MBA in Food & Agribusiness
Financial Management

Corporate Finance

Corporate Finance

- Corporate Finance describes the theory and practice of corporate financial management. The understanding of finance theory is essential for the development and implementation of effective financial strategies.

Contents

- Firm’s objectives and main financial decisions
- Time of value of money
- Cash flow analysis
- Capital budgeting
- Risk & Capital budgeting
- Cost of capital
- Capital structure
- Dividend policy

Firms objectives

Firms Objective Goal (1)

The objective of a business is to maximize the wealth of its shareholders.

In microeconomic manuals, the purpose of a business is to maximize its profits.

This purpose may be sufficient in the context of microeconomics, but it is not considered satisfactory for Financial Management.

Why;

Firms Objective Goal (2)

- It does not take into account:
  - the undertaken risk of investment projects.
  - the time at which the returns of the investment projects occur.

The Financial Goal of the Corporation

Why not maximize profits?

- Accounting profit differs from economic profit
- Profit earned may not equal cash received

Maximize the value of the firm's stock

- Future cash flows are considered
- The timing of future cash flows is considered
- The risks associated with cash flows are considered

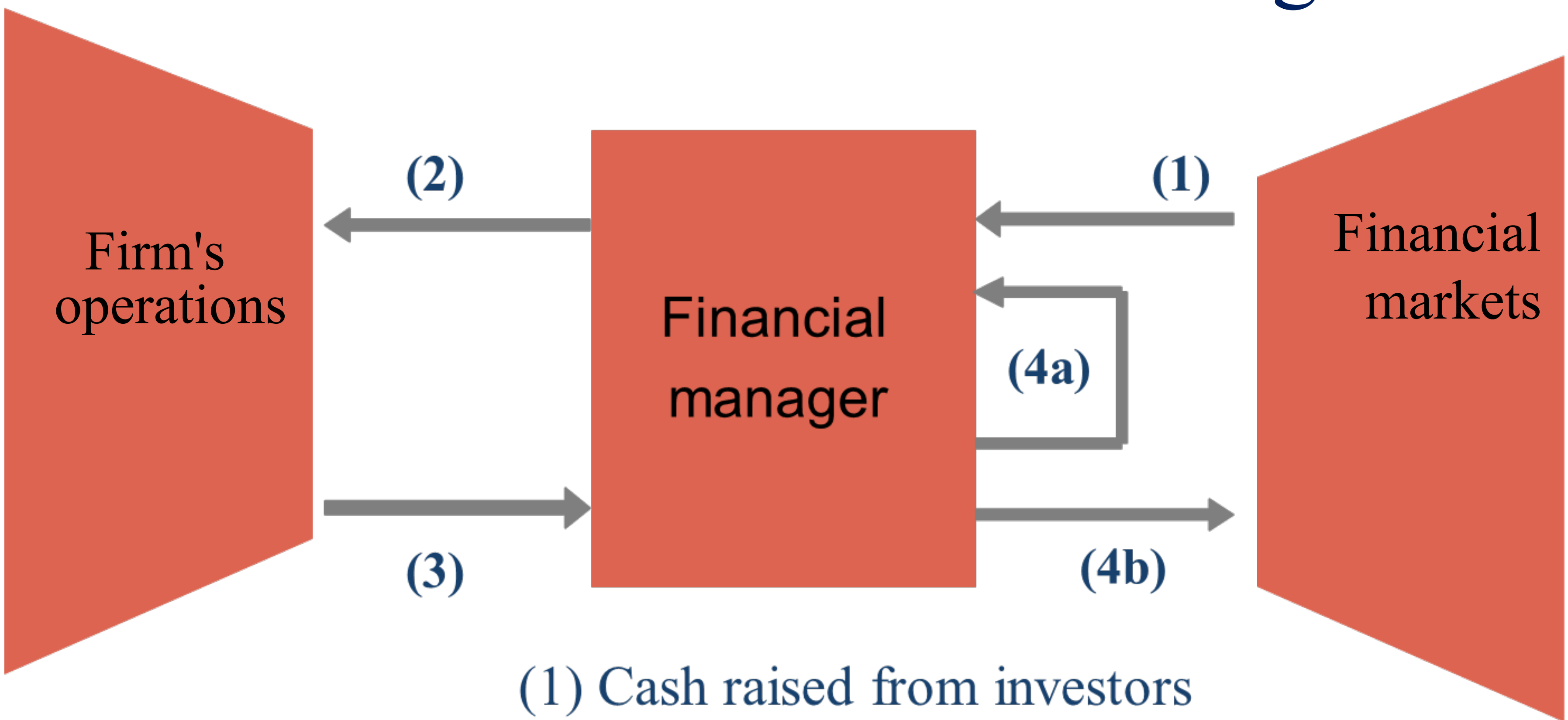
Fundamental Decisions in Financial Management

- Investment decision: deals with finding, evaluating and choosing various investment projects. The investment decisions are determined considering risk.

- Financing decision: is related to the optimal capital structure of the firm. The term "optimal capital structure" refers to a combination of the firm's long- term sources of finance that maximizes the value of firm's total cost of capital.

- Dividend policy: refers to the decision of the firm to distribute or retain its earnings. In other words, the dividend policy determines the firm's internal financing.

The Role of the Financial Manager



(1) Cash raised from investors
(2) Cash invested in firm
(3) Cash generated by operations
(4a) Cash reinvested
(4b) Cash returned to investors

Agency Relationship

- An agency relationship is created when the owner of a business hires an employee (an agent).
- The owner surrenders some control over the enterprise and its resources to the employee.
- Separating ownership from control creates the potential for agency conflicts.

Agency Problem

- Agency problem

  Managers are agents for stockholders and are tempted to act in their own interests rather than maximizing value.

- Agency cost

  Costs that arise from incurring and preventing conflicts of interest between a firm's owners and its managers.

  These costs may reduce positive residual cash flow, stock price, and shareholder wealth.

The Financial System (1)

- Financial markets and institutions
  - Financial markets include markets for trading financial assets such as stocks and bonds.
  - Financial institutions include banks, credit unions, insurance companies, and finance companies.

- The financial system at work
  - The financial system is competitive.
  - The system directs money to the best investment opportunities in the economy.
  - Lenders earn profit from the spread between lending and borrowing rates.

The Financial System

- How Funds Flow through the Financial System
  - The primary function of a financial system is to efficiently transfer funds from lender-savers to borrower-spenders.
- Basic mechanisms by which funds are transferred in the financial system
  - Directly through financial markets
  - Indirectly through financial institutions

Types of Financial Markets

- Primary Market
  - Wholesale market where firms' new securities are issued and sold for the first time
- Secondary Market
  - Retail market where previously issued securities are traded

- Money Market: market for low-risk securities with maturities of less than one year
  - Treasury Bills (T-Bills)
  - Commercial Paper
- Capital Market: market for securities with maturities longer than one year
  - Bonds
  - Common stock

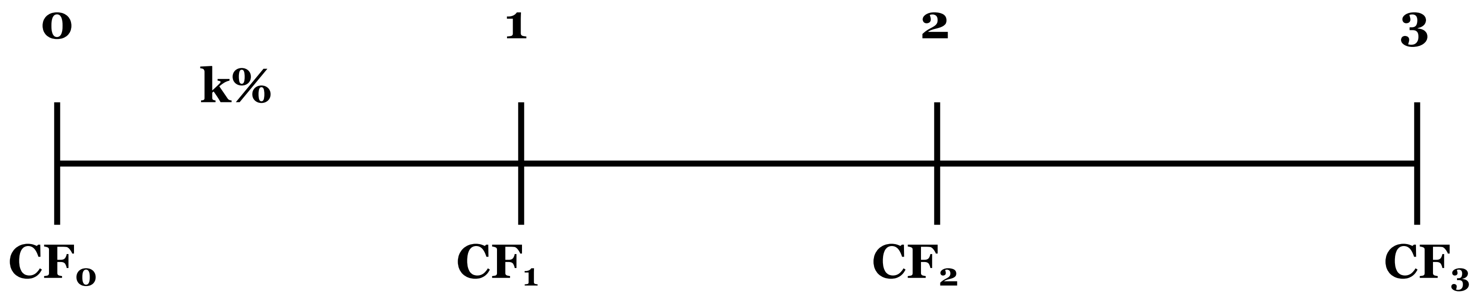
Time value of money

Time Value of Money: Definition

- The time value of money takes account of the fact that investors prefer to receive a given amount of money in the present than in the future.
- The choice between spending today and spending tomorrow:
  - The most important concept in finance
  - Used in nearly every financial decision
    - Business decisions
    - Personal finance decisions

Cash Flow Time Lines

Graphical representations used to show timing of cash flows



Time 0 is today
Time 1 is the end of Period 1 or the beginning of Period 2, etc.

Future Value vs. Present Value

Future Value (FV) measures the value of an investment after it earns interest for one or more periods.

Present Value (PV) is the current value of an amount that will be received in the future, at the appropriate interest rate.

Compounding is the process of increasing cash flows to a future value.

Discounting is the process of reducing future cash flows to a present value.

Future Value and Compounding (1)

Future Value Equation

The general equation to find a future value

$$FV_n = PV \times (1 + i)^n$$

where:

FV_n = future value of investment at end of period n

PV = original principle (P_0), or present value

i = the rate of interest per period

n = the number of periods; for example a year, month, or day

Future Value and Compounding (2)

Future Value example

You deposit \$100 in a savings account earning 10% compounded annually for five years. How much is in the account at the end of that time?

$$
\begin{aligned}
FV_5 &= 100 \times (1 + 0.10)^5 \\
&= 100 \times (1.10)^5 \\
&= 100 \times 1.6105 \\
&= 161.05
\end{aligned}
$$

Present Value and Discounting

Present Value Equation

$$PV = \frac{FV_n}{(1+i)^n}$$

This equation has the same elements as the future value equation. They differ only in the arrangement of the elements. Here, $(1 + i)^n$ is used for division and is called the present value factor or discount factor.

Present Value – Example

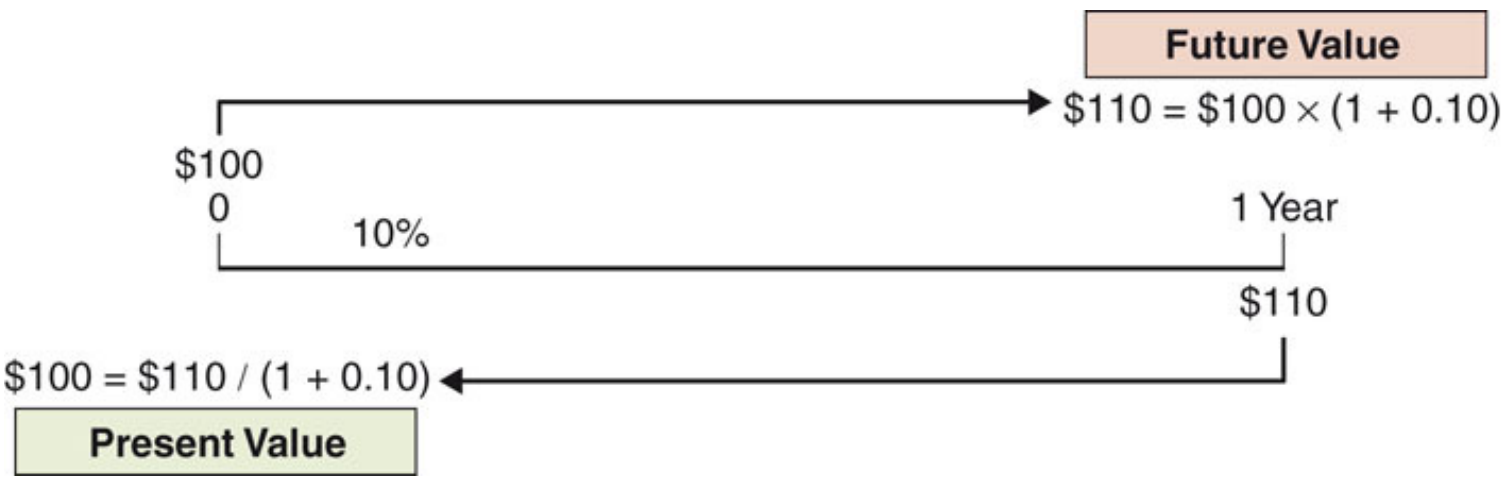
- What is the present value of $100 to be received 3 years from now if the discount rate is 6%?

$$PV = \$100 \times \left(\frac{1}{1+0.06}\right)^3 = \$100 \times (0.8396)$$

$$= \$83.96$$

Comparing Future Value & Present Value Calculations

The future value and present value formulas are one and the same; the present value factor, $1/(1+i)^n$, is just the reciprocal of the future value factor, $(1+i)^n$



Annuities

- Annuity is a series of periodic payments of equal amounts occurring over a specified period of time.

Future Value of an Annuity

$$FV_a = PMT\left[\sum_{t=0}^{n-1}(1+i)^t\right] = PMT\left[\frac{(1+i)^n - 1}{i}\right] = PMT*(FVAIF_{i,n})$$

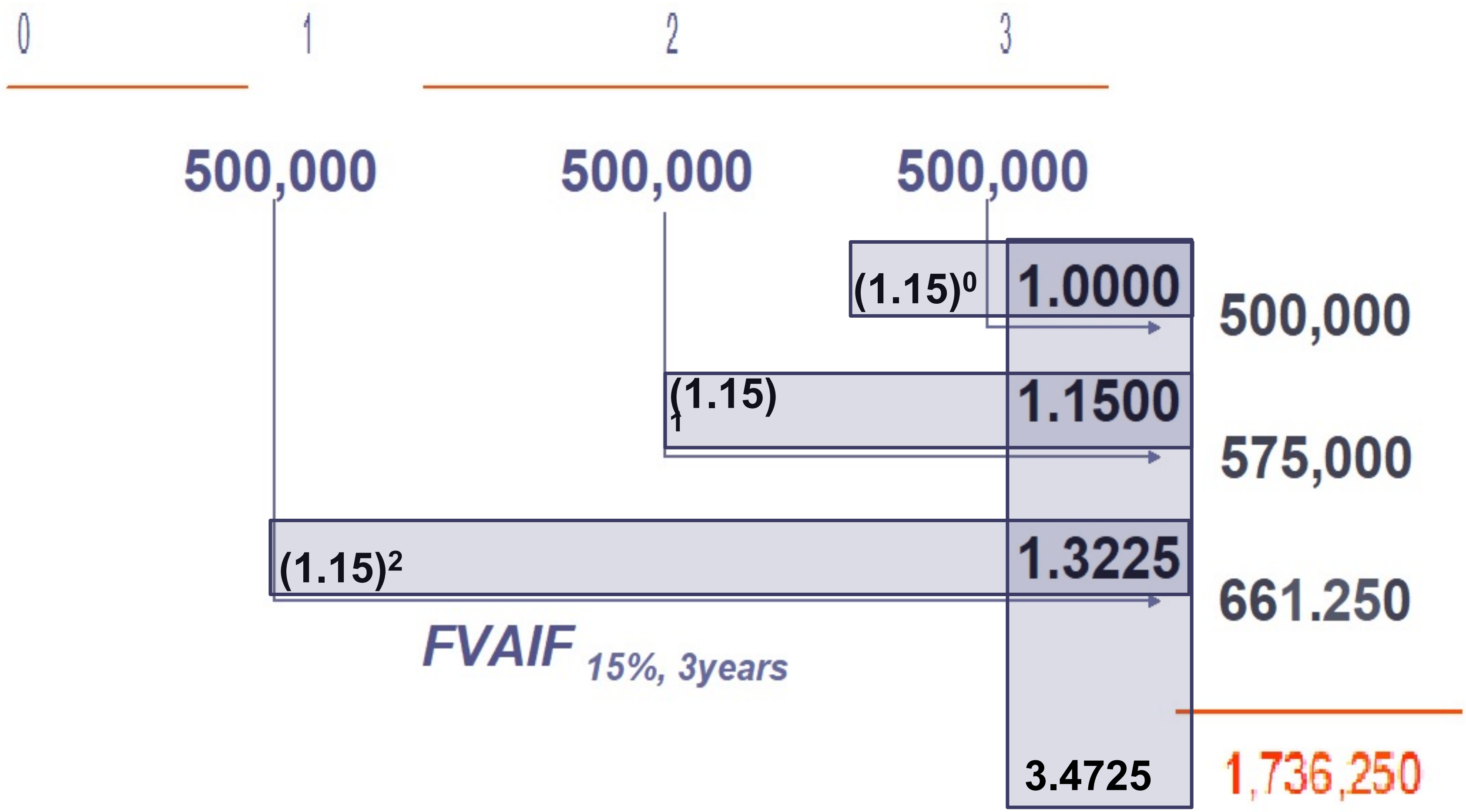
- FVa = Present value of an annuity
- PMT = Payment per period
- FVAIF = Future value of an annuity interest factor
- i = Interest rate
- n = Number of periods

Example

- Firm A is concerned about funding its pension plan. Management wants to know how much the pension plan will be worth at the end of 3 years if the firm contributes €500,000 per year and invests the fund at 15%.

- FV_a= 500,000*(3,4725) = 1,736,250

Example



0
1
2
3
500,000
500,000
500,000
(1.15)0
1.0000
500,000
(1.15)1
1.1500
575,000
(1.15)2
1.3225
661.250
FVAIF 15%, 3years
3.4725
1,736,250

Present Value of an Annuity

$$PV_a = PMT * \left[\sum_{t=1}^{n} \frac{1}{(1+i)^t} \right] = PMT * \left[\frac{1 - \frac{1}{(1+i)^n}}{i} \right] = PMT * \left[\frac{1-(1+i)^{-n}}{i} \right] = PV_a = PMT * \left[\sum_{t=1}^{n} \frac{1}{(1+i)^t} \right] = PMT * (PVAIF_{i,n})$$

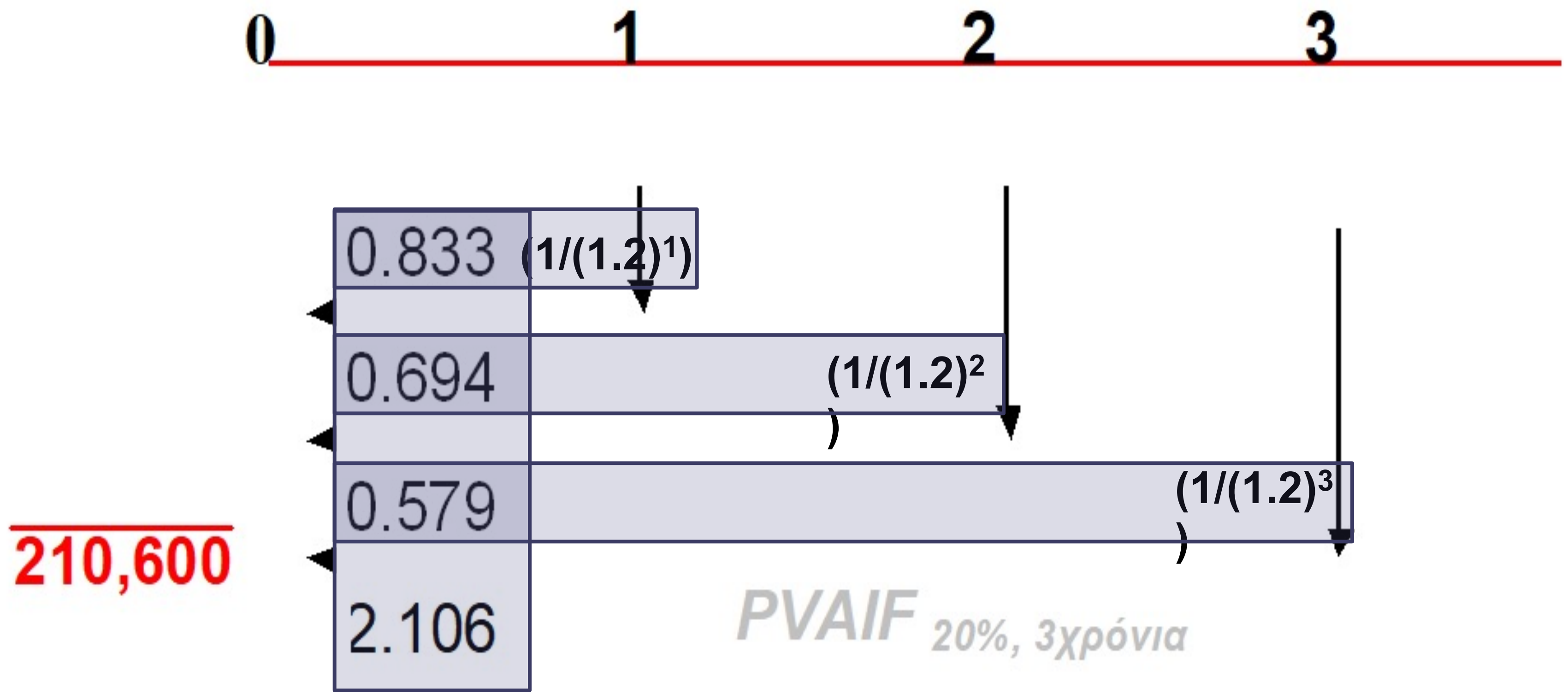
- **PVa = Present value of an annuity**
- **PMT = Payment per period**
- **PVAIF = Present Value annuity interest factor**
- **i = Interest rate per period**
- **n = Number of periods**

Example

- Suppose you want to know the present value of a lease that will pay €100,000 per year for 3 years. The discount factor is 20%.

- **PVa= 100,000*(2.106) = 210,600**

Example



0
1
2
3
0.833
(1/(1.2)¹)
0.694
(1/(1.2)²)
0.579
(1/(1.2)³)
210,600
2.106
PVAIF 20%, 3χρόνια

Present Value of a Perpetuity

- **PV = PMT / i**

- **PV = Present value of a perpetuity**
- **PMT= Payment per period**
- **i= Interest rate (discount factor)**

Example

- **Assume that a preferred stock pays dividend of 0.5 per year forever and that investor require 10 percent return.**

  - **PV = 0.5 / 0.10 = 5**

Some more issues…

- **Future Value for IntraYear Periods:**

$$FV_n = PV_0\left[1 + (i/m)^{n*m}\right]$$

- **Growth Rate:**

$$i = (FV_n / PV_0)^{1/n} - 1$$

- **Number of Periods:**

$$(1+i)^n = FV_n / PV_0$$

Cash flow analysis

Calculating Project Cash Flows

Capital budgeting involves estimating the NPV of the cash flows a project is expected to produce in the future.

Incremental Cash Flows

- Only incremental after-tax cash flow is used in an NPV analysis

An Incremental Cash Flow is the change in a firm's net cash flow attributable to an investment project.

Identifying Incremental Cash Flows

- Initial Investment Outlay: the incremental cash flows associated with a project that will occur only at the start of a project's life.
- Incremental Operating Cash Flow: the changes in day-to-day cash flows that result from the purchase of a capital project and continue until the firm disposes of the asset.
- Terminal Cash Flow: the net cash flows that occur only at the end of a project's life.

Calculating Incremental Cash Flows

- Compute the project's incremental cash flow from operations; this is cash flow remaining after operating expenses and taxes have been paid.
- Subtract expenditures for the project's capital assets (*Cap Exp*) and working capital (*Add WC*).

$$\text{Incremental cash flow}_t = [(Revenue - OpEx - D\&A) \times (1 - t)] + D\&A - CapExp - AddWC$$

Where:

OpEx is operating expenses
D&A is depreciation and amortization
CapExp is capital expenditures
AddWC is additional working capital
t is the tax rate

Calculation of the initial cost of the investment (1)

Initial outflows:

- Cost of purchase
- Cost of Shipping
- Cost of installation
- Additional expenses related to the installation and the use of new goods (i.e. packing, checking, cost of staff education, etc.)
- Increase in the net working capital due to the use of new goods (i.e. increase of the necessary raw materials because of the operation of new equipment).
- Increased tax payment from the sale of the old equipment (in the case of replacement).

Calculation of the initial cost of the investment (2)

Initial inflows:

- Income from the sale of the existing equipment
- Tax saving from the sale of the existing equipment at lower price than the book value

- **INITIAL COST OF THE INVESTMENT = INITIAL OUTFLOWS – INITIAL INFLOWS**

Incremental Operating Cash Flow

- The incremental cash flow from operations, equals the incremental net operating profits after tax plus the depreciation and amortization (*D&A*) associated with the project.

- Analysts often distinguish between types of costs when forecasting operating expenses:
  - Fixed costs that do not change with the units of output
  - Variable costs that change with every unit of output

Calculation of the incremental annual cash flows of the investment

- Increased income and increased expenses.
- Saving in operating costs, raw materials and other expenses.
- Tax savings from an increase in depreciation.

Terminal Cash Flow

- Cash flows in the last, or terminal, year of a project often includes cash flows not typically included in the calculations for prior years
  - Long-term assets and working capital that are no longer needed to support the project may be sold
  - Net cash flows from the sale of assets and the impact of the sale on the firm's taxes are included in the terminal year

$$
\begin{gathered}
AddWC = Change\ in\ cash\ and\ cash\ equivalents \\
+Change\ in\ accounts\ receivable \\
+Change\ in\ inventories \\
-Change\ in\ accounts\ payable
\end{gathered}
$$

Calculation of the terminal cash flow of the investment

- Residual value of the investment and its possible tax effects.
- Cash outlays associated with the project's termination.
- Recapture of non expense cash outflows that occurred at the project's initiation (i.e. reduction of the net working capital requirements).

Capital Budgeting Project Evaluation: Example

- The technical department of an urban park regeneration company is planning to undertake an investment project for the installation and implementation of a new water supply and lighting system for the park.
- For the implementation of the new investment, the purchase of technological equipment valued at € 150,000 is necessary, adding shipping and installation costs of € 4,000 and € 2,000 respectively.
- The useful life of the technological equipment is considered at 5 years.
- The expected annual incremental revenues and expenditures are estimated at 100,000 and 40,000 respectively.
- The equipment's residual value is € 20,000 and the company estimates that this will be its selling price.
- The corporate tax rate is 40% and the cost of capital is 15%.
- The firm follows the straight line depreciation method.
- The cumulative working capital is 10,000, 20,000, 25,000, 30,000 and 30,000 for the years 1-5 respectively. At the end of the 5 years the working capital will be recovered.

Answer

Initial Investment Outlay (1)	-150.000					
Shipping (2)	-4.000					
Instalation Costs (3)	-2000					
(I.I.) Initial Investment = (1) + (2) + (3)	**-156.000**					
Years	**0**	**1°**	**2°**	**3°**	**4°**	**5°**
(A) Revenues		100.000	100.000	100.000	100.000	100.000
(B) Expenditures		40.000	40.000	40.000	40.000	40.000
(C) Depretiations		27.200	27.200	27.200	27.200	27.200
(D) Taxable Income = [(A) - (B) - (C)]		32.800	32.800	32.800	32.800	32.800
(E) Taxes (40%*D)		13.120	13.120	13.120	13.120	13.120
(F) Earnings after taxes (D-E)		19.680	19.680	19.680	19.680	19.680
(G) NCF $_{\text{after taxes}}$ = [(A) - (B) - (E)]		46.880	46.880	46.880	46.880	46.880
(H) (-) Change in Working Capital		10.000	10.000	5.000	5.000	0
(J) (+) Residual Value (after taxes)						20.000
(I) (+) Return of the Net Working Capital						30.000
(T.C.F.) Terminal Cash Flow = (J) + (I)						**50.000**
NCF = (I.I.) + (I.O.C.F.) + (T.C.F.)	**-156.000**	**36.880**	**36.880**	**41.880**	**41.880**	**96.880**
	15%					
NPV=	**3.604**					
Annual Depretiation: (156.000-20.000)/5	27.200					

Capital budgeting

Capital Budgeting: Definition

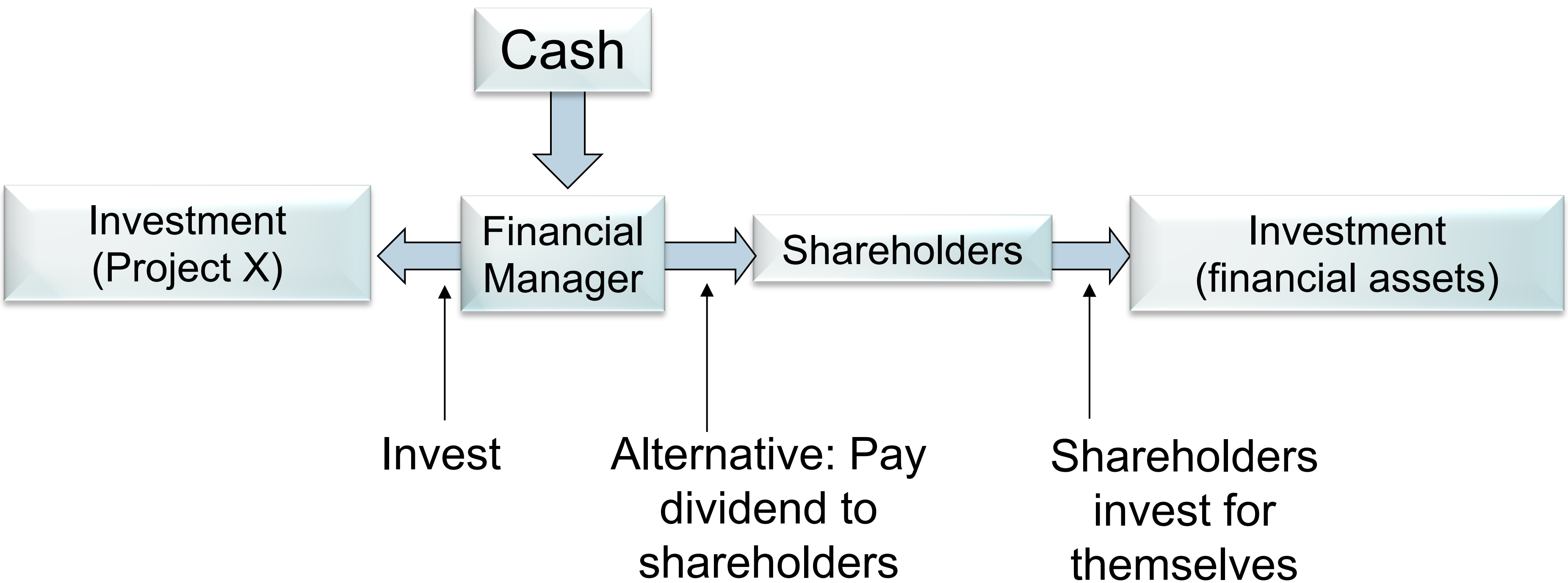
- Capital budgeting is the process of analyzing potential capital expenditures and describing which investments the firm should undertake.
- Capital budgeting decisions are probably the most important ones financial managers must make.

Characteristics of Capital Budgeting

- Represents a long-term investment decision
- These decisions determine the long-term productive assets that will create wealth for a firm's owners
- Determines the cost of the investment
- Estimates the expected cash flows from the investment and the riskiness of these cash flows
- Determines the appropriate cost of capital at which to discount the cash flows
- Determines the sum of the present values of the expected cash flows
- Emphasizes cash flows rather than income
- Very important to firm's future

Capital Budgeting and Cash Transfers

Every possible method for evaluating projects impacts the flow of cash about the company as follows.



Classification of Investment Projects (1)

Investment Project's Size

- Investment's size is a very important element for investments evaluation as it determines the funds required for undertaking the investment.

Investment Project's Risk

- Due to uncertainty, it is uncertain whether a project will fetch the expected returns.
- Investments do not encounter the same level of risk.

Classification of Investment Projects (2)

Type of Investment

- Investments in Tangible Assets
- Investments in Financial Assets

Reasons for Realization

- Investments classification according to the purpose for which they are being undertaken.
  - Expansion: Growth and increase of the company's production capacity
  - Replacement: Replacement of mechanical equipment

Classification of Investment Projects (3)

Financial Dependence

- Independent projects
  - Projects for which the decision to accept or reject is not influenced by decisions about other projects being considered by the firm

- Mutually exclusive projects
  - Projects for which the decision to accept one project is simultaneously a decision to reject another project
  - These projects typically perform the same function

- Supplementary projects
  - The realization of one project is a necessary condition that the other has also to be realized.

Methods of Evaluating Investment Proposals

There are 6 widely used methods of evaluating investment proposals:

- Average Rate of Return (ARR)
- Payback Method (PB)
- Net Present Value (NPV)
- Discounted Payback Period (DPP)
- Profitability Index (PI)
- Internal Rate of Return (IRR)

Average Rate of Return (ARR)

- $$\textbf{ARR} = \frac{\textbf{Annual average net earnings}}{\textbf{Initial investment}}$$

- If ARR is ≥ than profitability target, then investment is accepted

Average Rate of Return (ARR)

<u>Strengths</u>

- Easy to apply (uses available accounting information).

<u>Weaknesses</u>

- Uses net earnings and not NCFs.
- Does not take into account the time value of money.
- Ignores the absolute level of the investment. (i.e. An investment with a return of 20% corresponds to different earnings if the initial capital is 20,000 or 10,000).

Example

- The initial cost of an investment is €600,000 (equipment). UEL of the equipment is 6 years and the firm follows the straight-line depreciation method. The tax rate is 35%.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Inflows	350,000	370,000	370,000	330,000	290,000	250,000
Outflows(-)	190,000	170,000	140,000	130,000	120,000	120,000
Cash flow before taxes (=)	160,000	200,000	230,000	200,000	170,000	130,000
Depreciations (-)	100,000	100,000	100,000	100,000	100,000	100,000
Earnings before taxes (=)	60,000	100,000	130,000	100,000	70,000	30,000
Taxes 35% (-)	21,000	35,000	45,500	35,000	24,500	10,500
Earning after taxes(=)	39,000	65,000	84,500	65,000	45,500	19,500

- Annual Average Profit = (39,000 + 65,000 + 84,500 + 65,000 + 45,500 +19,500) /6 = 53,083.33€
- Initial Cost= 600,000 €

- Average Rate of Return= 53,083.33 / 600,000 = 8.85%.

Payback Method

- computes the amount of time required to recover the initial investment
- the project is acceptable if the payback period is shorter than a certain amount of time
- projects with shorter payback periods are less risky and thus more desirable

Strengths:

- Provides an indication of a project's risk and liquidity.
- Useful for short – term period characterized by low variability and stable economic conditions.
- Useful for investments that are subject to quick technological obsolescence.
- Easy to calculate and understand

Weaknesses:

- Ignores time value of money
- Ignores CFs occurring after the payback period

Payback Period: Example

$$PB = Years\ before\ cost\ recovery + \frac{Remaining\ cost\ to\ recover}{Cash\ flow\ during\ the\ year}$$

	0	1	2	3	4
Net Cash Flow	-3,000	1,500	1,200	800	300
Cumulative Net CF	-3,000	-1,500	-300	500	800

Payback = **2 + 300/800 = 2.375 years**

Net Present Value

NPV is the difference between the present values of the expected cash inflows and outflows

$$NPV = CF_0 + \frac{CF_1}{1+k} + \frac{CF_2}{(1+k)^2} + \cdots + \frac{CF_n}{(1+k)^n}$$

$$= CFo + \sum_{t=0}^{n} \frac{CF_n}{(1+k)^n}$$

Cost is CF_0 and is generally negative

A Five-Step Approach for Calculating NPV (1)

1. Estimate project cost
   - Identify and add the present value of expenses related to the project
   - The cash flow in year zero on the timeline is negative, indicating and outflow
2. Forecast cash flows
   - Both cash inflows and outflows are likely in each year of the project; estimate the net cash flow for each year

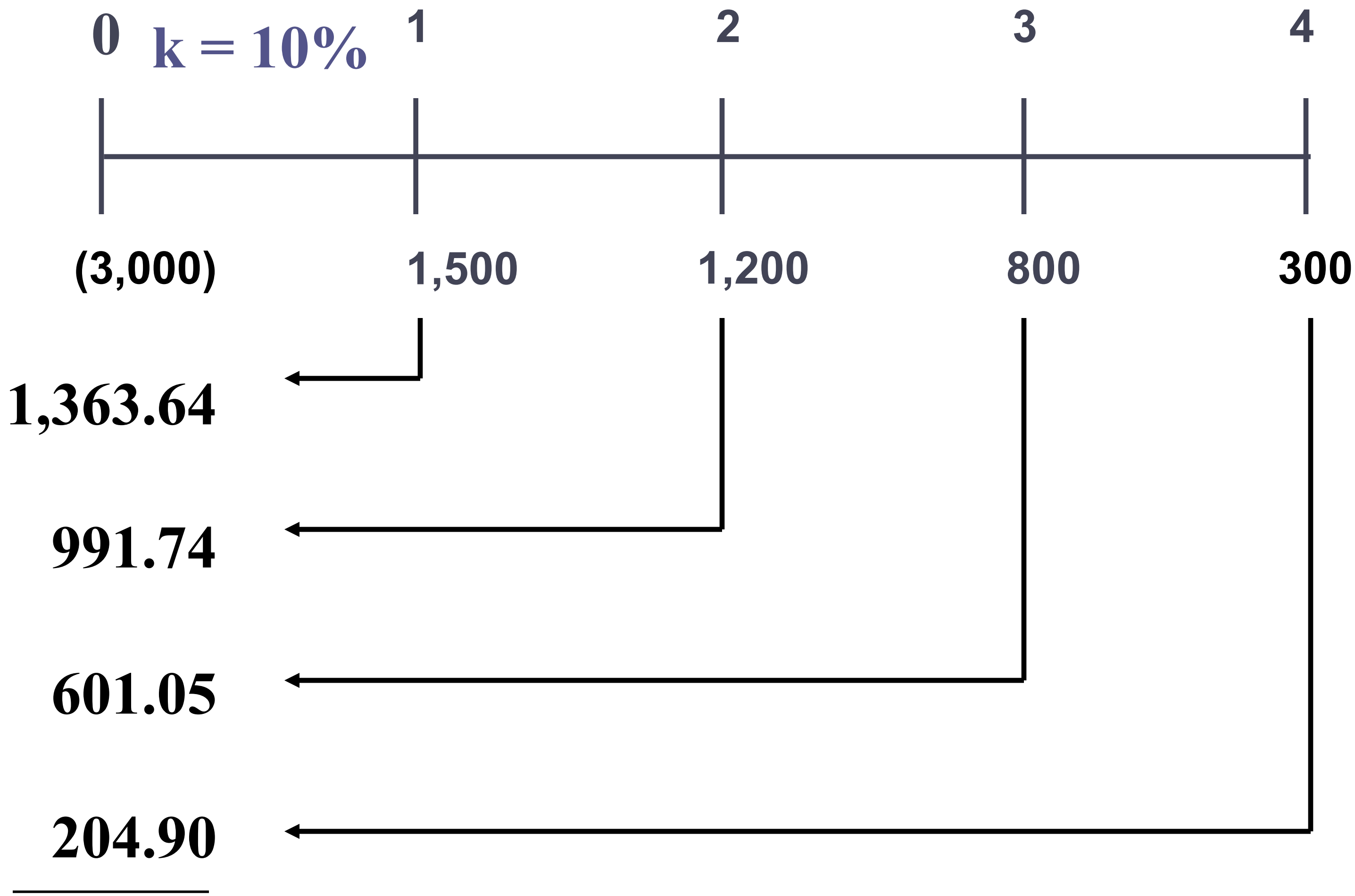
A Five-Step Approach for Calculating NPV (2)

3. Estimate cost of capital
   - The cost of capital is the discount rate used to determine the present value of expected cash flows
   - The riskier a project, the higher its cost of capital

4. Compute the project's NPV
   - Determine the difference between the present values of the expected cash inflows and outflows

5. Make a decision
   - Accept the project if it has a positive NPV (NPV>0)
   - Reject the project if it has a negative NPV (NPV<0)
   - Indifferent if NPV = 0.

What is Project S's NPV?



$NPV_S = \boxed{161.33}$

Example

Years (1)	NCF (2)	PVIF$_{10\%,n}$ (3)	PV (4)=(2)X(3)
0	(3,000)	1.000	(3,000)
1	1,500	0.9091	1,363.64
2	1,200	0.8264	991.74
3	800	0.7513	601.05
4	300	0.6830	204.90

			161.33

Net Present Value - Advantages

- Considers the time value of money
- Discounts NCFs with the weighted average cost of capital
- Provides the absolute contribution of a project
- NPVs from various projects can be added to give the total NPV a firm can achieve within a period of time
- Can be modified to consider the investment risk.

Net Present Value – Disadvantages

- Assumes that the weighted cost of capital remains constant over the whole life of the investment project.

Discounted Payback Period (DPP)

- Computes the discounted amount of time required to recoup the initial investment
- The project is acceptable if the discounted payback period is shorter than a certain amount of time
- Projects with shorter discounted payback periods are more desirable.

Strengths of DPP:

- Takes into account time value of money
- Provides an indication of a project's risk and liquidity.
- Useful for investments that are subject to quick technological obsolescence.

Weaknesses of DPP:

- Ignores CFs occurring after the discounted payback period.

Example

A firm is planning to invest at an investment project whose initial cost is 25,000 €.

It is estimated that this project's after tax cash flow will be as follows:
Assuming that the project's cost of capital is 10%.

Years	Net Cash Flows
1	€ 6,000
2	€ 7,000
3	€ 8,000
4	€ 9,000
5	€ 15,000

PV: 6,000/1.1+7,000/1.1^2 + 8,000/1.1^3 + 9,000/1.1^4 + 15,000/1.1^5 =

The PV of the first four years of the investment is: 5,454.5 + 5,785.1 + 6,010.5 + 6,147.1 = 23,397.2

PV of the 5th year: 9,313.9.

The Discounted Payback Period is:

In years: 4+(25.000-23.397,2)/9.313,9 = 4,172

In months: 0,172*12 = 2,064

In days: 0,064*30=1,92.

Thus DPP = 4 years, 2 months και 2 days.

Profitability Index

- When resources are limited, the profitability index (PI) provides a tool for selecting among various project combinations and alternatives

- The highest PI can indicate which projects to select
- If PI is greater than 1, the project is accepted.

$$\boldsymbol{PI = \frac{\sum_{t=0}^{n} \frac{CF_t}{(1+k)^{\,t}}}{CF_0}}$$

Advantages

- It takes into account time value of money.
- It takes into account all project's cash flows.

Disadvantages

- It does not take into account the absolute level of the net cash flows and thus it ignores the absolute level of the investment.

Example

A firm is planning to invest at a project whose initial cost is 100,000,000 €.
Assuming that the project's cost of capital is 10%.
It is estimated that this project's after tax cash flow will be as follows:

Years	Net Cash Flows
1	€ 50,000,000
2	€ 22,500,000
3	€ 90,000,000
4	€ 95,000,000

$$PI = \{[50{,}000{,}000/(1+0.10)] + [22{,}500{,}000/(1+0.10)^2] + [90{,}000{,}000/(1+0.10)^3] + [95{,}000{,}000/(1+0.10)^4]\} / 100{,}000{,}000 \Rightarrow$$

$$PI \approx 1.96.$$

Net Present Value vs Profitability Index

- Make the same acceptance/rejection decision for independent projects.

- However, if projects are mutually exclusive, then ranking conflicts can arise. If conflicts arise, the NPV method should be used.

Net Present Value vs Profitability Index: Example

Years	0	1	r
NCF (A)	-5,000	10,000	10%
NCF (B)	-10,000	20,000	10%

- Cost of Capital: 10%

NPV (A) = -5,000 + 10,000 *(1/1.1) = -5,000 + 9,091 = 4,091

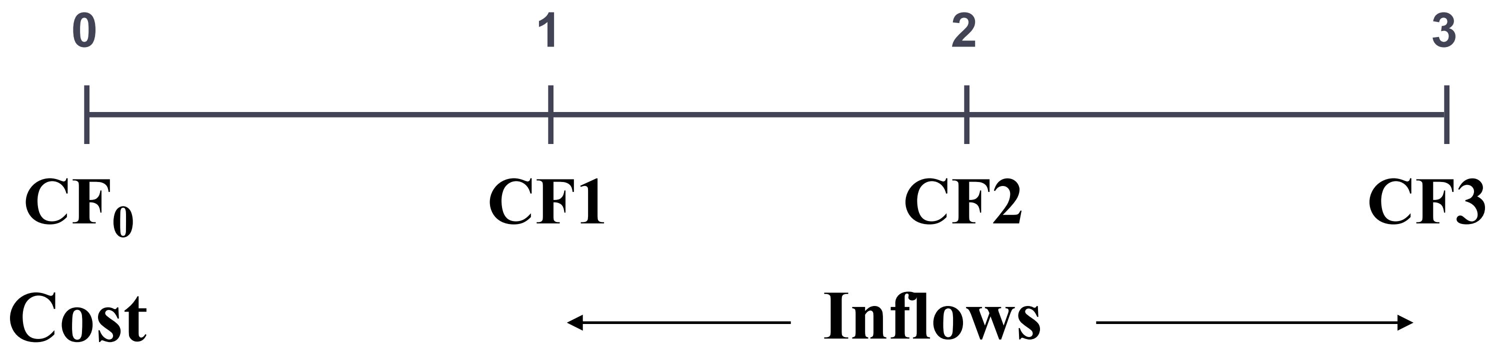
PI (A) = 9,091/ 5,000 = 1.81

NPV(B) = -10,000 + 20,000 *(1/1.1) = -10,000 + 18,181.8 = 8,181.8

PI(B) = 8,181.8/10,000 = 1.81

- According to PI we are indifferent, but according to NPV method the project B is being accepted.

Internal Rate of Return: IRR



IRR - discount rate at which NPV = 0.

- A project is acceptable if its IRR is greater than the firm's cost of capital
- The NPV and IRR techniques are similar in that both utilize discounted cash flows.
- The NPV and IRR methods will agree when projects are independent.

What is Project S's IRR?

IRR = ?

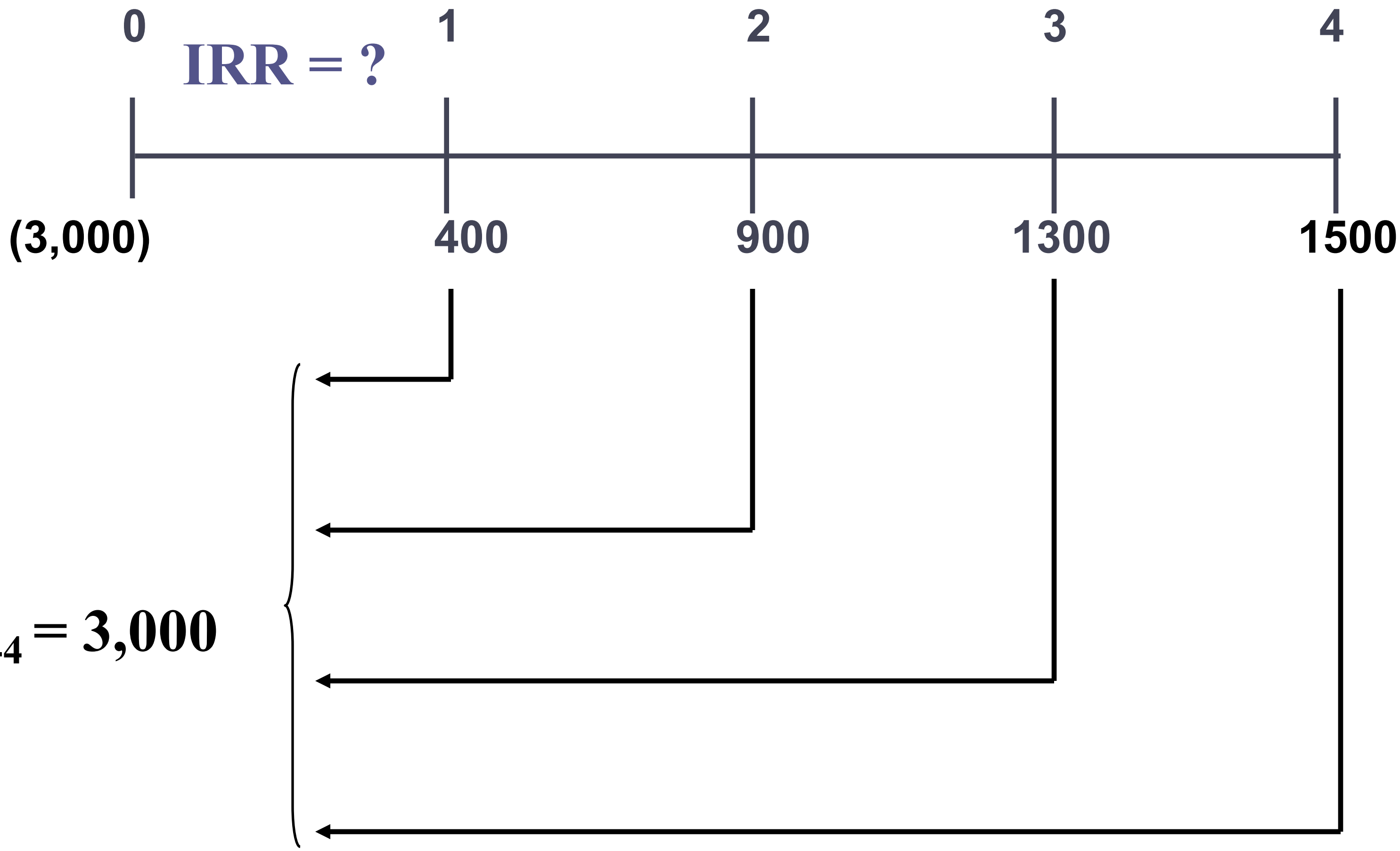
	0	1	2	3	4
k = 10%	(3,000)	1,500	1,200	800	300

Sum of PVs for CF_{1-4} = 3,000

$NPV_S = \boxed{0}$

$IRR_S = 13.1\%$

What is Project L's IRR?



k = 10%

Sum of PVs for CF_{1-4} = 3,000

NPV_L = $\boxed{0}$

IRR_L = 11.4%

Decisions on Projects S and L

- If S and L are independent, accept both:
  - IRRs =13.1% > k =10%.

- If S and L are mutually exclusive:
  - accept S because IRR_S =13.1% > IRR_L =11.4% .

Modified IRR

- If the initial cost is the only negative cash flow and all other annual cash flows are positive, then there will be only one positive IRR and the others, if any, will be either negative or imaginary.
- If there is an alternation of signs there may be more than one positive IRR values (Multiple IRR).
- We compute the Modified IRR (MIRR) in that case:
  - We discount the negative flows (PV) and compound the positive ones (FV) to maturity.

Modified IRR: Example

Years	Net Cash Flows
0	-100
1	300
2	-220
3	10

Stockholders requited rate of return: 20%. Then IRR is:

$$-100 + [300/(1+IRR)] - [220/(1+IRR)^2] + [10/(1+IRR)^3] = 0 \Rightarrow$$

$$IRR1 \approx 12.76\ \%\ \&\ IRR2 \approx 82.38\ \%\ .$$

P.V. of outflows in Y0 = $-100 - [220/(1+0.20)^2] = -252.78$.

F.V. of inflows in Y3 = $300x(1+0.2)^2 + 10 \text{ x } (1+0.2)^0 = 442$.

Modified IRR

Years	Non – Conventional Cash Flows	Conventional Cash Flows
0	-100	-252.78
1	300	0
2	-220	0
3	10	442

Modified IRR:

$-252.78 + [442/(1+MIRR)^3] = 0 \Rightarrow$

$MIRR \approx 20.47\ \%$

Advantages

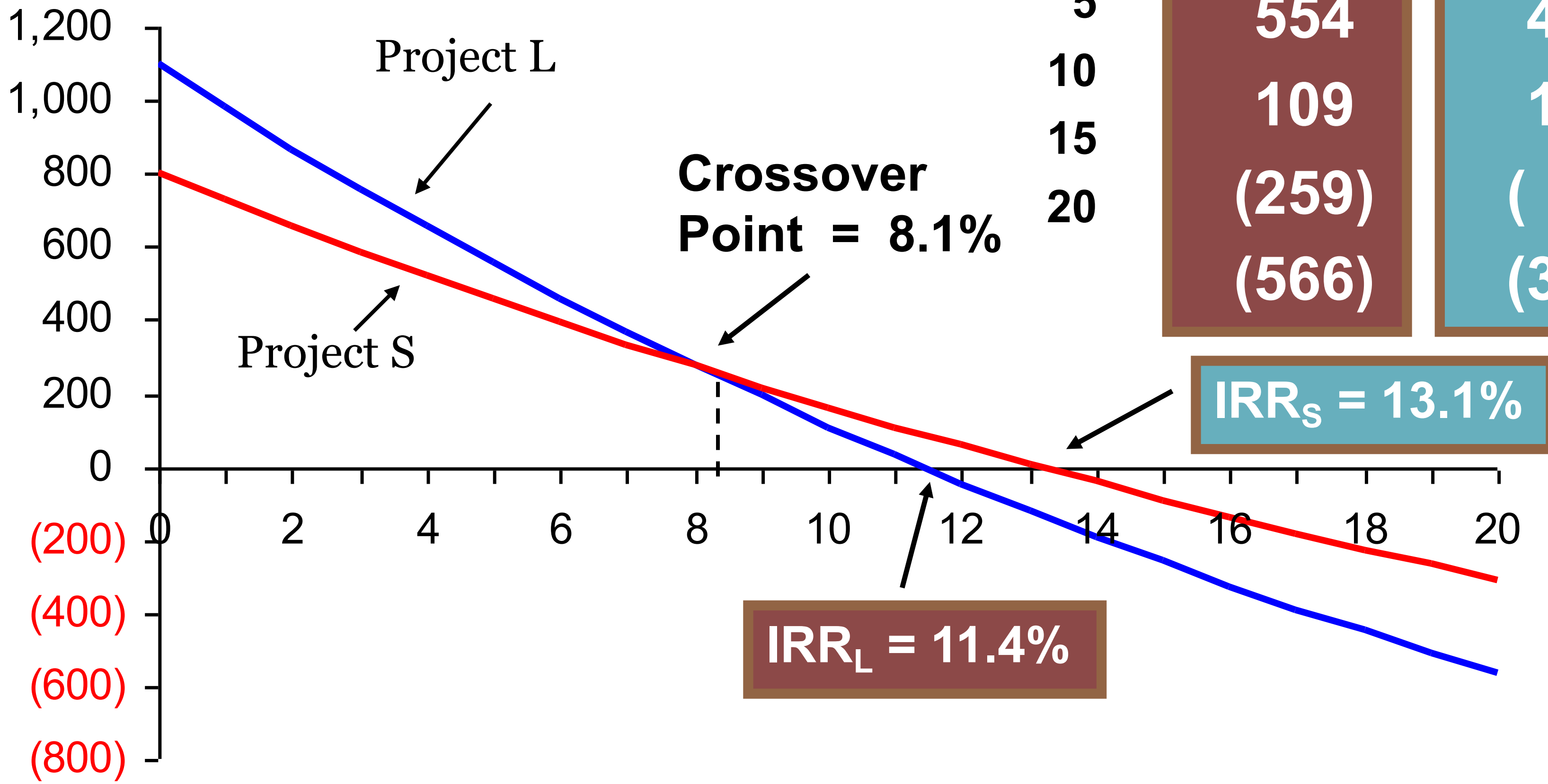
- Takes into account time value of money.
- Takes into account all flows of the investment project till maturity.
- It creates an investment margin of safety (i.e. if IRR is 25% and the required rate of return is 10%, there is a 15% safety margin.

Disadvantages

- Requires accurate forecasting of future flows and risk.
- It assumes that future cash flows are reinvested at an interest rate equal to IRR, which is unrealistic in the long run.

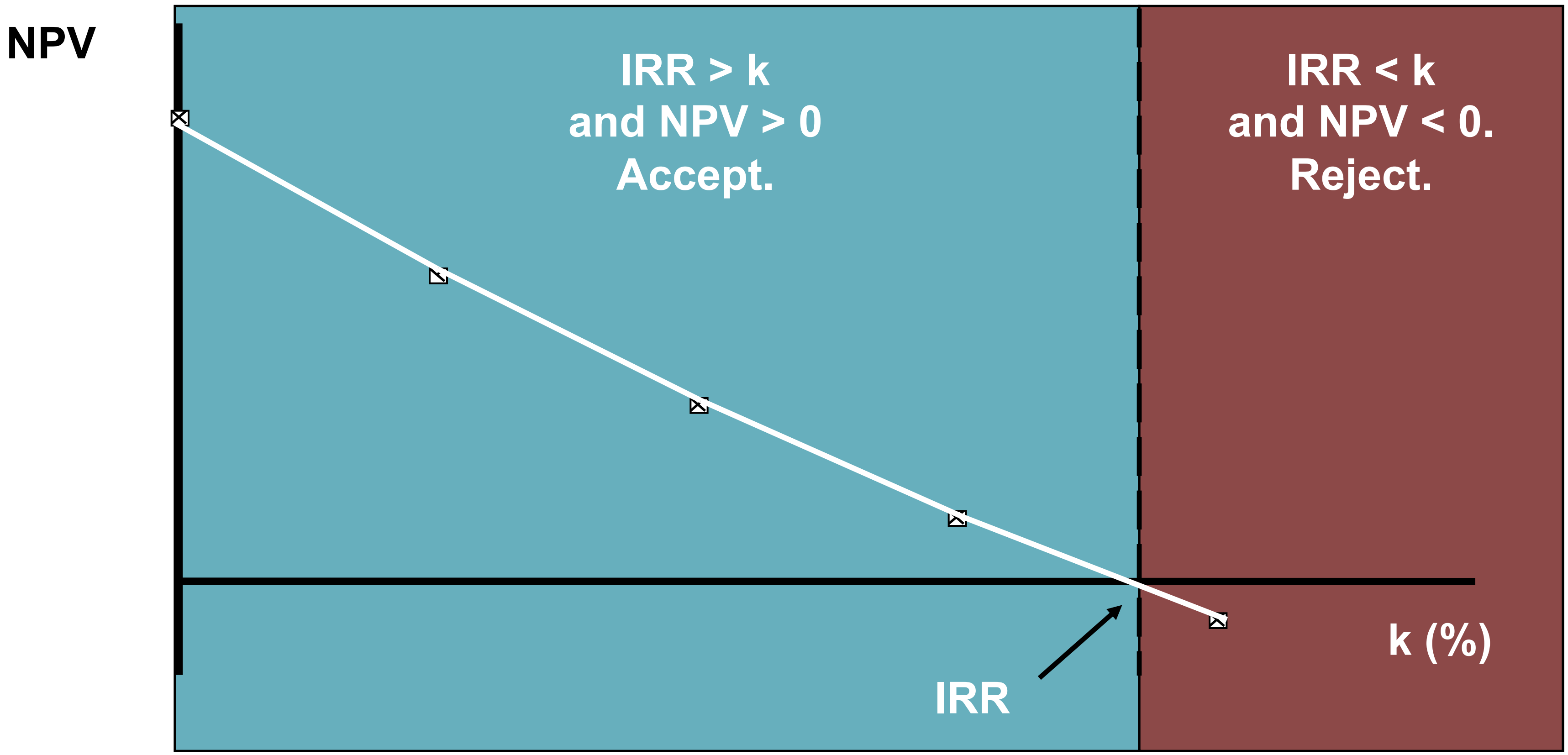
NPV Profiles for Project S and Project L

k	NPV_L	NPV_S
0	1,100	800
5	554	455
10	109	161
15	(259)	(91)
20	(566)	(309)



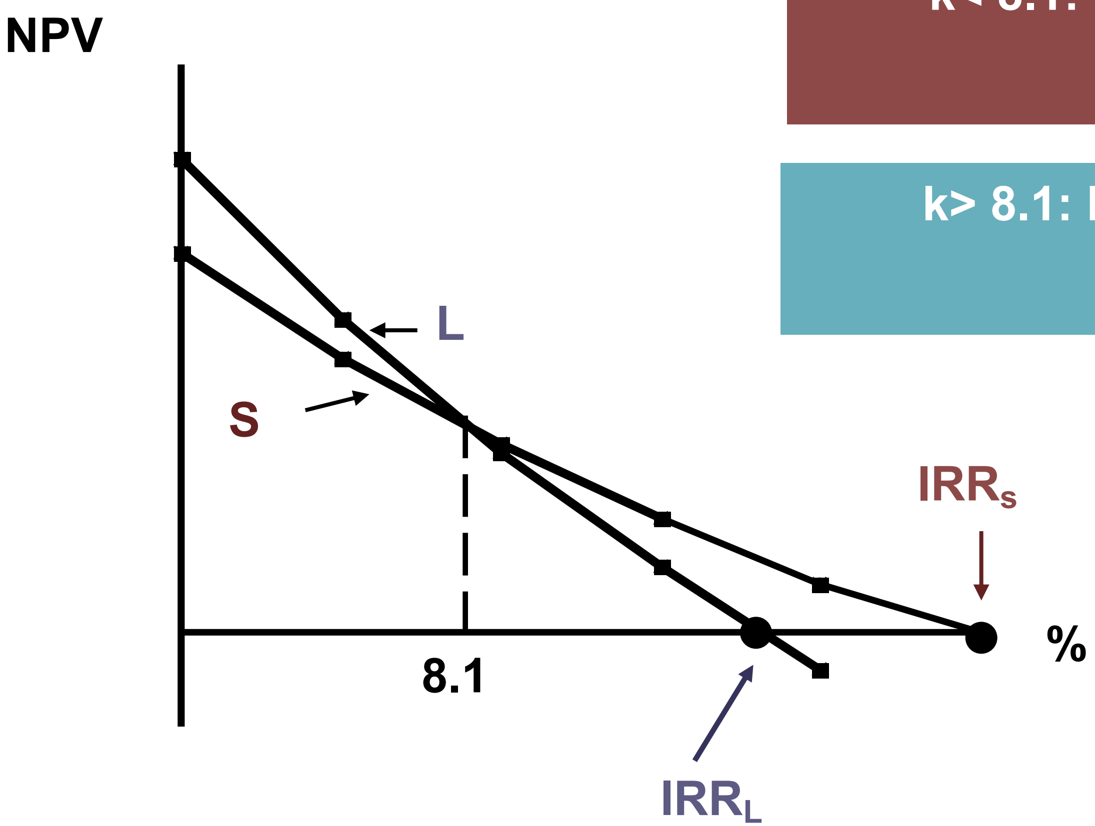
Independent Projects

NPV and IRR always lead to the same acceptance/rejection decision for independent projects



Mutually Exclusive Projects

The IRR and NPV methods can produce different acceptance/rejection decisions if projects are mutually exclusive.



k< 8.1: NPV_L> NPV_S , IRR_L < IRR_S
CONFLICT

k> 8.1: NPV_S> NPV_L , IRR_S > IRR_L
NO CONFLICT

Differentiation of decisions between investment projects

- In general, the NPV and IRR lead to the same decision. However, they may lead to opposite decisions, if the projects are mutually exclusive. This happens in the following three cases:
  - <u>When project size differences exist</u> (size disparity problem), i.e. compare a big investment project with a small one.
  - <u>When the projects have unequal lives</u> i.e. we compare a long-lasting investment project with a short-term project.
  - <u>When cash flow timing differences exist</u> (time disparity problem), i.e. we compare a project whose majority of cash flows materialise in the early years of its life with another one whose majority of cash flows materialise in later years.

NPV's Superiority

- Reinvestment rate assumptions:
  - NPV assumes that cash flows will be reinvested at k (required rate of return - cost of capital), which is the same for each investment and represents the return of all available investment opportunities.
  - IRR assumes that cash flows will be reinvested at project's IRR, which varies among projects, depending on the project's cash flows.
  - Reinvest at opportunity cost, k, is more realistic, so NPV method is best. NPV should be used to choose between mutually exclusive projects.

Risk & capital budgeting

Risk & Capital Budgeting

Expected Return

It is the weighted average of all potential returns of an investment, in which each potential return is weighted by the respective probability of occurrence.

$$\mathrm{E}(r) = \sum_{i=1}^{n} P_i r_i$$

Risk (1)

- Risk is the variability of the potential results around their expected value.
- A statistical measure of the dispersion of the probability distribution is standard deviation
- The larger the standard deviation, the greater the dispersion.

$$\sigma = \left\{ \sum_{i=1}^{n} P_i \left[r_i - \mathrm{E}(r) \right]^2 \right\}^{\frac{1}{2}}$$

Risk (2)

- The use of standard deviation can lead to wrong conclusions.
- This is because standard deviation is an absolute measure of variation.
- In this case, we need a relative measure of variation, the coefficient of variation (CV).
- Higher values of the coefficient of variation indicate higher variability per unit of expected return and consequently higher relative risk.

$$\mathbf{CV = \sigma / E(r)}$$

Stand – Alone Risk Approach

- Assumes that the examined investment project is the only asset of the firm and that the shareholders do not possess diversified portfolios.
- According to this approach, the most popular techniques for assessing a project's risk are the following:
  - the certainty equivalent approach
  - the risk-adjusted discount rate,
  - the sensitivity analysis,
  - the scenario analysis.
  - The Monte Carlo simulation
  - Decision trees

Certainty equivalent approach

$$\alpha_t = \frac{(\text{Certain cash flows})_t}{(\text{Risky or expected cash flows})_t}$$

$$NPV = \sum_{t=0}^{n} \frac{\alpha_t CF_t}{\left(1+i_F\right)^t}$$

- **The method of the certainty equivalent approach** modifies the risky incremental cash flows of the project to certain cash flows, which then discounts back to the present at the risk - free interest rate.
- α_t lies between zero (when extreme risk exists) and one (when risk does not exist).

Example

Firm ABC evaluates an investment project with initial cost €80,000 with an expected life of 5 years. The incremental after taxes cash flows and the certainty equivalent coefficient, as follows:
The required rate of return is 15%, while the risk-free interest rate is 10%. Find the net present value of the project, using the certainty equivalent approach. Should ABC accept the project?

Years	Incremental cash flows after taxes	Certainty equivalent coeffficient (α_t)
1	€10,000	0.95
2	€20,000	0.90
3	€30,000	0.85
4	€40,000	0.80
5	€50,000	0.75

Answer

$$NPV = [-80{,}000]+[(0.95\times 10{,}000)/(1+0.10)]+$$
$$+[(0.90\times 20{,}000)/(1+0.10)^2]+[(0.85\times 30{,}000)/(1+0.10)^3]+$$
$$+[(0.80\times 40{,}000)/(1+0.10)^4]+[(0.75\times 50{,}000)/(1+0.10)^5]$$
$$\Rightarrow \mathbf{NPV = 7{,}812}$$

Risk-adjusted discount rate

- The method is based on the concept that investors usually seek higher return from investment projects with higher risk.
- Consequently, if the risk of a project is greater than the risk involved in a typical activity, then the discount rate, used for the evaluation of the specific project should be adjusted upwards in order to compensate for this added risk.

$$NPV = \sum_{t=0}^{n} \frac{CF_t}{\left(1+i^*\right)^t}$$

Example

- Firm ABC evaluates an investment project with initial cost € 80,000 and expected life of 5 years. The firm expects that the project will yield the following incremental after taxes cash flows.
- The management of ABC believes that the normal required rate of return, for the firm of 15%, is not sufficient to cover the risk, associated with this project.
- The minimally acceptable rate of return on this project is 20%. Find the net present value of the project, by using the risk-adjusted discount rate. Should ABC accept this project?

Answer

Years	Incremental cash flows after taxes
1	€10,000
2	€20,000
3	€30,000
4	€40,000
5	€50,000

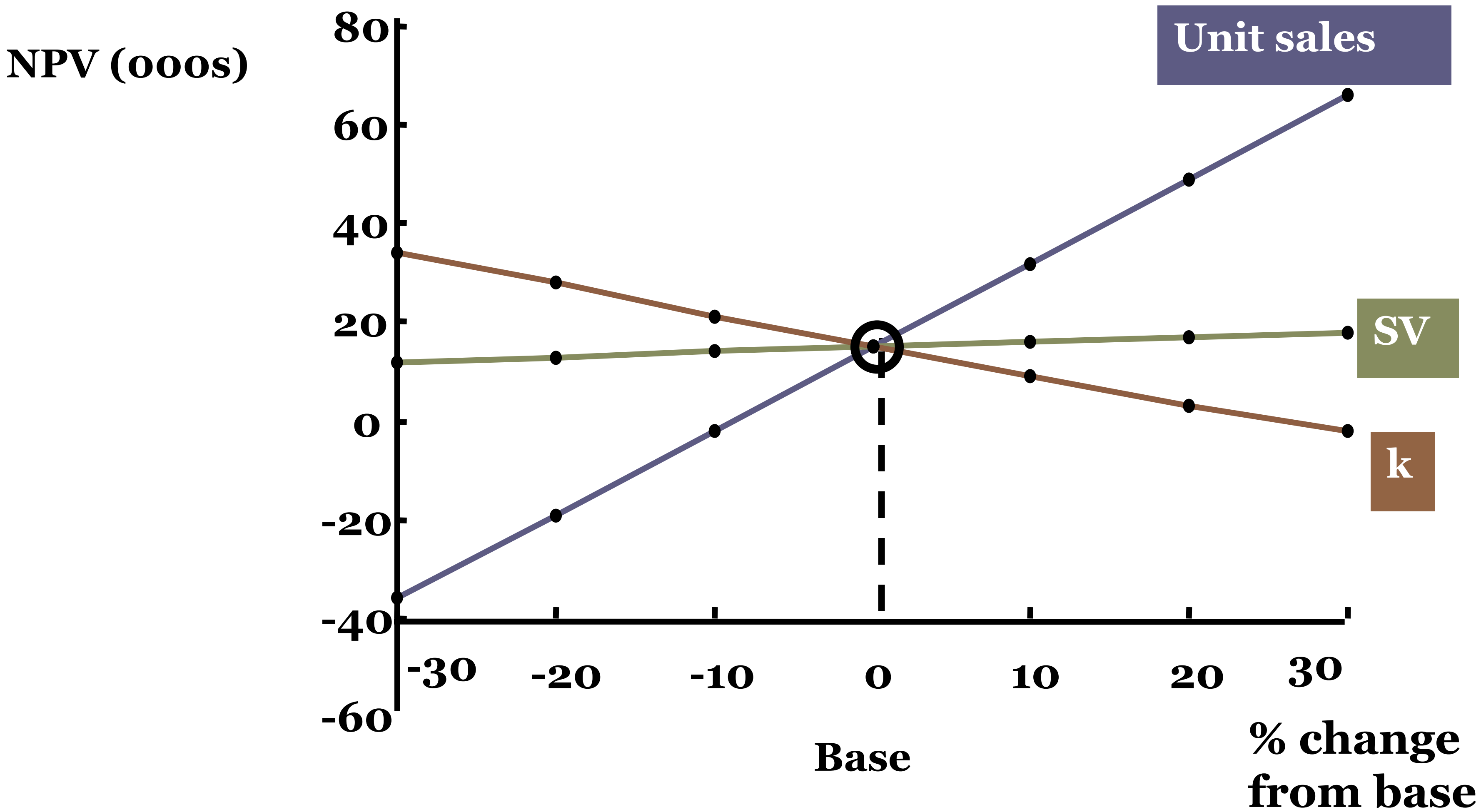
$$NPV = [-80{,}000]+[10{,}000{,}000/(1+0.20)]+[20{,}000{,}000/(1+0.20)^2]+[30{,}000{,}000/(1+0.20)^3]+[40{,}000{,}000/(1+0.20)^4]+[50{,}000{,}000/(1+0.20)^5] \Rightarrow$$

NPV = **-1,033 €**.

Sensitivity analysis (1)

- It is a method that measures how much the net present value (or the internal rate of return) will change in response to a given change in a single input variable, other things held constant.
- The input variables that could change are the discount rate, the sales, the operating costs, the costs of raw materials, etc.
- The sensitivity analysis is a “What if?” analysis.
- Sensitivity analysis begins with a base case situation developed using the expected input variables.
- Then, we estimate the base case net present value. Accordingly, we change the value of an

Sensitivity Analysis Graph



Example

- Firm ABC evaluate two projects, with an expected life of 3 years. The firm estimates that these projects will yield the following incremental after taxes cash flows:

Years	Cash flows of project A	Cash flows of the project B
0	(100,000)	(100,000)
1	20,000	30,000
2	40,000	50,000
3	80,000	60,000

- Which project is more risky if the discount rate changes from 10% to 12%?
- **Answer**

Projects	NPV (10%)	NPV (12%)	Percentage change of the NPV
A	11,344.85	6,687.32	-41.05%
B	13,673.93	9,352.22	-31.60%

Scenario analysis

- It is a method that usually examines three cases, one pessimistic, one optimistic and an average or most likely.
- The financial analyst creates a scenario with bad conditions, a scenario with good conditions and an average or most likely scenario.
- By using these variables, the analyst determines three net present values for each examined investment project.
- These net present values are calculated, using the cost of capital as the discount rate.
- Then, the analyst estimates the probability of occurrence of each scenario.

Example

- Firm ABC evaluates an investment project. Three scenarios (pessimistic, average and optimistic) have produced three net present values, which are 10,000, 20,000 and 30,000 respectively.
- If the probabilities of occurrence are (25% for pessimistic, 25% for optimistic and 50% for average scenarios, calculate:
  - the expected net present value,
  - the standard deviation of the net present value
  - the coefficient of variation of the net present value.
- If the coefficient of variation of the existing assets of the firm is 1.00, should ABC accept this project?

Answer

- $E(NPV) = (0.25*10{,}000)+(0.50*20{,}000)+(0.25*30{,}000) = 20{,}000$

- $\sigma = [(0.25)*(10{,}000-20{,}000)^2 +(0.50)*(20{,}000-20{,}000)^2+ (0.25)*(30{,}000- 20{,}000)^2]^{1/2}$ $=7{,}071.068$

- $CV = [\sigma / E(NPV)] = (7{,}071.068/20.000) = 0.35$

Monte Carlo Simulation (1)

It is a technique in which probable future events are simulated on a computer, generating estimated rates of return and risk measures. This technique follows six steps:

1. We construct a complete model of the investment project and specify the probability distribution of each of the determinants of cash flow.
2. We can ask the computer to select at random a value of each of these determinants and work out the net present value that would result.
3. After the computer has repeated this process a few thousand times, we should have a set of net present values.
4. The mean and the standard deviation of the set of net present values is determined. The mean is used as a measure of the project's expected profitability, and the standard deviation (or coefficient of variation) is used as a measure of the project's risk.

Monte Carlo Simulation (2)

4. Monte Carlo simulation allows the decision maker to base his/her decision on the full range of possible outcomes rather than a single-point estimate.
5. The project is accepted if the decision maker feels that enough of the distribution lies above the normal cutoff criteria (e.g. NPV≥0). Moreover, the decision maker can determine not only the expected value of the return but also the probability of achieving or surpassing a given return.

Decision trees

- This method allows the development of combined scenarios, per year / per case.
- It takes under consideration the combined probabilities of different scenarios, that evolve over time, based on what happened the previous year
- The “decision tree” is called as such because of how it depicts the different scenarios evolving over the years of the project
- How to calculate the NPV of a decision tree – based project
- Calculation process of NPV with the use of decision trees:
  - Calculate the NPV of each individual branch
  - Calculate the combined probability of each branch
  - Multiple the NPV of each branch with the respective combined probability and add them all together.

Example

- Assume the following project; k=5%

Year 0	Year 1		Year 2	
Initial Cost	P	CF	P	CF
-100	60%	80	60%	60
			30%	50
			10%	30
	40%	65	50%	55
			30%	40
			20%	30

Calculate the NPV

K	5%						
PROJECT A							
Year 0	Year 1		Year 2				
Initial Cost	P	CF	P	CF	Branch NPV	Combined P	NPV x Comb P
-100	60%	80	60%	60	30.61 €	36%	11.02 €
			30%	50	21.54 €	18%	3.88 €
			10%	30	3.40 €	6%	0.20 €
	40%	65	50%	55	11.79 €	20%	2.36 €
			30%	40	-1.81 €	12%	-0.22 €
			20%	30	-10.88 €	8%	-0.87 €
						100%	**16.37 €**

The Relationship between Risk and Return

- There is a direct relationship between risk and return:
  - The higher the risk, the higher the required rate of return, and possible/expected return
- An optimal combination of risk and return is the highest expected return for a given amount of risk.
- An optimal combination of risk and return is the lowest level of risk for a given expected return.

Measuring Risk

Diversification - Strategy designed to reduce risk by spreading the portfolio across many investments.

Unique Risk - Risk factors affecting only that firm.

Market Risk - Economy-wide sources of risk that affect the overall stock market. Also called "systemic risk". Market risk cannot be eliminated through diversification.

Cost of capital

Cost of Capital: Definition

Firm's average cost of funds, which is the average return required by firm's investors.

Estimating the Cost of Capital

If we divide the costs of capital into debt and equity portions of the firm, then we can use the above to arrive at the weighted average cost of capital (WACC) for the firm:

$$k_{Firm} = x_{Debt}k_{Debt} + x_{Equity}k_{Equity}$$

Cost of Debt

- The cost of debt to the firm is the effective yield to maturity (or interest rate) paid to its bondholders

Since interest is tax deductible to the firm, the actual cost of debt is less than the yield to maturity:

Equation 1

$$k_{Debt} = \text{yield} \times (1 - \text{tax rate})$$

Financing Sources

- There are four basic sources of long – term funds for the firm:
  - long-term debt,
  - preferred stock,
  - retained earnings and
  - common stock.

A). Long – term debt: Cost of bonds

- The cost of debt is the discount rate that equates the net proceeds from the sale of the bond, with the present value of the outflows that the firm pays to bondholders, adjusted for the tax deductibility of interest.

NP = the net proceeds from a bond, **It** = the interest payment per period, **n** = the number of periods to maturity, **FV** = the face value (or par value) of the bond, **kd** = the cost of debt.

$$NP = \sum_{t=1}^{n} \frac{I_t}{\left(1+k_d\right)^t} + \frac{FV}{\left(1+k_d\right)^n}$$

Example

- Firm ABC plans a 20-year maturity bond issue. The par value of the bond will be €1,000 and its coupon interest rate is 10%. The bond will be sold at a price equal to its par value and the coupons will be paid annually. The flotation costs (the total cost of issuing and selling the bond) will be 1% of the par value of the bond or € 10. The marginal tax rate of the firm is 40%. Calculate the after tax cost of debt.

$$(1,000-10)=\sum_{t=1}^{20}\frac{(100)_t}{\left(1+k_d\right)^t}+\frac{1,000}{\left(1+k_d\right)^{20}} \Rightarrow k_d = 11.13\%$$

K(dt) =(0.1113)*(1-0.4)=6.68%

A). Long – term debt: Cost of loans

- If the firm is dealing with a bank loan, the cost of debt is calculated as follows:

$$NP = \sum_{t=1}^{n} \frac{I_t + P_t}{\left(1 + k_d\right)^t}$$

NP = the net proceeds from the bank loan, **It** = the annual interest payment, **n** = the number of years that the loan lasts, **Pt** = the annual repayment of the principal of the loan, **kd** = the cost of the bank loan

- The after tax cost of debt is found by the following equation: $\mathbf{k_{dt} = k_d \times (1\text{-}t)}$

B). Cost of Preferred Stock

Preferred stock:

- has a fixed dividend (similar to debt)
- dividends are not tax deductible to the firm and are expected to be perpetual or infinite
- Its evaluation (i.e. how preferred stock price is determined) is similar to the evaluation of a perpetuity

$$k_{ps} = \frac{D_{ps}}{M_0}$$

D_{ps} = annual dividend of preferred stock
M_0 = the net proceeds per preferred share net of flotation costs
k_{ps} = cost of preferred stock

Example

Firm ABC plans to issue a new preferred stock in order to finance an investment project. The stock will be sold at its par value which is €100. The annual dividend of the preferred stock will be 12% of its par value. The firm estimates that the flotation costs will be 2.5% of its par value. Calculate the cost of the preferred stock.

Answer

- The net proceeds to the firm from each stock will be (100-0,025x100 =) €97.5. Each annual dividend will be (0.12*100 =) € 12.
- Therefore, the cost of the preferred stock will be
- $k_{ps} = (12/97.5) = 0.1231$ or 12.31%.

C). The Cost of Equity: Common Stock

- Rate of return investors require on the firm's common stock
- Alternative methods for estimating the cost of common stock
  - Method 1: Using the Capital Asset Pricing Model (CAPM)
  - Method 2: Using the Constant-Growth Dividend Model
  - Method 3: Bond-yield-plus-risk premium approach

C). Cost of Common Equity- The CAPM Approach

- The first method for estimating the cost of common equity is the CAPM method:

$$E(R_i) = R_{rf} + \beta_i\left[E(R_m) - R_{rf}\right]$$

Equation 2

$$k_{cs} = R_{rf} + (\beta_{cs} \times Market\ risk\ premium)$$

Risk Premium

- The risk premium is the difference between the market rate of return R_m and the risk-free rate of return R_{rf}
- The difference between the required return on a risky asset R_i and the return on a risk-free asset R_{rf} is an investor's compensation for risk

$$E(R_i) = R_{rf} + Compensation\ for\ bearing\ Systematic\ risk$$

Measuring Systemic Risk

- The market's influence on a stock's return is quantified in the stock's **beta.**

- If the beta of an asset is:
  - Zero, the asset has no measurable systemic risk
  - Greater than one, the systemic risk for the asset is greater than the average for assets in the market
  - Less than one, the systemic risk for the asset is less than the average for assets in the market

Compensation for risk

- The Capital Asset Pricing Model (CAPM) describes the relationship between risk and required return for an asset

$$E(R_i) = R_{rf} + \beta_i\left[E(R_m) - R_{rf}\right]$$

CAPM Example

A stock has a beta of 1.5. The expected return on the market is 10% and the risk-free rate is 4%. What is the expected return for the stock?

$$\begin{aligned} E(R_i) &= R_{rf} + \beta_i\left[E(R_m) - R_{rf}\right] \\ &= 0.04 + 1.50(0.10 - 0.04) \\ &= 0.13, or\ 13\% \end{aligned}$$

C). Cost of Common Equity-Valuation Approach

- In the second method to estimate the cost of equity we use the constant growth valuation model

$$P_0 = \frac{D_1}{K - g}$$

We can rearrange this equation to solve for the required rate of return:

Equation 3

$$k_{cs} = \frac{D_1}{P_0} + g$$

- In order to solve for the cost of common stock, we must estimate the dividend that stockholders will receive next period, D_1, as well as the rate at which the market expects dividends to grow at a constant rate, g

Example

- The ABC's common shareholders received recently a € 5 per share dividend and they expect dividends to grow at a rate of 10% into the foreseeable future. If the current market stock price is € 100, which is the investor's required rate of return (and consequently the cost of common stock equity of ABC)?

$$k_s = \frac{D_1}{P_0} + g = \frac{D_0(1+g)}{P_0} + g = \frac{5(1+0.10)}{100} + 0.10 = 0.1550$$

C). Cost of Common Equity: Bond-yield-plus-risk premium approach

- The risk premium approach

$$\mathbf{k_s = k_d + RP}$$

- The firm's stockholders undertake higher risk than the long-term debt holders and consequently they should require a risk premium.
- This method does not allow the risk premium to change over time.
- The percentage of the risk premium is usually estimated from a large number of firms and consequently this method is less likely to produce a precise cost of equity than other methods (for example, the capital asset pricing model- CAPM) that estimate directly the required rate of return of the firm's equity.

D). Cost of New Common Stock

- If the retained earnings are not enough to finance the investment projects of the firm, then the firm should issue new equity.
- In this case, the sale of new common equity involves flotation costs.
- The common practice is to use the dividend discount model, modified in such a way, so as to consider that the firm will receive less money from the sale of the new share, than the value of the old share.

$$k_e = \frac{D_1}{NP} + g$$

Example

The firm's ABC common shareholders have recently received €5 per share dividend and expect dividends to grow in the future at an annual rate of 10%. If the current market stock price is €100 and the flotation costs incurrent in selling new stock is 15% of the current stock price, which is the required rate of return (and consequently the cost of new common stock) of ABC?

$$k_e = \frac{D_1}{NP} + g = \frac{D_0\left(1+g\right)}{NP} + g \qquad \Rightarrow$$

$$k_e = \frac{5\left(1+0.10\right)}{100-\left(0.15\times 100\right)} + 0.10 = 0.1647$$

Weighted Average Cost of Capital, WACC

- The overall cost of capital is a weighted average of the various sources, including debt, preferred stock, and common equity
- $\mathbf{WACC = w_d k_d(1\text{-}t) + w_{ps} k_{ps} + w_{ce}\ (k_s\ ή\ k_e)}$
- where, **kd** = the cost of debt, **kps** = the cost of preferred stock, **ks (or ke)** = the cost of retained earnings (or the cost of the new equity), **t** = the firm's marginal tax rate, and **wd, wps, wce** = the proportion of debt, preferred stock and common stock in the firm's capital structure.
- It should be noted that the financial analyst should use market values rather than book values to calculate WACC.

Example

- ABC has a target capital structure of 30% debt, 10% preferred stock and 60% common stock.
- Furthermore, the firm has calculated that the before-tax cost of debt is 11.13%, the cost of preferred stock is 12.31%, and the cost of retained earnings is 15.50%.
- Its marginal tax rate is 40%.
- If the firm wants to raise €1,000,000 in order to increase its capital budget calculate the firm's weighted average cost of capital.

Answer

- In order to maintain its target capital structure, ABC should finance the new investment projects with €300,000 debt, €100,000 new preferred stock and €600,000 retained earnings (we assume that its retained earnings are enough to meet its needs for new equity). The weighted average cost of ABC will be:
- $WACC = w_{d*}k_{d*}(1\text{-}t) + w_{ps*}k_{ps} + w_{ce*}k_s$
- $WACC = (0.30)*(0.1113)*(1\text{-}0.40) + (0.10)*(0.1231) + (0.60)*(0.1550)$
- WACC = 0.1253 or WACC = 12.53%

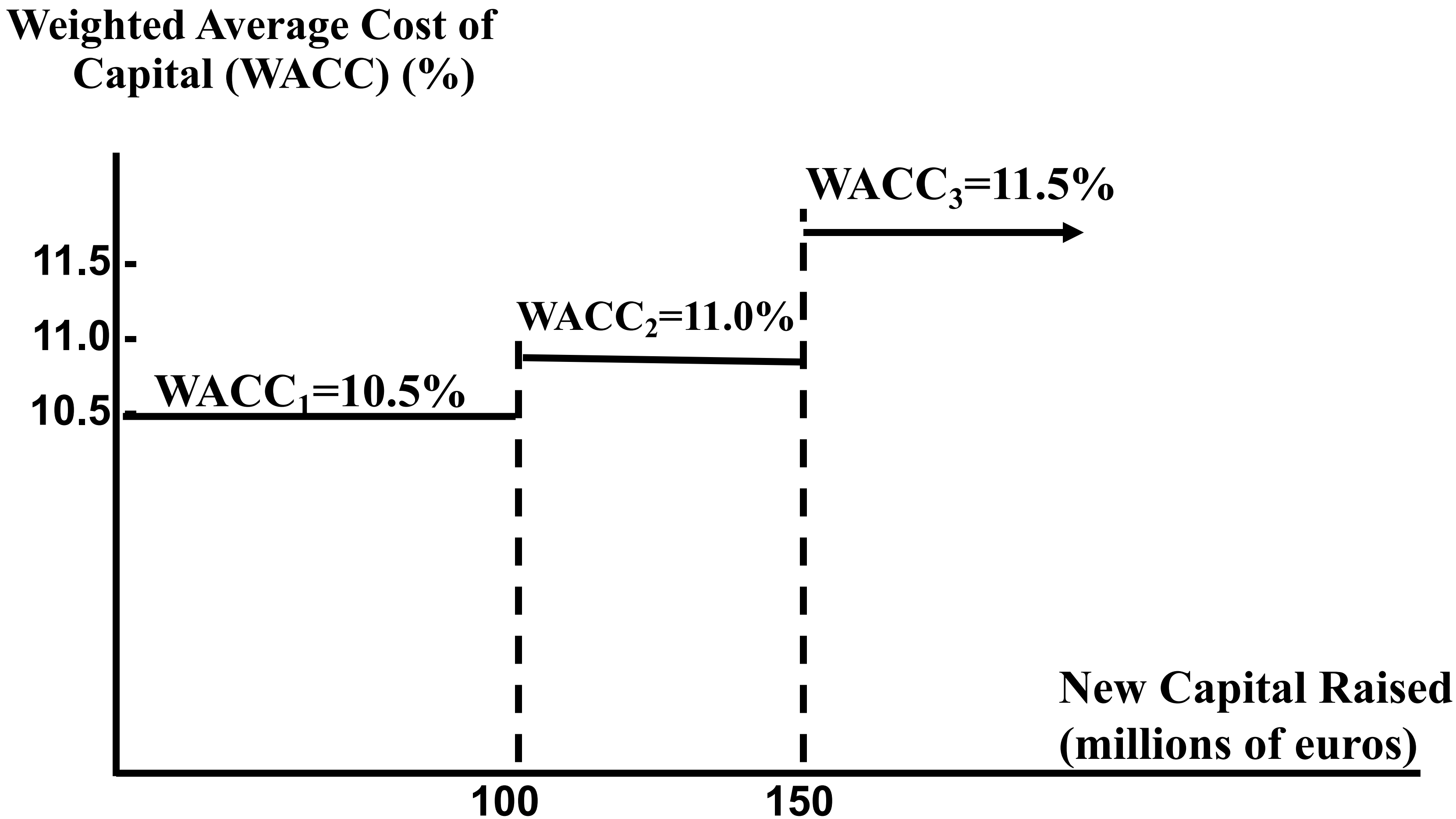
The Marginal Cost of Capital

- The market may demand a higher cost of capital for each amount of fund required if a large amount of financing is required.

Marginal Cost of Capital Schedule (MCC)

- A graph that relates the firm's weighted average cost of capital to the total amount of new capital raised
- Reflects changing costs, depending on amounts of capital raised

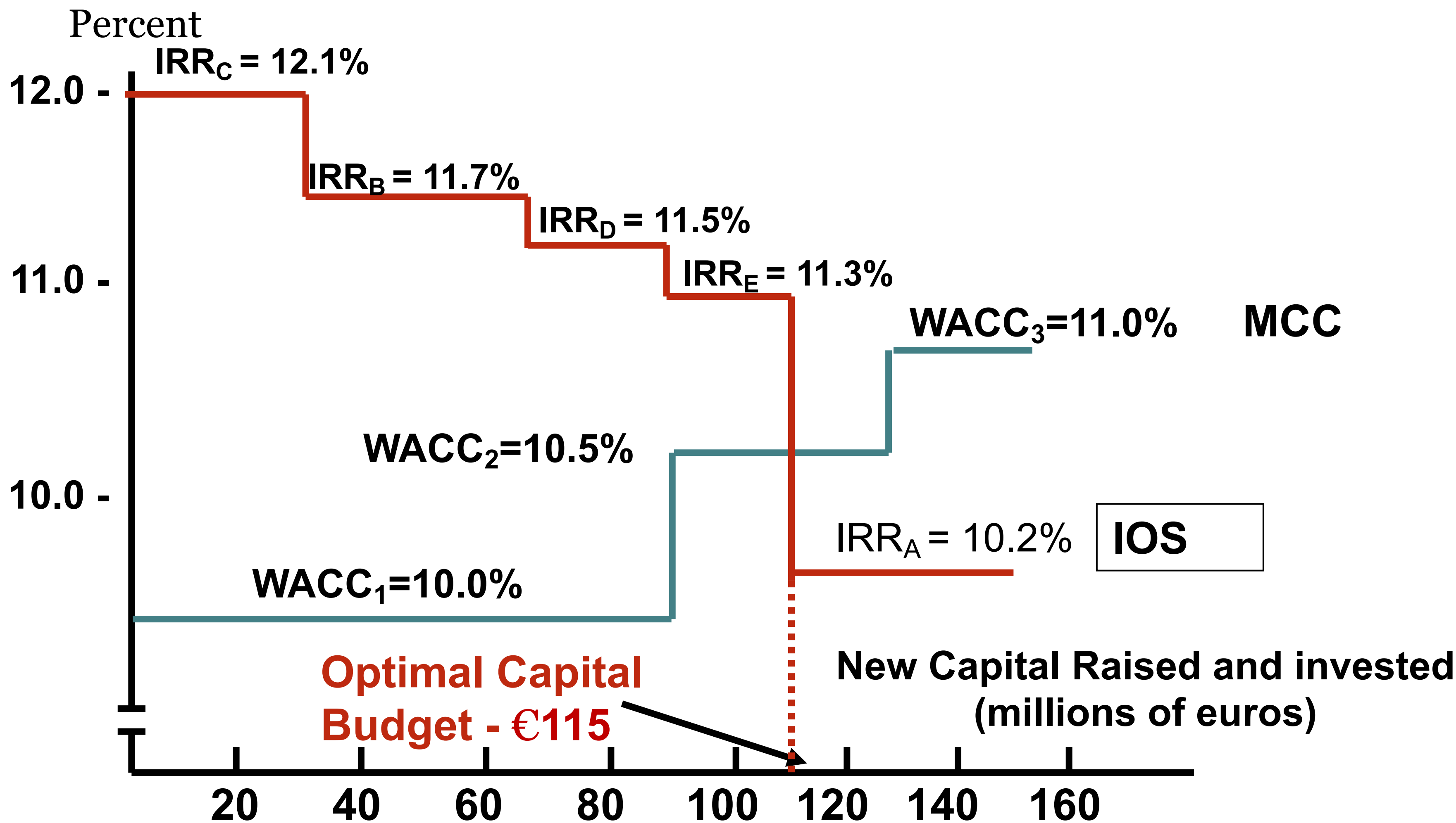
MCC Schedule



Combining the MCC and Investment Opportunity Schedules

- Use the MCC schedule to find the cost of capital for determining projects' net present values.
- Investment Opportunity Schedule (IOS)
  - Graph of the firm's investment opportunities ranked in order of the projects' internal rate of return

Combining the MCC and Investment Opportunity Schedules



Capital structure

Capital Structure and Firm Value

- A firm's capital structure is the mix of financial securities used to finance its activities.
- The mix will always include common stock and will often include debt and preferred stock.
- The firm may have several classes of common stock, for example with different voting rights and possibly different claims on the cash flows available to stockholders.

Capital Structure and Firm Value

- The debt at a firm can be long term or short term, secured or unsecured, convertible or not convertible into common stock, and so on.
- Preferred stock can be cumulative or noncumulative and convertible or not convertible into common stock
- The fraction of the total financing that is represented by debt is a measure of the financial leverage in the firm's capital structure.

Capital Structure and Firm Value

- A higher fraction of debt indicates a higher degree of financial leverage.
- The amount of financial leverage in a firm's capital structure is important because it affects the value of the firm.

Optimal Capital Structure

- Managers at a firm choose a capital structure so that the mix of securities making up the capital structure minimizes the cost of financing the firm's activities.
- The capital structure that minimizes the cost of financing the firm's projects is also the capital structure that maximizes the total value of those projects and, therefore, the overall value of the firm.

The Effect of Capital Structure on Stock Prices and the Cost of Capital

- The optimal capital structure maximizes the price of a firm's stock; this structure always calls for a debt/assets ratio that is lower than the one that maximizes expected EPS.

Stock Price and Cost of Capital Estimates with Different Debt/Assets Ratios

Debt/ Assets	k_d	Expected EPS	Estimated Beta	$k_s = [k_{RF} + (k_M - k_{RF})\beta_s]$	Estimated Price	Resulting P/E Ratio	WACC
0%	-	$2.40	1.50	12.0%	$20.00	8.33	12.00%
10	8.0%	2.56	1.55	12.2	20.98	8.20	11.46
20	8.3	2.75	1.65	12.6	21.83	7.94	11.08
30	9.0	2.97	1.80	13.2	22.50	7.58	10.86
40	**10.0**	**3.20**	**2.00**	**14.0**	**22.86**	**7.14**	**10.80**
50	12.0	3.36	2.30	15.2	22.11	6.58	11.20
60	15.0	3.30	2.70	16.8	19.64	5.95	12.12

All earnings paid out as dividends, so EPS = DPS.
Assume that k_{RF} = 6% and k_M = 10% and Corporate Tax = 40%.

$$\text{WACC} = w_d k_d(1 - T) + w_s k_s$$

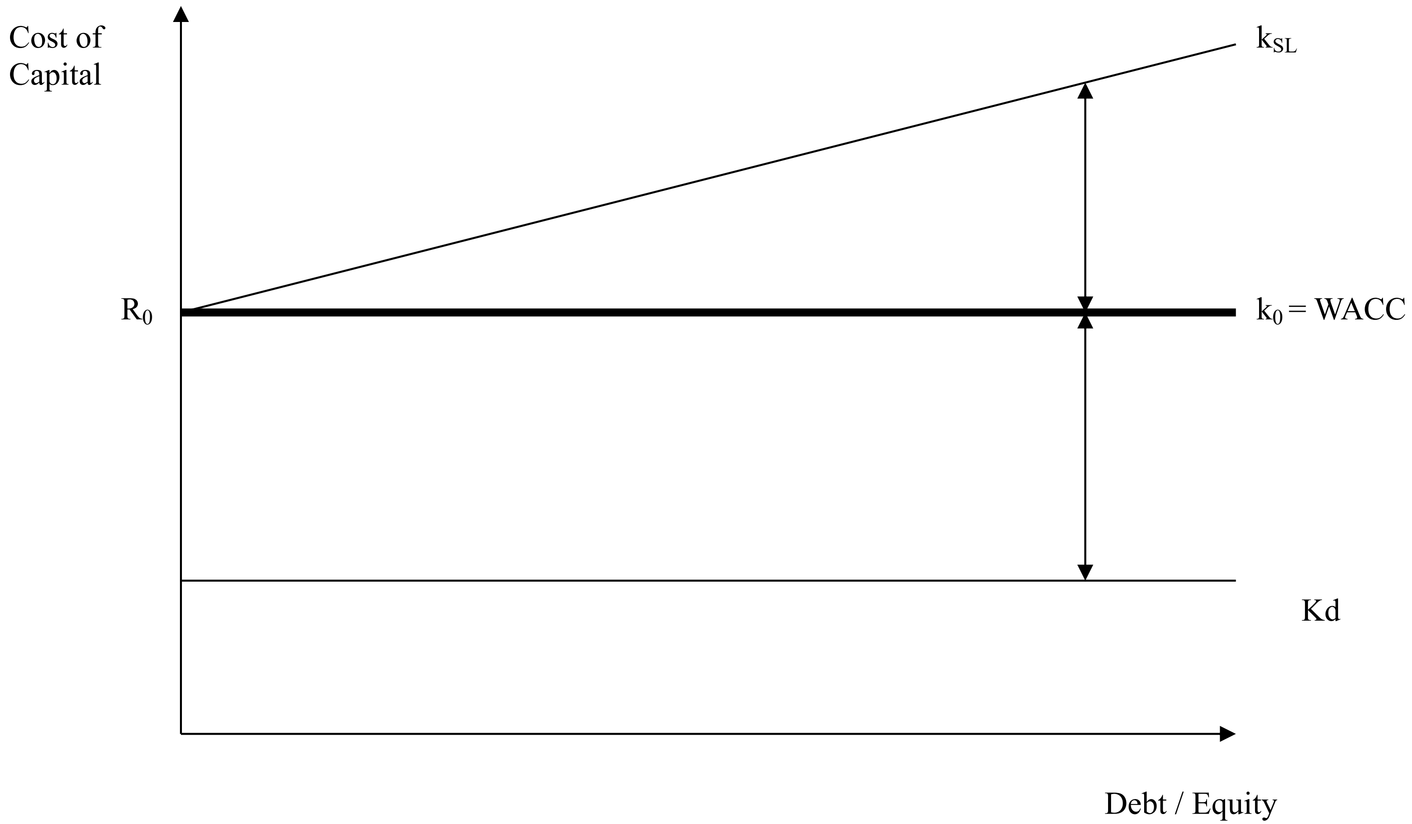
$$= (D/A)(k_{dT}) + (1 - D/A)k_s$$

At D/A = 40%, WACC = 0.4[(10%)(0.6)] + 0.6(14%) = 10.80%

The Approach of MM (without taxes)

- An increase in the use of debt leads to an increase in the earnings per share (EPS) and in the dividends per share (DPS), due to financial leverage.
- This increase however is completely offset by the increase in the cost of equity.
- The increase of the latter is due to the increase of financial risk, which comes from the increase of debt capital.
- Thus, the firm's overall cost of capital, which is called the firm's **capitalization rate**, remains constant.
- This approach of MM is known as the **Net Operating Income approach** (NOI) or the independence hypothesis.
- Three basic conclusions:
  - The firm's capital structure is irrelevant to the maximization of the shareholders' wealth.
  - The value of a firm is determined by its investment decisions and is not affected by its financing mix.
  - An increase in financial leverage used by a firm increases the risk and the expected rate of return on equity, but does not increase the firm's stock price.

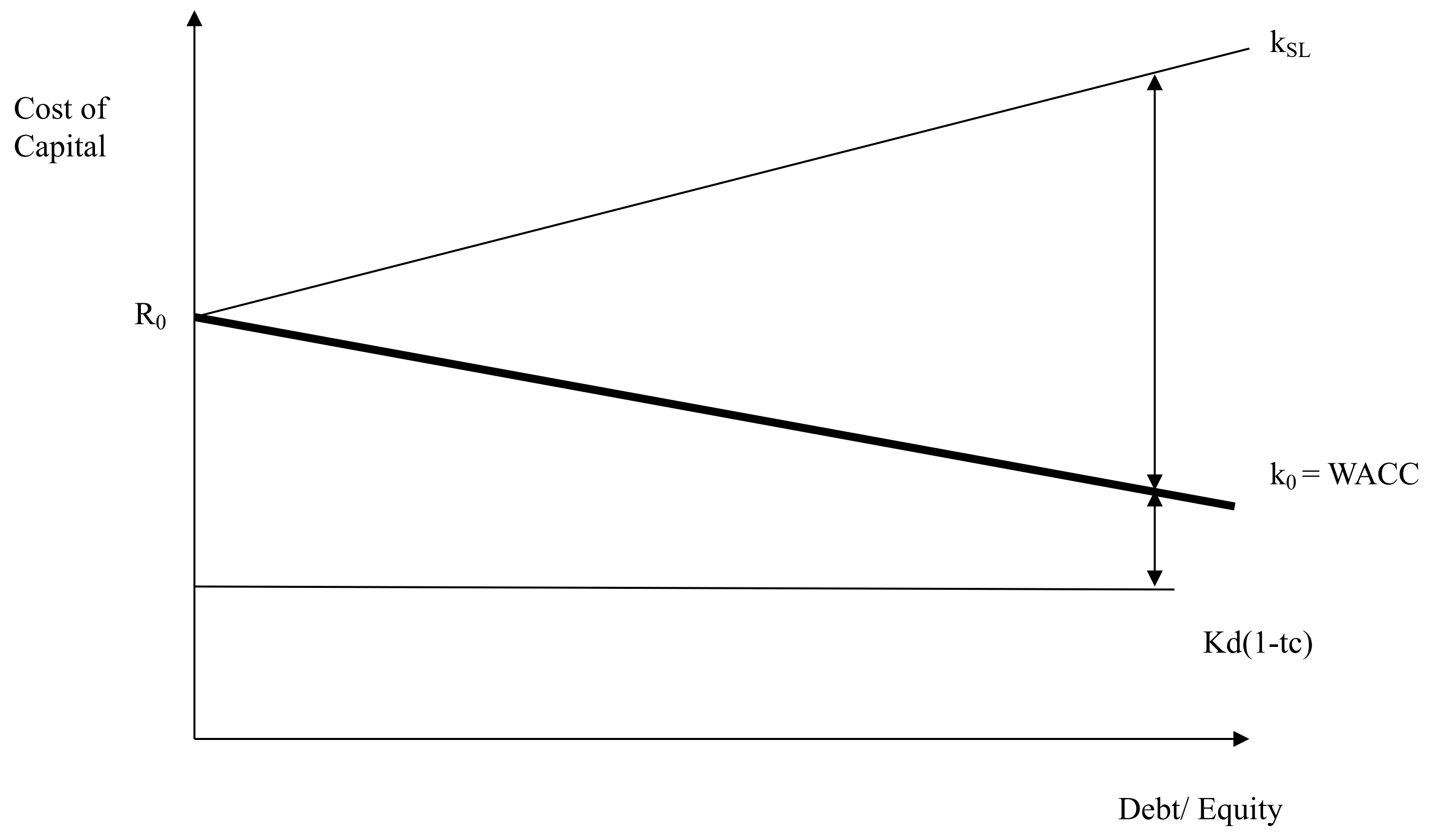
MM Net Income Approach (without taxes)



The Approach of MM (with taxes)

- If we take into account that the earnings of firms are taxed, then a firm's value is increased the more debt capital the firm uses.
- Consequently, firms are encouraged to finance their activities with 100% debt capital. This approach is based on the fact that the interest expense of debt is deducted from the firm's taxable income.
- According to this approach, the total cost of capital and the stock price are influenced by the use of debt.
- The use of more debt causes the cost of equity to rise at a slower rate than it did in the absence of taxes.
- Moreover, the cost of debt is less than the cost of equity (because of the tax shield) and thus if a firm uses more debt (i.e. it employs greater financial leverage) the firm's average cost of capital decreases.
- Consequently, more debt leads to an increase in the common stock price. Thus, the MM approach leads to the conclusion that the firm value (or the stock price), as well as the total cost of capital, are influenced by the capital structure.

MM Net Income Approach (with taxes)



- In 1977 M. Miller introduced personal taxes in the previous analysis.
- In this case, the value of a firm which does not use debt is even lower than before, as the firm’s discounted expected net income is less than before, because of the personal income tax payment paid by its investors.

Example

- ABC is an unlevered firm.
- It is estimated EBIT to be constant.
- All profits are being distributed.
- Cost of common stocks: 12%
- In case ABC becomes levered, cost of debt before taxes: 10%
- Debt is being used to purchase firm's common stocks.

A). If EBIT: 1.2 mil. € & ABC borrows 5 mil. €, show that the total value of ABC and cost of capital are independent to its debt (tc=0).

B). If EBIT : 2 mil. € & ABC borrows 5 mil. € show that the total value of ABC is being increased and total cost of capital is being reduced due to its debt (tc=40%).

Answer

A). $$V_L = V_U = \frac{1,200,000}{0.12} = 10,000,000$$

- Total value of ABC after the debt:

  S=V-D= 10,000,000-5,000,000=5,000,000

- Cost of common stocks of ABC:

$$k_{SL} = k_{SU} + RP = k_{SU} + (k_{SU} - k_d) * (\frac{D}{S}) = \left[0.12 + (0.12 - 0.10) * (5,000,000 / 5.000.000)\right] = (0,12 + 0,02) = 0,14$$

- Cost of capital of ABC:

$$WACC = (\frac{D}{D+S}) * k_d * (1 - t_c) + \frac{S}{D+S} * k_{SL} = \left[(5.000.000 / 10.000.000) * 0,1 * (1 - 0)\right] +$$

$$\left[(5.000.000 / 10.000.000) * 0,14\right] = (0,05 + 0,07) = 0,12$$

- So the total value of ABC and its cost of capital are irrelevant to its debt.

Answer

B). $$V_U = \frac{EBIT*(1-t_c)}{k_{sU}} = \frac{2,000,000*(1-0.4)}{0.12} = 10,000,000$$

- Total value of ABC after debt:

$$V_L = V_U + t_c * D = 10,000,000 + 0.4*5,000,000 = 12,000,000$$

- Total value of ABC equity after debt:

  S=V-D= 12,000,000-5,000,000=7,000,000

- Cost of common stock of ABC:

$$k_{SL} = k_{SU} + RP = k_{SU} + \frac{D}{S}*(1-t_c)*(k_{SU} - k_d) = 0.12 + \left[(0.12-0.10)-(1-0.4)*(\frac{5,000,000}{7,000,000}) \right] =$$

$$0.12 + 0.0086 = 0.1286$$

Answer

B).

- Cost of Capital of ABC:

$$WACC = (\frac{D}{D+S})*k_d*(1-t_c)+\frac{S}{D+S}*k_{SL} = \left[(5,000,000/12,000,000)*0.1*(1-0.4)\right]+$$

$$\left[(7,000,000/12,000,000)*0.11286\right] = (0.025+0.075) = 0.10$$

- So the total value of ABC increased and cost of capital reduced due to its debt.

Criticism of the 2 MM Approaches

- The assumption that there are no brokerage costs is not realistic.
- The assumption that all investors can borrow at the same interest rate as that of firms is not realistic. Some institutional investors are not allowed to borrow funds in order to buy securities.
- The financial leverage of individual investors ("homemade" leverage) and the financial leverage of firms (corporate leverage) are not perfect substitutes, as MM assume. the stockholders of the levered firm that uses debt capital are exposed in less risk than the stockholders who have invested their own funds plus a proportional debt capital in an unlevered firm.
- The view that the tax shield is the same for all firms is also not realistic. Tax saving usually differs among firms. For example, firms that are profitable can save more tax than firms that are struggling to survive.
- The assumption that there are no agency costs and costs associated with financial distress is not realistic.

Financial distress

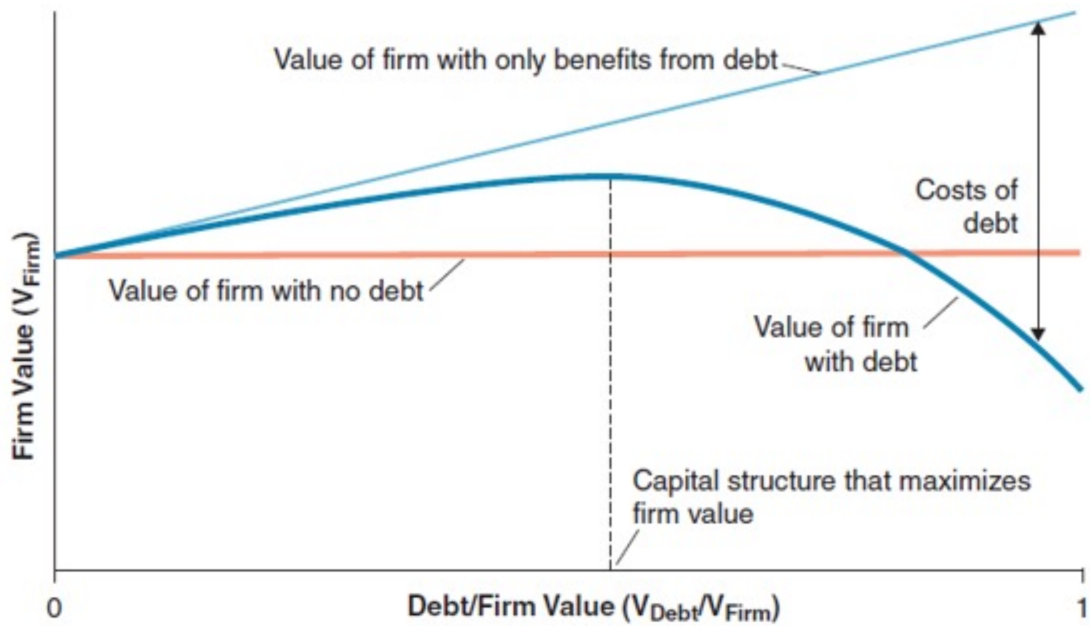
- The more debt a firm uses, the higher the probability this firm will bankrupt. The problems begin to arise well before the firm reaches in the stage of bankruptcy.
- the loss of capable executives,
- the refusal of suppliers to grant credits,
- The cancellation of orders from the customers, because of their concern for potential inability of the firm to produce and supply the products,
- the lack of sufficient funds, that leads the firm to reject attractive investment projects which, under other circumstances, would increase the stockholders wealth.
- the existing equipment will not be replaced and will become obsolete, resulting in lower levels of effectiveness and competitiveness,
- In the case of bankruptcy, the firm's assets are sold after a long time interval (as the process is time-consuming) and most of the time they are sold at a lower price than their real market value.
- In the case of bankruptcy, administrative expenses and the lawyers' fees absorb a considerable part of the firm's value.
- The increase of bankruptcy probability leads the firm to borrow new capital at a higher cost than before, due to an increase profitability of defaulting on debt payments. This increase in cost of debt weakens the firm's financial condition.

Agency costs

- The managers are usually not perfect agents of the shareholders.
- In order to prevent managers from acting solely according to their own interests, the shareholders must undertake specific monitoring activities and give appropriate incentives.
- These procedures are costly and these costs are known as **agency costs**.
- The reduction of firm's efficiency and the monitoring result in agency costs, which roll over the shareholders through the increase of cost of debt and the reduction of stock price.

The Trade-Off Theory

- The trade-off theory of capital structure says that managers choose a specific target capital structure based on the trade-offs between the benefits and the costs of debt.
- The theory says that managers will increase debt to the point at which the costs and benefits of adding an additional dollar of debt are exactly equal because this is the capital structure that maximizes firm value.
- It considers that all retained earnings is identical to new common stocks.



Trade-Off Theory of Capital Structure

The benefits and costs of debt combine to affect firm value. For low levels of debt, adding more debt to a firm's capital structure increases firm value because the additional (marginal) benefits are greater than the additional (marginal) costs. However, at some point, which is the point at which the value of the firm is maximized, the costs of adding more debt begin to outweigh the benefits, and the value of the firm decreases as more debt is added. The difference between the upward-sloping line and the curved line reflects the costs associated with debt.

Signaling Theory

- Symmetric Information
  - Investors and managers have identical information about the firm's prospects.
- Asymmetric Information
  - Managers have better information about their firm's prospects than do outside investors.
- Signal
  - An action taken by a firm's management that provides clues to investors about how management views the firm's prospects

The Pecking-Order Theory

- The pecking order theory recognizes that different types of capital have different costs. This leads to a pecking order in the financing choices that managers make. Managers choose the least expensive capital first then move to increasingly costly capital when the lower-cost sources of capital are no longer available
  - Managers view internally generated funds, or cash on hand, as the cheapest source of capital
  - Debt is more costly to obtain than internally generated funds but is still relatively inexpensive
  - Raising money by selling stock is the most expensive

EBIT – EPS Analysis

- It analyzes the impact of alternative ways of firm's financing on earnings per share, under different possible scenarios of earnings before interest and taxes.
- It should be used in conjunction with other methods of determining capital structure.

Drawbacks

- It does not take into account the effect of the increase in borrowing on cost of equity.
- It does not take into account profit volatility, but only the level of earnings before interest and taxes

Example

Data:

Existing capital structure:

- Long – term debt 300,000, interest rate 12%
- Common stocks (80,000 shares, priced at 16€ per share)

Planning of a new investment 400,000€:

- 1st way of funding (A): edit new stocks priced at 16€ per share .
- 2nd way of funding (B) : edit bonds interest rate 14%.

Other data:

- Tax rate: 40%
- EBIT is estimated to be increased from 100,000€ to 150.000€ with both ways.

Compute EPS.

Answer

Current project (in mil. €):

- Long – term funds (12%): 300 (corresponding interest: 36)
- Equity (80*16): 1,280
- Total debt and equity: 1,580

Project A (in mil. €):

- Long – term funds (12%): 300 (corresponding interest 36)
- Old Equity (80*16): 1,280
- New equity : (400/16=25*16): 400
- Total debt and equity : 1,980

Σχέδιο B (in mil. €):

- Old Long – term funds(12%): 300 (corresponding interest 36)
- New Long – term funds(14%): 400 (corresponding interest 56)
- equity(80*16): 1,280
- Total debt and equity : 1,980

Answer

	Current Project	Project A	Project B
EBIT	100	150	150
(-) Interests	36	36	92
(=) Earning before taxes	64	114	58
(-) Taxes (40%)	25,6	45,6	23,2
(=) Net Income	38,4	68,40	34,8
(-) Dividend of preferred stocks	0	0	0
(=) Earnings for distribution	38,4	68,4	34,8
(/) Number of shares	80	105	80
(=) EPS	0,48	0,6514	0,435

Financial Ratios

- The debt ratios differ according to the firm, industry and economy.
- <u>Long-term debt to total capitalization ratio</u>: Long-term debt / (Long-term debt + net worth)
  - ➢ This ratio shows the relative significance of long-term debt in the capital structure of the firm..
- <u>Long-term debt to net worth ratio</u>: Long-term debt / net worth
  - ➢ This ratio shows the relation between the long-term debt and the net worth of a firm.
- <u>Times – interest earned ratio</u>: EBIT / annual interest expenses
  - ➢ This ratio shows how many times the firm's annual interest payments are covered from its net operating income.
  - ➢ The lower this ratio the higher the probability that the firm will encounter financial difficulties.
  - ➢ A decrease in the sales of a firm usually leads to a decrease in the earnings before interest and taxes.

Dividend policy

Dividend Policy Characteristics (1)

- Dividend policy refers to the decision of a firm's management to choose the relation between the earnings as dividends or to retain and reinvest them in the firm.
- It is a jointly decision with the decisions of capital structure and of capital budgeting.
- Most firms refrain from varying their dividend policy frequently.
- The decision on the dividend policy that a firm will follow is confined by the dividend policy that the firm has followed in the past.
- The optimal dividend policy is the one that maximizes shareholders' wealth.

Dividend Policy Characteristics (2)

- The dividend payout ratio, which is the percentage of earnings that are distributed to the stockholders in the form of cash dividends. For example, if the dividend per share is € 1 and the earnings per share are € 2.5, then the dividend payout ratio is 40%. The complement of the payout ratio (that is, 1.00 – dividend payout ratio) denotes the proportion of earnings retained within the firm and is called retention rate.
- The stability of the dividend over time.
- The size (in €) of the next dividend that will be distributed.

How Firms Pay Dividends

<u>Stock Dividend</u> - Distribution of additional shares to a firm's stockholders

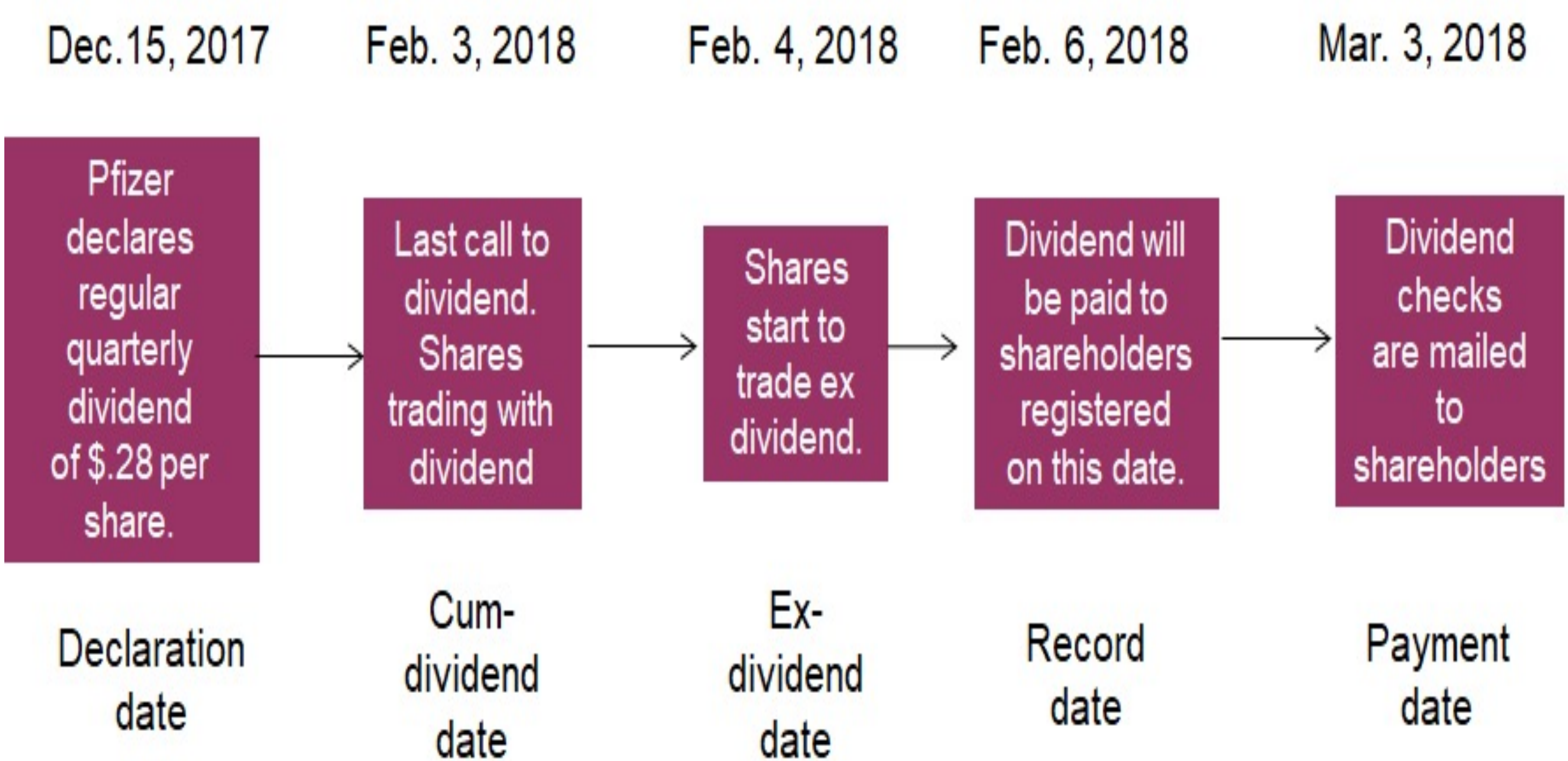
<u>Stock Splits</u> - Issue of additional shares to firm's stockholders

<u>Cash Dividend</u> - Payment of cash by the firm to its shareholders

-Regular

-Special

Dividend Payments Mechanism: Diagram



Dividend Payments Mechanism

- **Declaration date**: On December 15, for example, the Board of Directors decides the payment dividend of 0.28 € per share on Mars 3 (payment date), to all those who hold shares on February 6 (record date).
- **Record date**: On February 06, the company prepares a list of all company's shareholders on that day. The dividend will not be distributed to shareholders not listed till the 6th of February.
- **Cum-dividend date**: Shareholders have the opportunity to receive dividend if they buy shares three working days before the record date (i.e. until February 03 which is the cum - dividend date).
- The second day before the record date (February 04) is called **Ex-dividend date** (share trading without the right to dividend)
- **Payment Date**: The payment process to the beneficiaries starts on Mars 03.

Some important comments….

- The ex- dividend date is very important, as those who will buy the stock before that day will receive the current dividend.
- The share price should be reduced on that day.
- This reduction is a sign of efficiency and not inefficiency, as the market discounts the value of the cash dividend.
- In a world without taxes and transfer costs, the share price would be expected to fall as much as the amount of the dividend.

Decision for Dividend Distribution

- Companies set long-term dividend payment targets. Mature companies with fixed profits generally pay a large portion of their profits in dividends. Growing companies, on the other hand, make low payments.
- Business executives pay more attention to dividend changes than to their absolute levels. So if they pay a dividend of € 2 per share, it is an important financial decision if last year's dividend was € 1, while it is not an important decision if it was € 2.
- Dividend changes follow changes in long-term profits. Temporary earnings changes are very difficult to influence dividend policy.
- Business executives are reluctant to make dividend changes that may need to be maintained. They are particularly concerned about the fact that in the future they may be forced to cancel the dividend increase.

- According to Lintner's model the dividend depends on the company's current earnings and the previous year's dividend, which in turn depends on the same year's earnings and the previous year's dividend, and so on.
- Dividends are therefore described as a weighted average of current and past earnings.

Dividend Policy and Stock Value

- Dividend Irrelevance Theory
  - Theory states that a firm's dividend policy has no effect on either its value or its cost of capital.
  - Investors value dividends and capital gains equally.
- Optimal Dividend Policy:
  - Strikes a balance between current dividends and future growth that maximizes the firm's stock price.
- Dividend Relevance Theory
  - A firm's value is affected by its dividend policy.

Residual dividend theory

- The firm will distribute dividends only once having financed all the profitable investment projects.
- The size of the dividend distributed depends on the firm’s investment opportunities of the company and its profits.

Investors and Dividend Policy

- Information Content, or Signaling
  - Signaling hypothesis says that investors regard dividend changes as signals of management's earnings forecasts.

- Free Cash Flow Hypothesis
  - All else equal, firms that pay dividends from cash flows that cannot be reinvested in positive net present value projects (free cash flows), have higher values than firms that retain free cash flows.

Bird in the hand theory

- According to Lintner (1962) and Gordon (1963)
  - Dividends have less risk than capital gains
  - Therefore the cost of equity decreases as the percentage of distributed profits increases
  - Investors, therefore, look for companies with high dividend yield because they consider them less risky than companies with low dividend yield.
  - Due to this relatively lower risk, the cost of equity should be lower for companies with a high dividend yield than for those with a low dividend yield.
  - Thus, maximizing the percentage of distributed profits will maximize the value of the firm.

Clientele effect

- The tendency of a firm to attract the type of investor who likes its dividend policy
- Some investors prefer dividends for tax reasons, while others prefer capital gains for the same reasons.
- If a company increases its dividend payout ratio, then investors who prefer dividends would buy the firm's shares, while the others would sell them.
- Therefore, there would be no change in the firm value, resulting that the dividend policy does not affect shareholders wealth.

Stock Dividends and Stock Splits

- Stock Dividend: Firm issues new shares instead of paying a cash dividend. If 10%, you would get 10 shares for each 100 owned
  Stock Split: Firm increases the number of shares outstanding, say 2:1.
- A stock split is quite similar to a stock dividend, but it involves the distribution of a larger multiple of the outstanding shares
  - a key distinction between stock dividends and stock splits is that stock dividends are typically regularly scheduled events, while stock splits tend to occur infrequently during the life of a company

Stock Repurchases

- With a stock repurchase, a company buys some of its shares from stockholders
- They give stockholders the ability to choose when they receive the distribution, which affects the timing of the taxes they must pay as well as the cost of reinvesting funds that are not immediately needed
- Stockholders who sell shares back to a company pay taxes only on the gains they realize, and historically these capital gains have been taxed at a lower rate than dividends
- From management's perspective, stock repurchases provide greater flexibility in distributing value.