

Course in Macroeconomics and Global Economics  
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Instructor: Prof. Barbara Annicchiarico  
Teaching Assistants: Francesca Diluiso, Matilde Giaccherini

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## Solution practice 9

### Exercise 1

1. The present value of such a bond is  $\text{€}V = \frac{\text{€}z}{i} = \frac{100}{0.1} = 1000$
2. The present discounted value is:

$$\text{€}V = \frac{\text{€}z}{1+i} \times \frac{1 - 1/(1+i)^n}{1 - 1/(1+i)}$$

- $i = 0.10$   $n = 10 \rightarrow \text{€}V \approx 616.16$   
 $n = 20 \rightarrow \text{€}V \approx 858.59$   
 $n = 30 \rightarrow \text{€}V \approx 949.50$   
 $n = 60 \rightarrow \text{€}V \approx 1007.08$

- $i = 0.02$   
 $n = \infty \rightarrow \text{€}V = 5000$   
 $n = 10 \rightarrow \text{€}V \approx 898.3$   
 $n = 20 \rightarrow \text{€}V \approx 1635.1$   
 $n = 30 \rightarrow \text{€}V \approx 2239.6$   
 $n = 60 \rightarrow \text{€}V \approx 3476.1$

- $i = 0.05$   
 $n = \infty \rightarrow \text{€}V = 2000$   
 $n = 10 \rightarrow \text{€}V \approx 772.2$   
 $n = 20 \rightarrow \text{€}V \approx 1246.2$   
 $n = 30 \rightarrow \text{€}V \approx 1537.2$   
 $n = 60 \rightarrow \text{€}V \approx 1892.9$

## Exercise 2

1. The human wealth is defined as the expected present value of after-tax labor income. In this case:

$$V(Y^e - T^e) = 40,000(0.75)[1 + (1 + 0.05) + (1 + 0.05)^2] = 94,575$$

2. The total wealth is the sum of non-human wealth and human wealth:

$$W^{TOT} = 100,000 + 94,575 = 194,575$$

- 3.

$$C = \frac{W^{TOT}}{\text{working years} + \text{retirement}} = \frac{194,575}{3 + 7} = 19,457.5$$

- 4.

$$V(Y^e - T^e) = 20,000 + 40,000(0.75)[1 + (1 + 0.05) + (1 + 0.05)^2] = 114,575$$

$$C = \frac{W^{TOT}}{\text{working years} + \text{retirement}} = \frac{100,000 + 114,575}{3 + 7} = 21,455.5$$

- 5.

$$40,000(0.75)[1 + (1 + 0.05) + (1 + 0.05)^2] + [\underbrace{40,000(1 + 0.05)^2}_{\text{last working year salary}} (0.6)] \times 7 = 279,795$$

$$C = \frac{W^{TOT}}{\text{working years} + \text{retirement}} = \frac{100,000 + 279,795}{3 + 7} = 37,979.5$$

## Exercise 3

The present value of expected profits is:

$$V(\Pi^e) = \frac{\Pi}{1+r} \left[ 1 + \frac{1-\delta}{1+r} + \left( \frac{1-\delta}{1+r} \right)^2 + \dots \right] = \frac{\Pi}{r+\delta}$$

thus:

- r=5%

$$V(\Pi^e) = \frac{\Pi}{r+\delta} = \frac{18,000}{0.05+0.08} \approx 138,462 > 100,000 \rightarrow \text{the manufacturer should invest}$$

- r=10%

$$V(\Pi^e) = \frac{\Pi}{r+\delta} = \frac{18,000}{0.1+0.08} = 100,000 = 100,000 \rightarrow \text{indifferent}$$

- r=15%

$$V(\Pi^e) = \frac{\Pi}{r+\delta} = \frac{18,000}{0.15+0.08} \approx 78,261 < 100,000 \rightarrow \text{the manufacturer should not invest}$$