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# Financial Policy

# Investment Appraisal Methods

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# Course Outline

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- **Introduction**

- ◆ Lecture 1: Financial Management and the Business Environment
  - Readings: Brealey & Myers (B&M) Chap1, Chap2.
- ◆ Lecture 2: Time Value of Money
  - Readings: B&M Chap3

- **Investment Decisions**

- ◆ **Lecture 3: Investment Appraisal Methods (+ Quiz 1)**
  - **Readings: B&M Ch5**
- ◆ Lecture 4: Net Working Capital and Cash Flow Management
  - Readings: B&M Ch30, 31.
- ◆ Lecture 5: Financial Forecasting and Budgeting
  - Readings: B&M Ch6, 19.2, 29.
- ◆ **Week 6 Midterm Exam (1h30)**

- **Financing Decisions**

- ◆ Lecture 6: The Value of Bonds and Common Stocks
  - Readings: B&M Ch4.
- ◆ Lecture 7: Internal Funds, Equity Financing and Dividend Policy
  - Readings: B&M Ch14, 15, 16.
- ◆ Lecture 8 and 9: Capital Structure and the Cost of Financing (+ **Quiz 2**)
  - Readings: B&M Ch9, 10.1, 19.
- ◆ Lecture 10: Overall Recap
- ◆ **Week 11 Final Exam (3h)**

# Class Outline

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- Objectives
  - ◆ Relevance/opportunity of an investment project ?
  - ◆ How to choose among several investment projects ?
- Net Present Value
- Internal Rate of Return
- Profitability Index
- Payback Period
- Exercise: Ginza Ltd

# Net Present Value (NPV)

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- You are the CFO of XYZ Ltd and you are proposed a €1 mn investment in a new venture called "project A"
- Should you stay or should you go (now)?
- How can you analyze it?
  - ◆ You must assess its impact on XYZ shareholders' wealth: **does it increase XYZ's market value?**

# Net Present Value (NPV)

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- "Project A"
  1. Forecast cash flows of the project over its life
  2. Determine the opportunity cost of capital
    - Time value of money
    - Risk involved in "project A"
  3. Discount the future cash flows
  4. Sum them up to get the Present Value (PV)

# Net Present Value (NPV)

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- What discount rate for "project A"?
  - ◆ The discount rate is the opportunity cost of capital
  - ◆ We try to measure the **opportunity cost** of investing in the project rather than in the capital market
  - ◆ Instead of accepting the project the firm XYZ can return the cash to shareholders and let them invest the funds in financial asset with similar risk profile

# Net Present Value (NPV)

- In order to receive the **future** cash flows generated by the project A, XYZ' shareholders must renounce **today** to €1 mn of cash
- What do you prefer ?
  - ◆ €1mn today or future cash flows

Market Value (€ millions)

ASSET	REJECT PROJECT A	ACCEPT PROJECT A
Cash	1	0
Other assets	9	9
Project A	0	PV
	10	9 + PV

- Net Present Value
  - ◆  $NPV = -€1mn + PV(CF)$

# Net Present Value (NPV)

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$$\text{NPV} = \begin{array}{l} - \text{investment outlays} \\ + \text{PV of future cash flows} \end{array}$$

Accept the investment project if  $\text{NPV} > 0$

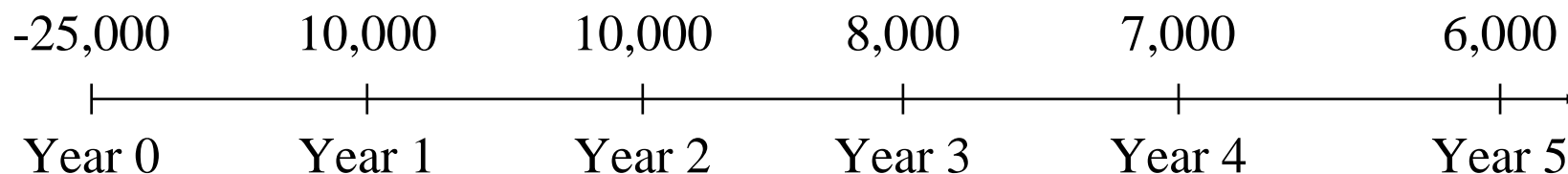
# Net Present Value (NPV)

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- Example

- ◆ XYZ Ltd is considering new machinery that would reduce manufacturing costs associated with its "water-engine" car, for which the after-tax cash flows are given below. Assuming the firm has a 10% required rate of return, calculate the NPV of this project. Would you accept it ?



# Internal Rate of Return

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- The internal rate of return (IRR) is the **rate of discount** which makes  $NPV = 0$

- ◆ We want IRR such that

$$0 = -C_0 + \frac{C_1}{1 + IRR} + \frac{C_2}{(1 + IRR)^2} + \dots + \frac{C_n}{(1 + IRR)^n}$$

- ◆ Also called discounted-cash-flow (DCF) rate of return

# Internal Rate of Return

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- Example
  - ◆  $C_0 = -4000$ ,  $C_1 = +2000$ ,  $C_2 = +4000$
  - ◆ IRR ?
- No analytic solution to the previous equation  
=> trial and error
  - ◆ Trial and error
  - ◆ Computer or scientific calculator solution

# Internal Rate of Return

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Accept the investment project if  
 $IRR > \text{Opportunity cost of capital}$

# Internal Rate of Return

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- What's the reasoning behind?



# Internal Rate of Return

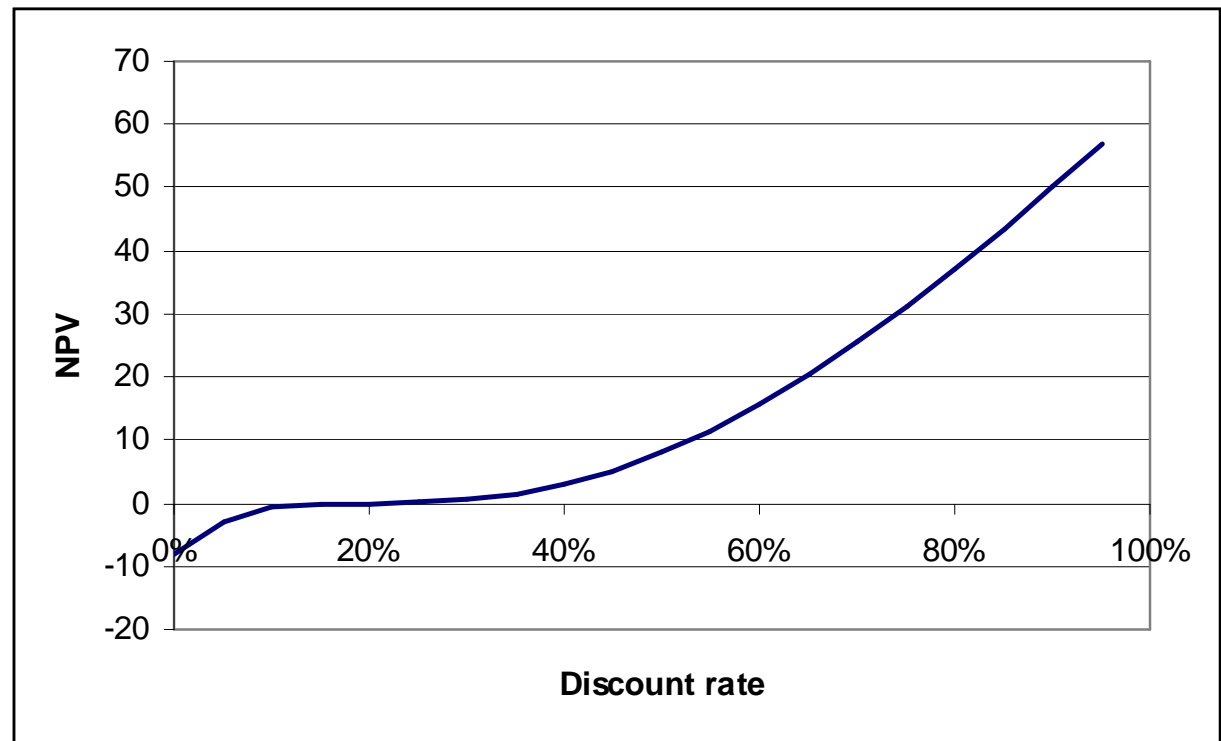
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- IRR's pitfalls
  - ◆ The IRR rule is equivalent to the NPV rule **if and only if** the NPV is a smoothly declining function of the discount rate (as in the previous graph)

# Internal Rate of Return

- IRR's pitfalls example #1:

Cash Flows			
$C_0$	$C_1$	$C_2$	$C_3$
1000	-3600	4320	-1728



# Internal Rate of Return

- IRR's pitfalls example #2 :
  - ◆ XYZ Ltd plans to make an advertising campaign that would involve an initial outlay of €1mn and would then increase annual pretax profits by €300,000 over the next 5 years. Tax rate is 50% and taxes are paid with a delay of one period. Compute the expected cash flows, the IRR and the NPV at 10%.

	0	1	2	3	4	5	6
Pretax flow	-1000	+300	+300	+300	+300	+300	
Tax		+500	-150	-150	-150	-150	-150
<b>Net Flow</b>	<b>-1000</b>	<b>+800</b>	<b>+150</b>	<b>+150</b>	<b>+150</b>	<b>+150</b>	<b>-150</b>

# Internal Rate of Return

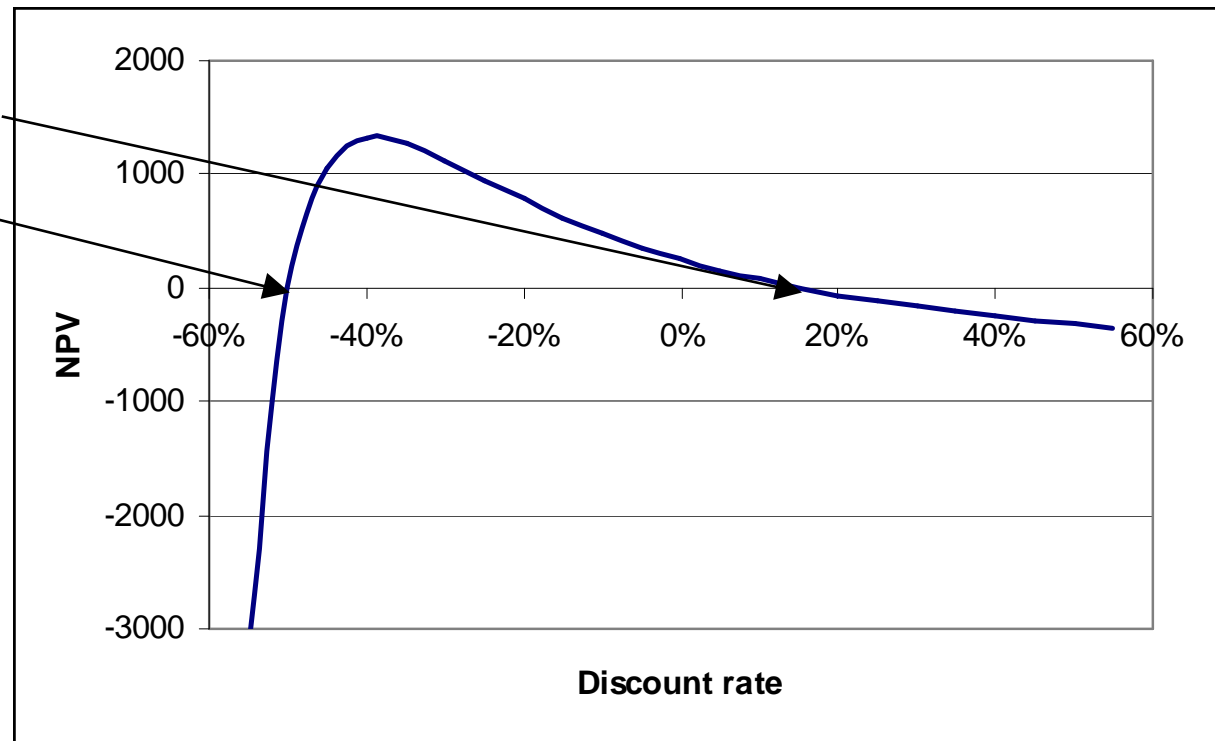
- IRR's pitfalls example #2 :

- ◆ Two IRR

- $IRR_2 = 15.2\%$

- $IRR_1 = -50\%$

- ◆ NPV = 74.9



# Internal Rate of Return

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- IRR is almost equivalent to NPV
- BUT it has some pitfalls

=> better to use NPV than IRR

# Profitability Index (PI)

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- XYZ Ltd has €150mns to invest. It has the choice between the 3 following projects. Its opportunity cost of capital is 8%. What would you suggest?

Cash Flows (€ mns)				
Project	C <sub>0</sub>	C <sub>1</sub>	C <sub>2</sub>	NPV at 8%
A	-150	500	100	399
B	-75	150	200	235
C	-75	100	250	232

# Profitability Index (PI)

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- Because financial resources are limited, we cannot choose only on the basis of the NPV
  - ◆ We must rank the project on "**NPV per dollar of investment**" basis
  - ◆ Profitability Index =  $NPV / Investment$

Project	PI
A	2,66
B	3,14
C	3,09

# Payback Period

- How long does it take to recover the initial outlays?

Cash Flows (€ mns)						
Project	C <sub>0</sub>	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	Payback Period (in years)	NPV at 8%
A	-1000	300	500	700	3	307
B	-1500	1000	1000	0	2	283
C	-750	100	700	50	2	-14

- ◆ Payback rule: accept the projects with initial outlays are recovered before the cutoff date.

# Payback Period

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- Previous slide example
  - ◆ If the company XYZ decides the cutoff date is 2 years then only project B and C will be accepted
- The drawbacks of the payback rule
  - ◆ Ignore all cash flows after the cutoff date
  - ◆ Does not take into account time value of money
    - Some companies use the **discounted payback period**
- Not theoretically valid but still widely used
  - ◆ Why ?

# Recap

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- The NPV offers a sound approach to evaluate investment project
  - ◆ Always prefer NPV to IRR
- NPV is very sensitive to the discount rate
  - ◆ Small changes in the discount rate may result in wide fluctuations
- Most managers use several criteria to make their opinion
  - ◆ NPV, IRR, Profitability Index, (Discounted) Payback Period

# Exercise

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- Ginza Ltd
  - ◆ Sales as of year 0 were €1,000,000 and net income was €60,000
  - ◆ Ginza considers an important investment project that would improve its sales and increase its profitability. It has to make a choice between 2 investment opportunities for which accelerated depreciation is allowed over 5 years.

# Exercise

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- Ginza Ltd

- ◆ Investment A

- Initial outlay €100,000
- Increase in sales (compared to year 0)
  - Year 1 €100,000
  - Year 2 €120,000
  - Year 3 €140,000
  - Year 4 €160,000
  - Year 5 €180,000
- Salvage value €10,000

# Exercise

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- Ginza Ltd

- ◆ Investment B

– Initial outlay	€200,000
– Increase in sales (compared to year 0)	
● Year 1	€100,000
● Year 2	€200,000
● Year 3	€300,000
● Year 4	€400,000
● Year 5	€500,000
– Salvage value	€10,000

# Exercise

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- Ginza Ltd
  - ◆ We know that the contribution margin makes 30% of sales before tax and the net working capital is about 72 days of sales before tax.
  - ◆ Based on NPV, PI, IRR and Payback Period do you think the company should invest in either of the two proposals and if so, which one is preferable?
  - ◆ The corporate tax rate is 45% and the discount rate is 10%.

# Exercise

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- Ginza Ltd
  - ◆ We shall assume that
    - The investment is made at the very beginning of the first year
    - Cash flows are available end-of-year
    - The net working capital must be financed at the beginning of the year
    - The equipment is resold for its salvage value at the end of the 5th year, a tax of 45% on capital gains being recorded