

Queen's University
Department of Economics
Economics 222 A and B
Midterm Examination
26 October 2004

Please read all the questions carefully. Record your responses in the answer booklet provided. You are encouraged to draw diagrams to support your answers. Please label the axes and lines or curves on your diagrams. The exam has two parts.

Part I consists of short questions. Do **any five** of the nine questions. Each question is worth 8 marks for a total of 40 marks.

Part II consists of long questions. Do **any two** of the three questions. Each question is worth 30 marks for a total of 60 marks.

The exam is 120 minutes long. Upon completion of your exam, hand in only the answer booklet clearly labelled with your student number and class section (A or B). Keep the question paper for future reference.

Part I

Answer **any 5** of the following 9 questions. Each question is worth 8 marks for a total of 40. Answers without any explanations will receive zero marks. Where possible, illustrate your answer with a diagram.

1. Suppose that there is worldwide boom (a rise in prices) on stock markets. What will be the effect of this boom on the world real interest rate?
2. An economist writes: “The best way to guarantee ongoing growth in GDP per capita is to raise the savings rate.” Briefly discuss this statement.
3. Suppose that recent tax cuts in the U.S. (in lump-sum taxes, say) imply no changes in current or future government spending. Does economic theory predict, then, that these tax cuts affect the U.S. current account balance or the world real interest rate?
4. Suppose that recent increases in the price of oil are temporary, and so do not affect the expected future marginal product of capital. In oil-importing regions such as the EU or U.S., will these oil price increases affect employment, output, or the current account?
5. Does the rate of change in the consumer price index (CPI) overstate increases in the cost of living?
6. Suppose that the Canadian adult population is 26 million. The labour force participation rate is 67 percent. There are 1 million unemployed workers. How many workers are employed? What is the unemployment rate?
7. If the rate of inflation expected for 2005 rises but there is no change in the nominal interest rate, then what will be the effect on investment in physical capital?
8. An economist writes: “It is easy to predict how countries will rank according to their inflation rates. All we need to know is the growth rate of each country’s money supply.” Briefly discuss this statement.
9. In recent years the real wages of skilled workers have risen faster than those of unskilled workers. Give one explanation for this increase in wage inequality.

Part II

Answer **any two** of the three questions. Each question is worth 30 marks for a total of 60 marks.

1. Suppose that Russia has the following production function:

$$Y = AK^{0.5}N^{0.5}.$$

Employment, N , is not growing. Output is growing at a rate of 2% per year. The capital stock is growing at a rate of 3% per year.

(a) What is the growth rate of total factor productivity?

(b) Suppose that the money market can be described by

$$\frac{M^s}{P} = Y.$$

There is no growth in the money supply. What is the rate of inflation or deflation?

(c) Find an expression for the marginal product of labour.

(d) What is the growth rate of the real wage?

2. In this question, we shall see the quantitative effect of changes in a country's population growth rate. Our tool will be the growth model in a closed economy. The production function is:

$$Y = K^{0.3}N^{0.7}.$$

National saving is given by $S = 0.16Y$ so that $C = 0.84Y$. The population (or labour force) grows like this over time:

$$N_{t+1} = (1 + n)N_t.$$

The capital stock evolves this way:

$$K_{t+1} = 0.9K_t + I_t,$$

because the depreciation rate is $d = 0.10$.

(a) Write the production function relating per capita GDP, y , to the capital-labour ratio, k .

(b) Suppose that $n = 0.06$. Find k^* , the steady-state capital labour ratio. Then also find c^* the steady-state value of consumption per capita.

- (c) Repeat your calculations from part (b) but for a population growth rate of $n = 0.02$.
- (d) Use a diagram to illustrate how a change in the population growth rate affects the steady state.

3. Japan currently has a large current account surplus with the United States. In this question, we imagine that these two large economies are the only ones in the world. In Japan, suppose that national savings can be described by:

$$S_J = 200 + 12r^w + \frac{G_J}{4},$$

and investment can be described by:

$$I_J = 320 - 30r^w.$$

In the U.S., the corresponding relationships are:

$$S_U = 400 + 10r^w,$$

and

$$I_u = 600 - 25r^w.$$

- (a) Why do the savings curves slope up?
- (b) Why does the level of government spending, G , affect national saving?
- (c) If $G_J = 48$, solve for r^w , CA_J , and CA_U .
- (d) The government of Japan has a large debt. Suppose that it therefore reduces its spending. In what directions will r^w , CA_J , and CA_U change?

Please do not write on the first page of an examination booklet.

Also start each answer on a new page.

Also do not write on the back of any page.

Part I Answers

The following are very brief solutions to part I of the midterm. In order to get full marks all diagrams must have been included and labelled. Additionally, all movements in the market must be fully explained. Questions are worth 8 marks each for a total of 40.

1. The boom in stock markets is an increase in wealth. That tends to reduce saving at any given real interest rate. In the savings-investment diagram the desired saving curve shifts to the left, so the world interest rate rises.
2. This statement is false. The graph of $sf(k)$ and $(n+d)k$ against k shows that an increase in s raises the steady-state capital-labour ratio and hence raises output per capita. But it does this only once, and not on an ongoing basis. Only ongoing growth in productivity can lead to ongoing growth in GDP per capita.
3. The tax cuts imply future tax increases. If Ricardian equivalence holds, then there will be no change in the U.S. current account or in the world interest rate, because U.S. national saving will not change. That is because U.S. taxpayers save the entire tax cut. If, instead, there is myopia, then some of the tax cut will be spent, and U.S. national saving will fall. That will shift the U.S. saving curve to the left, which will lower the U.S. current account balance (raise the deficit) and raise the world interest rate.
4. This is a temporary, adverse supply shock. It will lower employment, because a fall in A reduces the demand for labour at any real wage. Employment falls in both the classical and Keynesian models. Output falls for two reasons: (a) the direct effect of A ; (b) the fall in N . A fall in output leads to a fall in saving, so the current account balances in the EU and the U.S. will fall.
5. The rate of change in the CPI overstates changes in the cost of living for two main reasons, described on page 46 of ABS. First, there may be quality improvements. Second, there may be substitution away from goods with rapidly rising prices (so that the weights in the CPI 'basket' may be out-of-date).

6. The labour force is $0.67(26) = 17.42$ million. Thus employment is 16.42 million. The unemployment rate is $1/17.42 = 5.74\%$.

7. The expected real interest rate is given by $r = i - \pi^e$. If expected inflation rises but the nominal interest rate does not change, then the real interest rate falls. This will tend to encourage investment in physical capital, by lowering the user cost of capital and so raising the target capital stock.

8. This statement is incorrect. To show this, recall the simple example in which L does not depend on the interest rate, so that:

$$\pi = \frac{\Delta M}{M} - \eta_Y \frac{\Delta Y}{Y}.$$

Thus a country with fast money growth will not necessarily have high inflation if it also has fast output growth. Chapter 7 shows that the rankings by money growth and inflation do roughly match up for countries with very high money growth rates, but they need not do so more generally.

9. A leading explanation for this inequality is skill-biased technical change. Using two diagrams of labour supply and demand, we can show that an increased demand for skilled workers will lead their wages to rise without any rise in the wages of unskilled workers. [The main competing explanation is an increased supply of unskilled workers, through globalization perhaps.]

Part II Answers

1. (a) Growth accounting gives us:

$$\frac{\Delta Y}{Y} = \frac{\Delta A}{A} + 0.5 \frac{\Delta K}{K}.$$

Thus TFP growth is $2 - 0.5(3) = 0.5$ percent per year.

(b) Converting to growth rates gives us:

$$\pi = \frac{\Delta M}{M} - \frac{\Delta Y}{Y},$$

so there is deflation of 2% per year in Russia.

(c) The marginal product of labour is given by:

$$MPN = 0.5AK^{0.5}N^{-0.5}.$$

(d) We set the real wage equal to the MPN and simply express our answer in part (c) in growth rates. Remember that N does not grow. Thus:

$$\frac{\Delta w}{w} = \frac{\Delta A}{A} + 0.5 \frac{\Delta K}{K} = 2.$$

2. (a) Dividing the production function by N gives us:

$$y = k^{0.3}.$$

(b) Dividing the investment equation by the population gives us:

$$k_{t+1} = 0.9/1 + nk_t + \frac{0.15}{1+n}k_t^{0.3}.$$

In a steady state, $sk^{0.3} = (n+d)k$ or $0.16k^{0.3} = (.16)k$ so that $k^* = 1$. That means that $c^* = 0.84$.

(c) If instead $n = 0.02$ then $0.16k^{0.3} = (.12)k$, so that $k^* = 1.508$ and $c^* = 0.95$.

(d) The steady state occurs when the curve $16k^{0.3}$ intersects the ray $(n+0.10)k$. A fall in n reduces the slope of the ray, and so raises the steady-state capital-labour ratio.

3. (a) The savings curves slope up because of the substitution effect. The income effect for borrowers also leads to the same, positive sign.

(b) An increase in G lowers national saving because it is paid for by an increase in taxes. The increase in taxes reduces private disposable income, which leads to a fall in private saving and a fall in private consumption, just as any fall in current income does. With no fall in government saving but a fall in private saving, national saving falls. Equivalently, $S = Y - C - G$, so S falls because the fall in C is less than the rise in G . [One cannot answer this question by simply saying that a rise in G lowers government saving.]

(c) By setting world saving equal to world investment, we find that $r^w = 4$, $CA_J = 60$ and $CA_U = -60$. [This question contained a type-setting error. In the equations, an increase in G_J erroneously raised S_J . In fact, it should have the opposite effect. Full marks were given for consistent, numerical answers.]

(d) A fall in G_J will raise Japanese national saving. That will tend to raise CA_J , lower CA_U , and lower the world interest rate. [Full marks also were given for an answer based on the misleading equations, as in part (c).]