ECON 222
Macroeconomic Theory I
Fall Term 2010

Midterm Exam

DURATION: 80 minutes.

INSTRUCTIONS: Use the EXAMINATION BOOKLETS to answer. Show ALL RELEVANT STEPS.

CALCULATORS: non-programmable, Casio 991, blue sticker, gold sticker.

Section A (Short Answer Questions): Do FOUR of the SIX questions. Provide a brief explanation to support your answer. Each question is worth 10 MARKS for a total of 40 MARKS.

Section B (Long Answer Questions): Complete BOTH questions. Each question is worth 30 MARKS for a total of 60 MARKS.

TOTAL: 100 MARKS.

Section A: Short Answer Questions

A1

In a world with two large economies, what relationship between the current accounts of the two countries is satisfied when the world real interest rate is at its equilibrium value?

Answer: The current accounts of the two countries sum to zero.

A2

True or False? An increase in the interest rate means a negative substitution effect in the consumption saving decision. Explain your answer.

Answer: The statement is true. A higher interest rate raises the price of current consumption $(1 + r)$, causing consumers to substitute away from current consumption (which has become relatively more expensive), and toward future consumption (which has become relatively cheaper).

A3

What is the effect on desired national saving of a temporary lump-sum tax increase?

Answer: Consumers have higher taxes today but lower future taxes. If consumers take

this into account, current desired consumption is unchanged, and since output and government purchases haven't changed, desired national saving is unchanged as well. This is the case of Ricardian equivalence. If consumers do not anticipate lower future tax burdens, they may reduce current desired consumption, increasing desired national saving.

A4

What is the key difference that determines whether an international transaction appears in the current account or the capital account?

Answer: The current account includes only the trade of currently produced goods and services. Trades of existing assets are counted in the capital account.

A5

True or False? The higher the steady-state capital-labour ratio is in the neoclassical growth model, the more consumption each worker can enjoy in the long run. Explain your answer.

Answer: The statement is false. Increases in the capital-labour ratio increase consumption per worker in the steady state only up to a point. If the capital-labour ratio is too high, then consumption per worker may decline due to diminishing marginal returns to capital, and the need to divert too much of output to maintain the capital-labour ratio.

A6

Why is the classical model of the labour market not very useful for studying unemployment?

Answer: The classical model of labour market assumes that any worker who wants to work at the equilibrium real wage can find a job. The classical model therefore does not account for equilibrium frictional and/or structural unemployment.

Section B: Long Answer Questions

B1: Productivity, Output and Employment

Suppose we have an economy with the following aggregate production function:

$$Y = AK^{1/3}N^{2/3}$$

where A is TFP, K represents capital and N represents labour. Set $A = 6$ and $K = 43$. Everything is expressed in real terms.

1. Use the production function to derive an algebraic expression for the demand curve for labour. Assuming that the wage rate prevailing in this economy was equal to $w = 3.5$, what would be the level of employment?

2. Now suppose that the supply curve is upward sloping and has the following form:

$$N^S = 10\left[(1-t)w\right]^2$$

where w is the real wage rate, and t is the tax rate on labour income. Assume for now that $t = 0$. Calculate the wage rate and the level of employment that satisfy the equilibrium in the labour market. Show your results graphically.

3. Repeat part 2 under the assumption that the tax rate on labour income, t, equals 0.15. Compare the new equilibrium to the no-tax equilibrium. What has been the effect?

Answer:

1. Start by taking the derivative of the production with respect to labour to obtain the MPN curve. Set this equal to the real wage (w).

$$MPN = \frac{\partial Y}{\partial N} = \frac{2}{3}AK^{1/3}N^{-1/3} = w$$

Then solve this for N, which is the demand for labour, N^d.

$$N^d = \frac{\left(\frac{2}{3}A\right)^3 K}{w^3}$$

Inserting values for TFP, $A = 6$, and the capital stock, $K = 43$, we get:

$$N^d = \frac{2752}{w^3}$$

With $w = 3.5$, $N^d \approx 64.19$.

2. In equilibrium, labour demand, N^d, has to be equal to supply, N^s.

$$N^d = \frac{2752}{w^3} = 10w^2 = N^s$$

We can rewrite this in terms of w, which yields

$$w = \left(\frac{2752}{10}\right)^{1/5} \approx 3.0756$$

At this equilibrium wage rate, labour demand is $N^d = 2752/(3.0756^3)) \approx 94.59$. The determination of labour demand is shown graphically in Figure 1.

3. In equilibrium, $N^d = N^s$:

$$N^d = \frac{2752}{w^3} = 10[(1-t)w]^2 = N^s$$

We can rewrite this in terms of w, which yields

$$w = \left(\frac{2752}{10(1-t)^2}\right)^{1/5} \approx 3.2822 \text{ when } t = 0.15$$

At this equilibrium wage rate, labour demand is $N^d = 2752/(3.2822^3) \approx 77.8327$.

Compared to the case without taxes, the introduction of a tax on labour income drives up the before-tax wage rate w. Firms now demand fewer workers. In equilibrium, employment is lower (77.8 versus 94.6), and the market wage rate is higher ($3.28 versus $3.08).

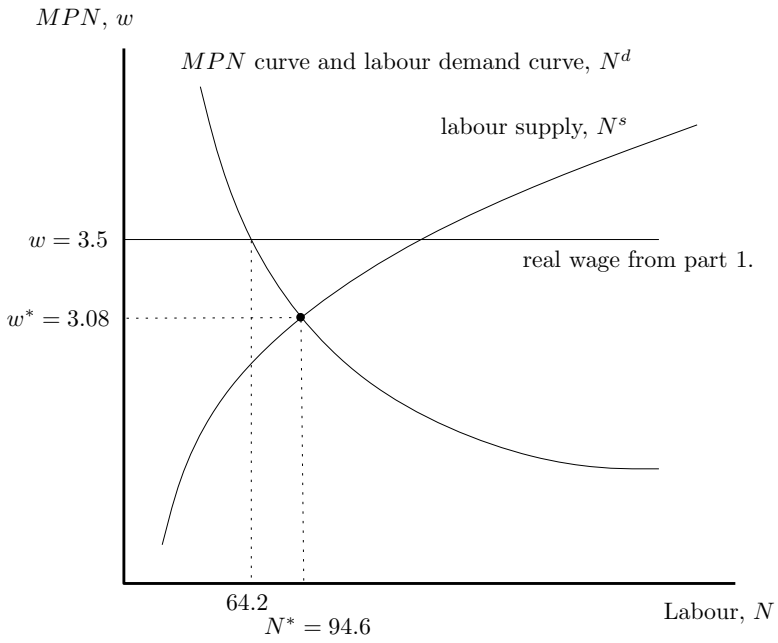

Figure 1: Question B1, part 1

B2: Saving and Investment in a Large Open Economy

Greece, an open economy, has a history of too much government spending and too little tax revenue due to tax evasion. Suppose its national accounts, desired investment and desired consumption are the following:

$$\begin{aligned} \bar{Y} &= 400 \\ T &= 85 \\ INT &= 35 \\ TR &= 10 \\ G &= 90 \\ NFP &= 0 \\ I^d &= 35 - 450r^w \\ C^d &= 300 - 300r^w \end{aligned}$$

where $\bar{Y}$ is full-employment output, INT is interest payments on government debt, TR is transfer payments from the government to domestic residents, G is government spending, and NFP is net factor payments.

1. Calculate the government budget surplus (deficit). Express the government's budget balance as a percentage of GDP.

2. Find equations for desired national saving (S^d) and the current account (CA) as functions of the world real interest rate r^w.

3. Suppose there is only one other economy in the world: Germany. Germany's saving and investment decisions are summarized by the following two equations:

$$S^d_{Germany} = 290r^w$$
$$I^d_{Germany} = 25 - 600r^w$$

With free trade and international borrowing/lending between Greece and Germany, what is the equilibrium world real interest rate? What is Greece's current account balance in equilibrium. Illustrate this situation graphically.

Answer:

1. The government's budget is

$$T - G - TR - INT = 85 - 90 - 10 - 35 = -50$$

The government has a budget deficit of 50, which is 12.5% of GDP (50/400=.125).

2.
$$S^d = \bar{Y} - C^d - G = 400 - (300 - 300r^w) - 90 = 10 + 300r^w$$

and
$$CA = S^d - I^d = 10 + 300r^w - (35 - 450r^w) = -25 + 750r^w$$

3.
$$S^d_{Greece} + S^d_{Germany} = I^d_{Greece} + I^d_{Germany}$$
$$10 + 590r^w = 60 - 1050r^w$$
$$\Rightarrow \ r^w \approx 3.0488\%$$

At this world interest rate, Greece has a current account deficit equal to

$$CA = -25 + 750(.030488) = -2.1341$$

The determination of the world real interest rate is depicted in Figure 2.

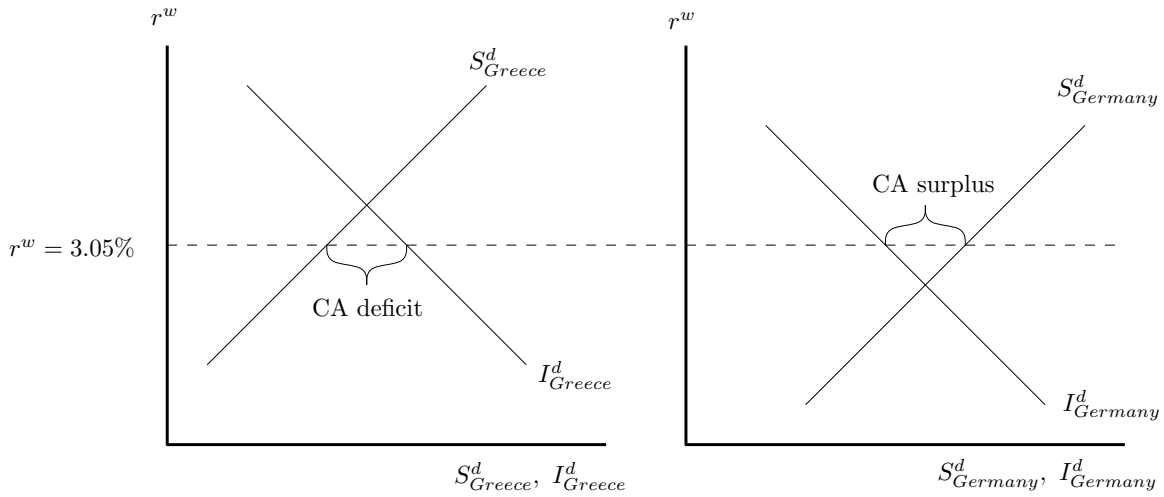

Figure 2: Question B2, part 3