Course: Corporate Finance.
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Session 1

Capital Budgeting Tools

I. The Idea of TVM

Date

Amount

NO! For at least two reasons

equivalent?

1. Inflation

Price today = 

Price in one year =  + 

2. Earning interest on it

 + 

I. The Idea of TVM

A project (= an investment) that will generate one cash flow in one year:

Date

Amount

If the current interest rate is **5%**, ***will you accept to invest € 1000 today in this project***?

- **To decide, compare**

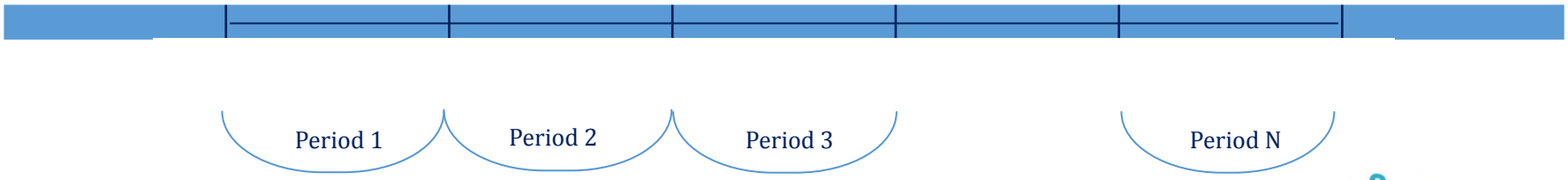
The value of cash-flow from the project ***today*** ***The cost of the project*** ***today***

Take into account the time value of money to decide

If the value of cash inflow today > The cost Accept
If not Reject

I. The Idea of TVM

- ***How can I obtain the value today (the present value) of a future cash flow?***
- If the project will generate cash flows over N periods in the future



How to obtain the present value of cash flows?

- ***What if all the future cash flows are equal? What if we have an infinite number of cash flows?***

- ***Tools to evaluate cash flows lasting several periods.***
- ***We develop these tools in this session.***

II. The Three Rules of Time Travel

Financial decisions *Comparing or combining cash flows that occur at different points in time.*

Three important rules:

Rule 1: Comparing and Combining Values

It is only possible to compare or combine values at the same point in time.

II. The Three Rules of Time Travel

Rule 2: Moving Cash Flows Forward in Time

Suppose we have € 1000 today, and we wish to determine the equivalent amount in one year's time.

If the current interest rate is 10%, ***we move the cash flow forward in time as follows***:

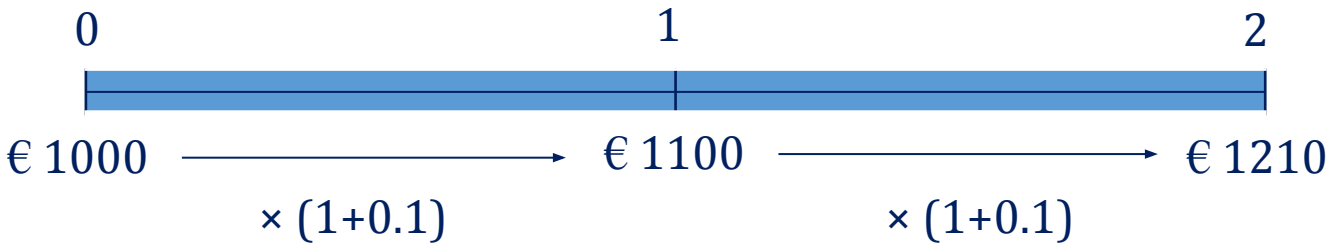
€1000 × (1+0.1) = €1100 in one year

In general, if the market interest rate is r
CF today × (1+r) □ Move the cash flow from the beginning to the end of the year

II. The Three Rules of Time Travel

How much the € 1000 is worth in two years' time?

- If the interest rate for year 2 is also 10%, then

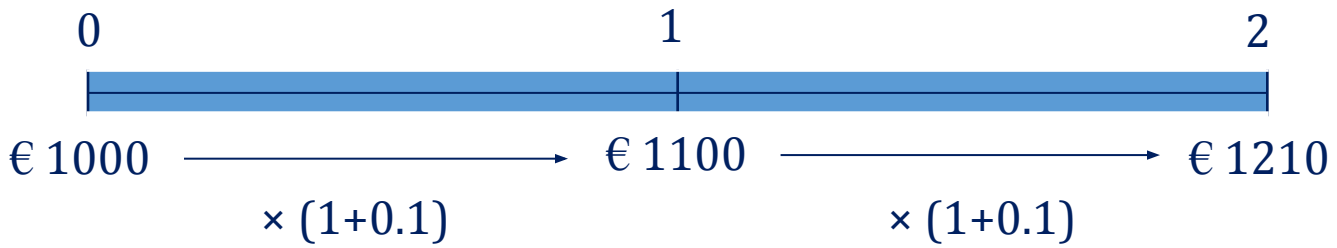


- Given a 10% interest rate, **all of the cash flows (€1000 at date 0, €1100 at date 1, and €1210 at date 2) are equivalent**: ***They have the same value but are expressed in different points in time***.

- The value of a cash flow that is moved forward in time is known as its ***future value***.

- ***Compound interest***: Earning 'interest on interest'.

II. The Three Rules of Time Travel



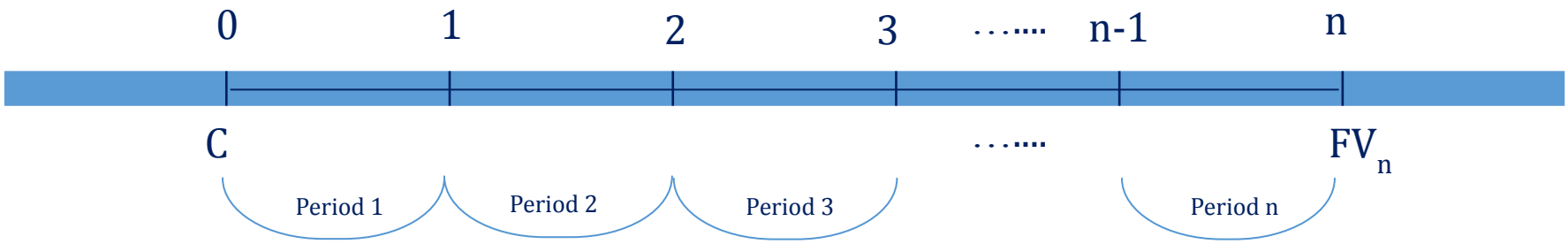
- If we move the cash flow two years, we obtain: €1000 × $(1.10)^2$ = € 1210

- Over 3 years?

- If we move the cash flow three years, we obtain: €1000 × $(1.10)^3$ = € 1331

II. The Three Rules of Time Travel

In general, to take cash flow ***C*** forward ***n*** periods into the future, we must compound it by the ***n*** intervening interest rate factors.



If the interest rate r is constant, then

Future Value of a Cash Flow

$$FV_n = \underbrace{C \times (1+r) \times (1+r) \times \ldots \times (1+r)}_{n \text{ times}} = C \times (1+r)^n$$

II. The Three Rules of Time Travel

Exercise 1

Suppose you invest €1000 in an account paying 10% interest per year. How much will you have in the account in 7 years and in 75 years?

Solution

7 years: €1000 × $(1.10)^7$ = €1948.72 □ Your money nearly double.

75 years: €1000 × $(1.10)^{75}$ = €1,271,895.37 □ You will be a millionaire!

II. The Three Rules of Time Travel

Rule 3: Moving Cash Flows Back in Time

Suppose you would like to compute the value today of €1000 you anticipate receiving in one year.

If the current market interest rate is 10%, you can compute this value as follows:

$$\frac{1000}{(1+0.1)} = €909.09$$

- To move the cash flow backward in time, **we divide it by the interest rate factor, (1+r)**, where r is the interest rate.

- This process of moving a value or cash flow backward in time is known as ***discounting***.

II. The Three Rules of Time Travel

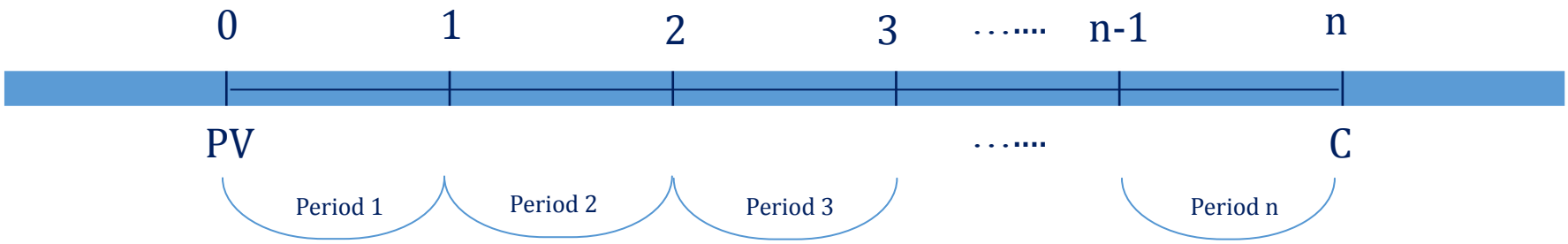
- Suppose you would like to compute the value today of €1000 you anticipate receiving in two years.

If the current market interest rate is 10%, you can compute this value as follows:

- The value of a future cash flow at an earlier point on the timeline is its ***present value*** at the earlier point in time.

II. The Three Rules of Time Travel

In general, to move a cash flow ***C*** backward ***n*** periods, we must discount it by the ***n*** intervening interest rate factors.



If the interest rate r is constant, then

Present Value of a Cash Flow

$$PV = \frac{C}{(1+r)^n}$$

II. The Three Rules of Time Travel

Exercise 2

You are considering investing in a savings bond that will pay €15 000 in 10 years. If the competitive market interest rate is fixed at 6% per year, what is the bond worth today?

Solution

$$PV = \frac{15000}{1.06^{10}} = 8375.92$$

II. The Three Rules of Time Travel

Applying the Rules of Time Travel

The rules of time travel allow us to compare and combine cash flows that occur at different points in time. Suppose we plan to save €1000 today, and €1000 at the end of each of the next two years.

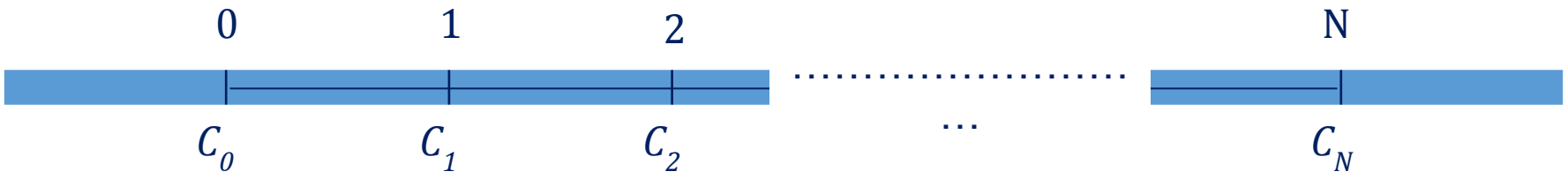
If we earn a fixed 10% interest rate on our savings, how much will we have three years from today?

Solution

$€\ 1000*1.1^3 + €\ 1000*1.1^2 + €\ 1000*1.1 = €\ 3641$

III. Valuing a stream of Cah Flows

Consider a stream of cash flows: C_0 at date 0; C_1 at date 1, and so on, up to C_N at date N. We present this cash flow stream on a timeline as follows:



Present Value of a Cash Flow Stream

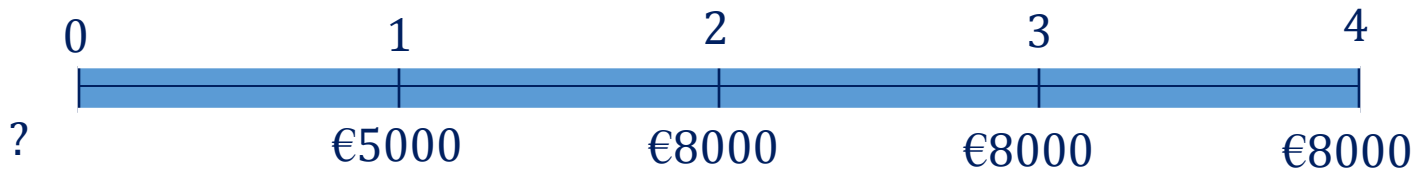
$$PV = C_0 + \frac{C_1}{(1+r)} + \frac{C_2}{(1+r)^2} + \ldots + \frac{C_N}{(1+r)^N} = \sum_{n=0}^{N} PV(C_n) = \sum_{n=0}^{N} \frac{C_n}{(1+r)^n}$$

III. Valuing a stream of Cah Flows

Exercise 3

You have just graduated and need money to buy a new car. Your rich uncle will lend you the money so long as you agree to pay him back within four years, and you offer to pay him the rate of interest that he would otherwise get by putting his money in a savings account. Based on your earnings and living expenses, you think you will be able to pay him €5000 in one year, and then €8000 each year for the next three years.
If your uncle would otherwise earn 6% per year on his savings, how much can you borrow from him?

Solution



PV = € 24,890.65