HEC Paris **Financial Economics – Fall 2013** **Quiz 2 A**

LAST NAME _____ FIRST NAME _____

Present value of a growing perpetuity:

$$P(C,r,g)=\frac{C}{r-g}$$

Present value of an ordinary annuity with growing payments:

$$A(C,r,g,T)=\frac{C}{r-g}\left(1-\left(\frac{1+g}{1+r}\right)^{T}\right)$$

a) Two projects have the same IRR. This implies that:

- ❑ You are indifferent between them
- ❑ They have the same NPV
- ❑ They have the same payback period
- ❑ They have the same opportunity cost of capital
- ❑ None of the above

The following applies to questions b), c), d), and e) below.
A project requires an investment of 100 € in a machine that is depreciated by 10 € per year over 10 years (i.e., depreciation is equal to 10 € in years 1, 2, …, 10). The machine generates a product whose sales are equal to 30 € per year over the next 10 years (i.e., from year 1 to year 10). Expenses are equal to 10 € each year (i.e., in each of the years 1 through 10).

b) Assume there are no taxes. What is the annual net income from the project from year 1 to year 10?

- ❑ 0 €
- ❑ 10 €
- ❑ 20 €
- ❑ 30 €

c) What is the Net Present Value (NPV) of the project at t=0 knowing that cash flows from the project are discounted at 10% per year?

- ❑ –38.55 €
- ❑ 18.48 €
- ❑ 22.89 €
- ❑ 84.34 €
- ❑ 100.00 €

d) Now assume that the company is in the 30% corporate income tax bracket. The taxes for income in year t are paid in year t as well. The NPV of the project at t=0 in the presence of taxes will be:

- ❑ –56.99 €
- ❑ 4.46 €
- ❑ 17.02 €
- ❑ 65.90 €
- ❑ 70.00 €

e) The corporate income tax is still 30%. However, taxes on income in year t are to be paid in year t+1, that is a year later. What is the NPV of the project at t=0 now?

- ❑ –55.31 €
- ❑ 6.13 €
- ❑ 18.70 €
- ❑ 67.58 €
- ❑ 72.73 €

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SOLUTION KEY

Present value of a growing perpetuity:

$$P(C,r,g)=\frac{C}{r-g}$$

Present value of an ordinary annuity with growing payments:

$$A(C,r,g,T)=\frac{C}{r-g}\left(1-\left(\frac{1+g}{1+r}\right)^{T}\right)$$

a) Two projects have the same IRR. This implies that:

- ❑ You are indifferent between them
- ❑ They have the same NPV
- ❑ They have the same payback period
- ❑ They have the same opportunity cost of capital
- ❑ None of the above ←

The following applies to questions b), c), d), and e) below.
A project requires an investment of 100 € in a machine that is depreciated by 10 € per year over 10 years (i.e., depreciation is equal to 10 € in years 1, 2, …, 10). The machine generates a product whose sales are equal to 30 € per year over the next 10 years (i.e., from year 1 to year 10). Expenses are equal to 10 € each year (i.e., in each of the years 1 through 10).

b) Assume there are no taxes. What is the annual net income from the project from year 1 to year 10?

NI = 30 – 10 – 10 = 10 €

- ❑ 0 €
- ❑ 10 € ←
- ❑ 20 €
- ❑ 30 €

c) What is the Net Present Value (NPV) of the project at t=0 knowing that cash flows from the project are discounted at 10% per year?
CF_t = 30 – 10 = 20 € for t=1, …, 10

$$NPV=-100+\frac{20}{0.10}\left(1-\frac{1}{1.10^{10}}\right)=22.89€$$

- ❑ –38.55 €
- ❑ 18.48 €
- ❑ 22.89 € ←
- ❑ 84.34 €
- ❑ 100.00 €

d) Now assume that the company is in the 30% corporate income tax bracket. The taxes for income in year t are paid in year t as well. The NPV of the project at t=0 in the presence of taxes will be:
CF_t = 30 – 10 – 3 = 17 € for t=1, …, 10

$$NPV=-100+\frac{17}{0.10}\left(1-\frac{1}{1.10^{10}}\right)=4.46€$$

- ❑ –56.99 €
- ❑ 4.46 € ←
- ❑ 17.02 €
- ❑ 65.90 €
- ❑ 70.00 €

e) The corporate income tax is still 30%. However, taxes on income in year t are to be paid in year t+1, that is, a year later. What is the NPV of the project at t=0 now?

$$NPV=-100+\frac{20}{0.10}\left(1-\frac{1}{1.10^{10}}\right)-\frac{\frac{3}{0.10}\left(1-\frac{1}{1.10^{10}}\right)}{1.10}=6.13€$$

- ❑ –55.31 €
- ❑ 6.13 € ←
- ❑ 18.70 €
- ❑ 67.58 €
- ❑ 72.73 €