

## Answers for mid-term exam

### Question A.3: The determination of consumption (30 Marks)

#### Part a): (5 Marks)

First, calculate the real rate of interest, which is the nominal rate minus the inflation rate ( $r = i - \pi = 0.8 - 0.4 = 0.4$ ).

For subpart 1), the students could start by asking: how much could an Irish consume in the first period. The answer is their total present income ( $y$ ) and assets ( $a$ ) as well as the present value of the future income ( $y^f$ ). This is the PVLR and is:

$$\text{PVLR} = y + a + y^f/(1 + r) = 28\,000 + 5\,000 + 26\,000/(1.04) = 58\,000$$

For subpart 2), they should start with the expression for future consumption ( $c^f$ ), which is:

$$c^f = (y - c + a)(1 + r) + y^f$$

To get the maximum amount of  $c^f$ , set present consumption to zero, then:

$$c^f = (y + a)(1 + r) + y^f = (28\,000 + 5\,000)(1.04) + 26\,000 = 60\,320$$

#### Part b): (10 Marks)

It is useful to start with the inter-temporal budget constraint, which is:

$$(1) \quad c + c^f/(1 + r) = y + a + y^f/(1 + r)$$

Next set the slope of the indifference curve equal to the slope of the budget line (bearing in mind that the negative signs cancel):

$$(2) \quad 23/27(c^f/c) = (1 + r) \text{ and re-write it with } c^f \text{ on the left hand side:}$$

$$(3) \quad c^f = (27/23)(1 + r)c$$

Substituting (3) into (1) yields:

$$(4) \quad c(1 + 27/23) = y + a + y^f/(1 + r), \text{ then}$$

$$(5) \quad c = 0.46(58\,000) = 26\,680$$

Substituting the value from (5) into (3), solve for  $c^f$

$$(6) \quad c^f = (27/23)(1 + r)c = (27/23)(1.04)(26\,680) = 32\,572.80$$

Substituting the values from (5) and (6) into (1) we get:

$$(6) \quad 26\,680 + 32\,572.80/1.04 = 58\,000 \text{ which is PVLR}$$

The consumers here are savers since present income is greater than present consumption ( $y - c = 28\,000 - 26\,680 = 1\,320$ ).

**Part c): (7 Marks)**

The key here is to realise that the *real* rate of interest has fallen from 4% to 2%. This will affect the PVLR. Equations (4) and (5) from above can be used to calculate present consumption bearing in mind that PVLR is now higher. In particular:

$$(4') \quad c(1 + 27/23) = y + a + y^f/(1 + r) = (28\,000 + 5\,000 + 26\,000/(1.02)) \text{ then}$$

$$c = 0.46(58\,490.0196...) = 26\,905.490...$$

To get future consumption, use relationship (3) above to get:

$$(3') \quad c^f = (27/23)(1 + r)c = (27/23)(1.02)26\,905.490... = 32\,216.4$$

From the definition of saving we see that it has fallen ( $s = y - c = 28\,000 - 26\,905.490... = 1\,094.509...$ ) from its original level of 1 320. The substitution effect dominates.

**Part d): (8 Marks)**

This tests the students' knowledge of the Richardian Equivalence Hypothesis (REH) and the arguments for and against it. A complete answer should start with a simple demonstration of when REH holds. Start with the PVLR definition on which present consumption depends. This:

$$(7) \quad \text{PVLR} = y + a + y^f/(1 + r)$$

The lump-sum tax (call it  $t$ ) reduces the amount of present income available for saving. At the same time consumers get back the amount collected times  $1 + r$  in the future. The new PVLR is then:

$$(7') \quad \text{PVLR} = y - t + (y^f + t(1 + r))/(1 + r) = y - t + y^f/(1 + r) + t$$

- If the Irish consumers are forward looking, they will realise that their PVLR has not changed and present consumption will be unaffected.
- The result depends on consumers being forward looking which they may not be. To the extent that they are not present consumption will be lowered.
- Certain consumers may be income constrained and have to spend all of their income on current consumption. Present consumption for this group will fall and to the extent that they are an important part of consumption then the tax should have an effect on total consumption.

### Question B.2: Current accounts (20 Marks)

The students should produce the diagram showing the US with its saving-investment curving crossing at a point above the world rate of interest while those for Asia crossing below that point. The key relationship to note is that the current account balances of the two must sum to zero. Thus:

$$(1) \quad CA_{US} + CA_{Asia} = 0$$

A reduction in the US deficit brought about by a lowering in spending ( $G$ ) will shift the US saving curve to the right, initially lowering the amount of world saving. This in turn will put downward pressure on the world interest rate, in the process raising investment in the United States. In Asia, the lower world interest rate will also increase investment but saving will be lower (there are no shifts in their saving curves). This will lower Asia's current account surplus. The process will continue until the lower US current account deficit is equal to the lower Asian surplus.

### Question B.3: Investment (20 Marks)

The students should produce the graph showing the relationship between the future marginal product of capital and the user cost of capital. Firms invest up to the point where  $MPK^f = uc = (r + d)P_k$ . (we are ignoring taxes but if the students put that in, so much the better). A policy that results in an elimination of taxes on purchasing capital goods will lower the price of capital. This, in turn, will lower the  $uc$  line and increase the desired demand for capital. With  $K^d$  now greater than before, the elimination of the tax raises desired investment through the following mechanism:

$$(1) \quad I_t^d = K^{d'} - K_t + dK_t, \text{ where: } I_t^d = \text{desired gross investment; } d = \text{depreciation; } K = \text{capital stock; and } K^{d'} \text{ is the new higher desired demand for capital.}$$