage rate equal to the slope of the PPF and I1. The optimum consumption bundle for the consumer is consumption goods equal to c_1 and leisure equal to L_1 . So the consumer's working time (and labor supply) is $h - L_1$.

The government increases spending (G), causing taxes to increase ($G = T$). Non-wage income ($\pi - T$) and the disposable income decrease. This is a negative income effect. The consumer reduces both consumption goods (C) and leisure (L) as they are normal goods. Less leisure is equivalent to an increase in working time ($h - L$). The consumer supplies more labor service (N^s). The real wage (w) drops to induce more labor demand (N^d) by the firm. Employment increases. More labor input in production results in larger total output (Y).

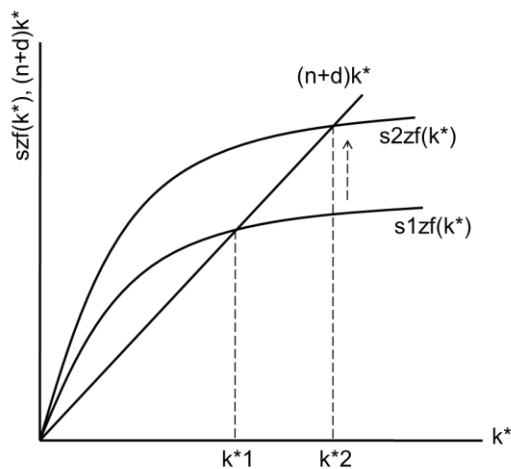


The increase in government spending and taxes causes the PPF1 to shift down to PPF2 as $G = T$ increases from G_1 to G_2 . The competitive equilibrium moves from point A to point B at a lower indifference curve I_2 . The optimum amount of consumption goods drops from C_1 to C_2 while leisure decreases from L_1 to L_2 . The consumer's working time increases from $h - L_1$ to $h - L_2$. The real wage decreases because the slope of the PPF2 and I_2 at point B is less steep than at point A. The drop in consumption (the distance $C_1C_2=AE$) is smaller than the increase in government spending (the distance $G_2G_1=AD$).

In conclusion, an increase in government spending results in larger total output, lower consumption, higher employment and a lower real wage. The increase in government spending partially crowds out consumption because higher taxes reduce disposable income. The consumer works more at a lower real wage and receives less consumption goods. Consumer welfare and utility are lower.

2. In the **Solow growth model**, suppose the saving rate (s) in the economy increases. Analyze the effects of such increase on the quantity of capital per worker and output per worker in the steady state. Give the economic reason of why such output growth is said to be transitory. (10 point)

Answer:



Assume the initial saving rate is s_1 so that saving per worker is $s_1zf(k^*)$. At equilibrium, saving per worker equals steady-state investment per worker. So the initial steady-state capital per worker is k^*_1 .

As the saving rate increases to s_2 , saving per worker also increases to $s_2zf(k^*)$. The saving per worker curve rotates upwards from $s_1zf(k^*)$ to $s_2zf(k^*)$ which is equal to the steady-state investment at the new level of steady-state capital per worker k^*_2 . Higher capital per worker results in higher output per worker at y^*_2 , given the per

worker production function.

At the initial steady-state capital per worker of k^*_1 , aggregate output (Y) and aggregate capital (K) are growing at the rate of population growth (n). As the saving rate increases, aggregate saving and aggregate investment are also increasing. The rising aggregate investment causes aggregate capital (K) to grow at a higher rate than n , resulting in aggregate output (Y) also growing at a higher rate than n .

However, the aggregate production function is characterized by diminishing returns to capital, given the labor input. The marginal product of capital is falling as the capital input is increasing, so that aggregate output, aggregate savings, aggregate investment and aggregate capital are growing at a decreasing rate. The growth will slow down towards the rate of population growth (n) at the new steady-state of k^*2 . The high aggregate output growth is said to be transitory because the economy will experience a period of such high growth only in the transition from k^*1 to k^*2 where it will drop to the initial growth rate of n .

3. In the **endogenous growth model**, assume the following variables:

Y = output

C = consumption

z = marginal product of the efficiency units of labor

H^s and H^s' = supply of current and future human capital by the consumer, respectively

H^d = demand for human capital by the firm

b = the efficiency of human capital accumulation technology

u = time allocated to producing output.

Derive the competitive equilibrium condition. And what are the effects of an increase in the marginal product of the efficiency units of labor (z) on the real wage rate, the levels of output and consumption, and the equilibrium growth rates of output and consumption? (10 points)

Answer: The firm's production function is given by:

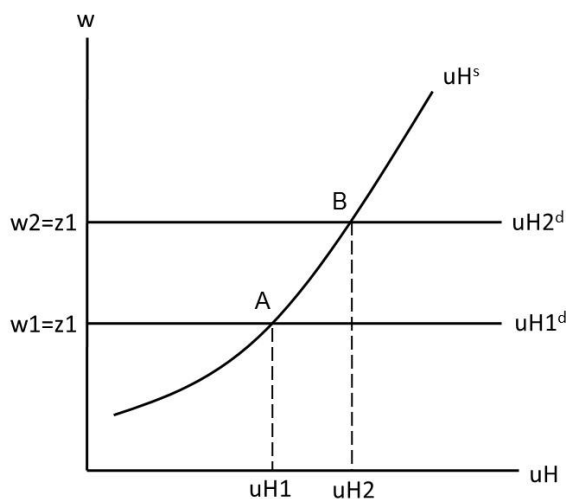
$$Y = zuH^d$$

So the firm's profit function is total output or total revenue minus labor cost:

$$\pi = Y - wuH^d$$

$$\pi = zuH^d - wuH^d$$

$$\pi = (z - w)uH^d$$



The firm maximizes profits at $z = w$ which is also the firm's demand for efficiency units of labor (uH^d). The market clears when the demand and supply of efficiency units of labor are equal ($uH^d = uH^s$).

At the initial equilibrium, the firm maximizes profits at point A where the marginal product of the efficiency units of labor ($z1$) equals the real wage ($w1$) and the firm's demand ($uH1^d$)

equals the consumer's supply of the efficiency units of labor (uH^s).

When the marginal product of the efficiency units of labor increases from z_1 to z_2 . The firm has incentives to hire more labor and has to offer a higher real wage. The demand curve shifts upwards to uH^{2d} . The consumer supplies more efficiency units of labor to uH^{2s} . The firm and the consumer reach the new equilibrium at point B where the real wage is higher at w_2 .

The production function is $Y = zuH^d$. More employment of labor (uH) and higher z result in the higher level of output. Consumption is $C = wuH^s$. The higher real wage (w) and more employment (uH) raise the level of consumption.

At the new equilibrium, the growth rate of consumption is still $b(1 - u)$. Output is also growing at the same rate of $b(1 - u)$ because consumption equals output in every period.

$$\frac{C'}{C} - 1 = \frac{z_2 u H'}{z_2 u H} - 1 = \frac{H'}{H} - 1 = b(1 - u) - 1$$

In conclusion, the higher marginal product of the efficiency units of labor results in the higher levels of the real wage, output and consumption. The equilibrium growth rates of output and consumption remain the same at $b(1 - u)$.