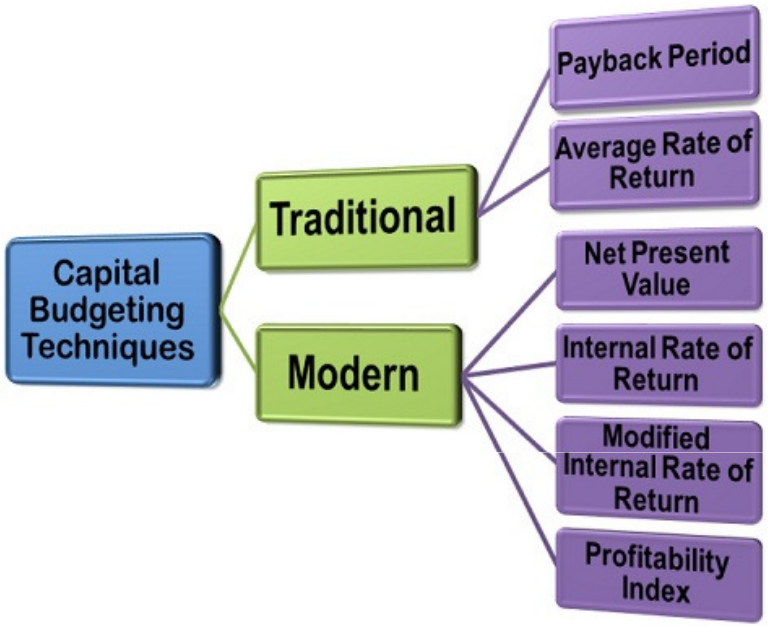
Business Finance : course n°7

Capital Budgeting Decision & Cash flow forecast I
Major investment appraisal methods

BA 2nd Year - 01/11/2019

Capital Budgeting Decision

Capital budgeting, and investment appraisal, is the planning process used to determine whether an organization's long term investments such as new machinery, replacement of machinery, new plants, new products, and research development projects are worth the funding of cash through the firm's capitalization structure (debt, equity or retained earnings).



It is the process of allocating resources for major capital, or investment, expenditures. One of the primary goals of capital budgeting investments is to increase the value of the firm to the shareholders.

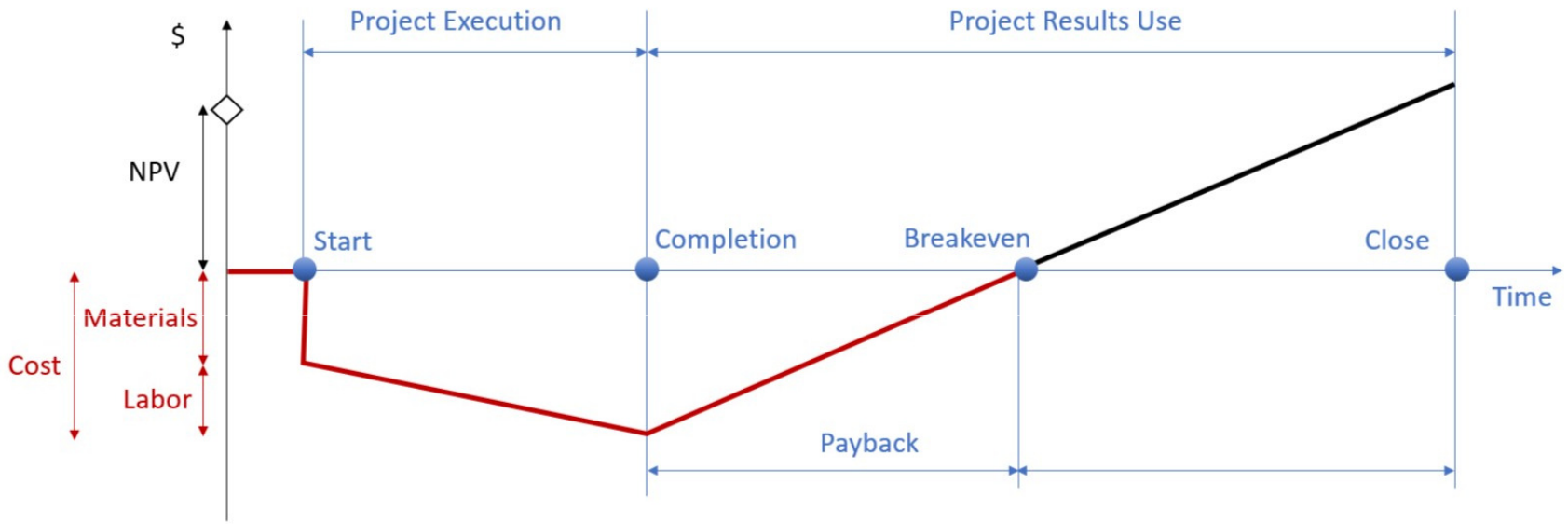
Payback period

Payback period in capital budgeting refers to the time required to recoup the funds expended in an investment, or to reach the **break-even point**.

For example, a $1000 investment made at the start of year 1 which returned $500 at the end of year 1 and year 2 respectively would have a two-year payback period. Payback period is usually expressed in years.

Starting from investment year by calculating Net Cash Flow for each year: Net Cash Flow Year 1 = Cash Inflow Year 1 - Cash Outflow Year 1. Then Cumulative Cash Flow = (Net Cash Flow Year 1 + Net Cash Flow Year 2 + Net Cash Flow Year 3, etc.)
Accumulate by year until Cumulative Cash Flow is a positive number: that year is the payback year.

Payback period



$$NPV = \Sigma \frac{R(t)}{(1+i)^t}$$

R(t) = Cash Inflow – Cash Outflow
i = the Discount Rate
t = time

Payback period

The time value of money is not taken into account.

Payback period intuitively measures how long something takes to "pay for itself." All else being equal, shorter payback periods are preferable to longer payback periods. Payback period is popular due to its ease of use despite the recognized limitations described below. See Cut off period.

The term is also widely used in other types of investment areas, often with respect to energy efficiency technologies, maintenance, upgrades, or other changes. For example, a compact fluorescent light bulb may be described as having a payback period of a certain number of years or operating hours, assuming certain costs. Here, the return to the investment consists of reduced operating costs.

Payback period

Although primarily a financial term, the concept of a payback period is occasionally extended to other uses, such as energy payback period (the period of time over which the energy savings of a project equal the amount of energy expended since project inception); these other terms may not be standardized or widely used.

Other use : for stock investment : the Price / Earning ratio

Payback period

Practical work : what is the payback period of the following stream of cash flows ?

Year	Cash Flow
0	- 50 000
1	5 000
2	7 500
3	9 500
4	12 500
5	15 500
6	18 500
7	22 000
8	25 000
9	27 500
10	31 000

Payback period

Practical work : what is the payback period of the following stream of cash flows ? Answer : 5 years.

Year	Cash Flow	Cumulative Cash Flow
0	- 50 000	
1	5 000	- 45 000
2	7 500	- 37 500
3	9 500	- 28 000
4	12 500	- 15 500
5	15 500	-
6	18 500	18 500
7	22 000	40 500
8	25 000	65 500
9	27 500	93 000
10	31 000	124 000

Payback period

The **Price / Earning Ratio (PER)** is a concept that is

1) Very close to the Payback period concept

1) Widly used for stock comparison

You just divide the current price of a stock by the current earning per share.

Will you prefere high PER or low PER ?

Accounting rate of return

Accounting rate of return, also known as the Average rate of return, or ARR is a financial ratio used in capital budgeting. The ratio does not take into account the concept of time value of money.
ARR calculates the return, generated from **net income** of the proposed capital investment. The ARR is a percentage return. Say, if ARR = 7%, then it means that the project is expected to earn seven cents out of each dollar invested (yearly).
If the ARR is equal to or greater than the **required rate of return**, the project is acceptable. If it is less than the desired rate, it should be rejected. When comparing investments, the higher the ARR, the more attractive the investment. More than half of large firms calculate ARR when appraising projects.

Accounting rate of return

The key advantage of ARR is that it is easy to compute and understand.

The main disadvantage of ARR is that it disregards the time factor in terms of time value of money or risks for long term investments.

The ARR is built on evaluation of profits and it can be easily manipulated with changes in **depreciation methods**.

The ARR can give misleading information when evaluating investments of different size.

Accounting rate of return

$$\text{ARR} = \frac{\text{Average return during period}}{\text{Average investment}}$$

where:

$$\text{Average investment} = \frac{\text{Book value at beginning of year 1} + \text{Book value at end of useful life}}{2}$$

$$\text{Average return during period} = \frac{\text{Incremental revenue} - \text{ Incremental expenses (including depreciation)}}{\text{Initial investment}}$$

$$\text{Average profit} = \frac{\text{Profit after tax}}{\text{Life of investment}}$$

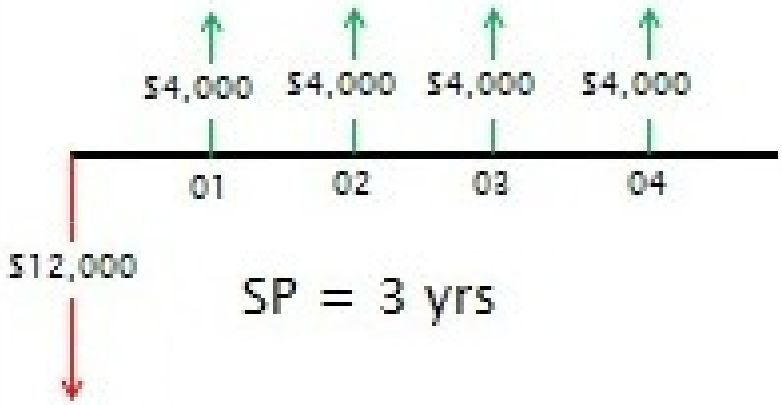
Net Present Value

You know about it allready.
WACC is **Weighted Average Cost of Capital** ; average between debt cost and equity cost.

	A	B	C	D	E	F	G
1							
2		**WACC**	10%			**Method - 1 : Using Basic PV Formula**	
3			**Year**			**PV-Formula**	**Present Value**
4		**2017-A**	0	-$250,000		=D4/((1+$C$2)^C4)	-$250,000
5		**2018-P**	1		$100,000	=E5/((1+$C$2)^C5)	$90,909
6		**2019-P**	2		$150,000	=E6/((1+$C$2)^C6)	$123,967
7		**2020-P**	3		$200,000	=E7/((1+$C$2)^C7)	$150,263
8		**2021-P**	4		$250,000	=E8/((1+$C$2)^C8)	$170,753
9		**2022-P**	5		$300,000	=E9/((1+$C$2)^C9)	$186,276
10		**Sum-PV**					**$472,169**

Net Present Value

Another example



Year (N)	Discount Rate	DF 1/(1+R)^N	Cash Flow	Present Value
1	7%	0.93	$4,000	$3,720
2	7%	0.87	$4,000	$3,480
3	7%	0.82	$4,000	$3,280
4	7%	0.76	$4,000	$3,040
	Totals		$16,000	$13,520

- **Net** present value (NPV) is the sum of the present value and the initial (negative) investment.

  NPV = $13,520 – **$12,000** = $1,520
- Cash flow = **$16,000** – **$12,000** = $4,000

Internal Rate of Return

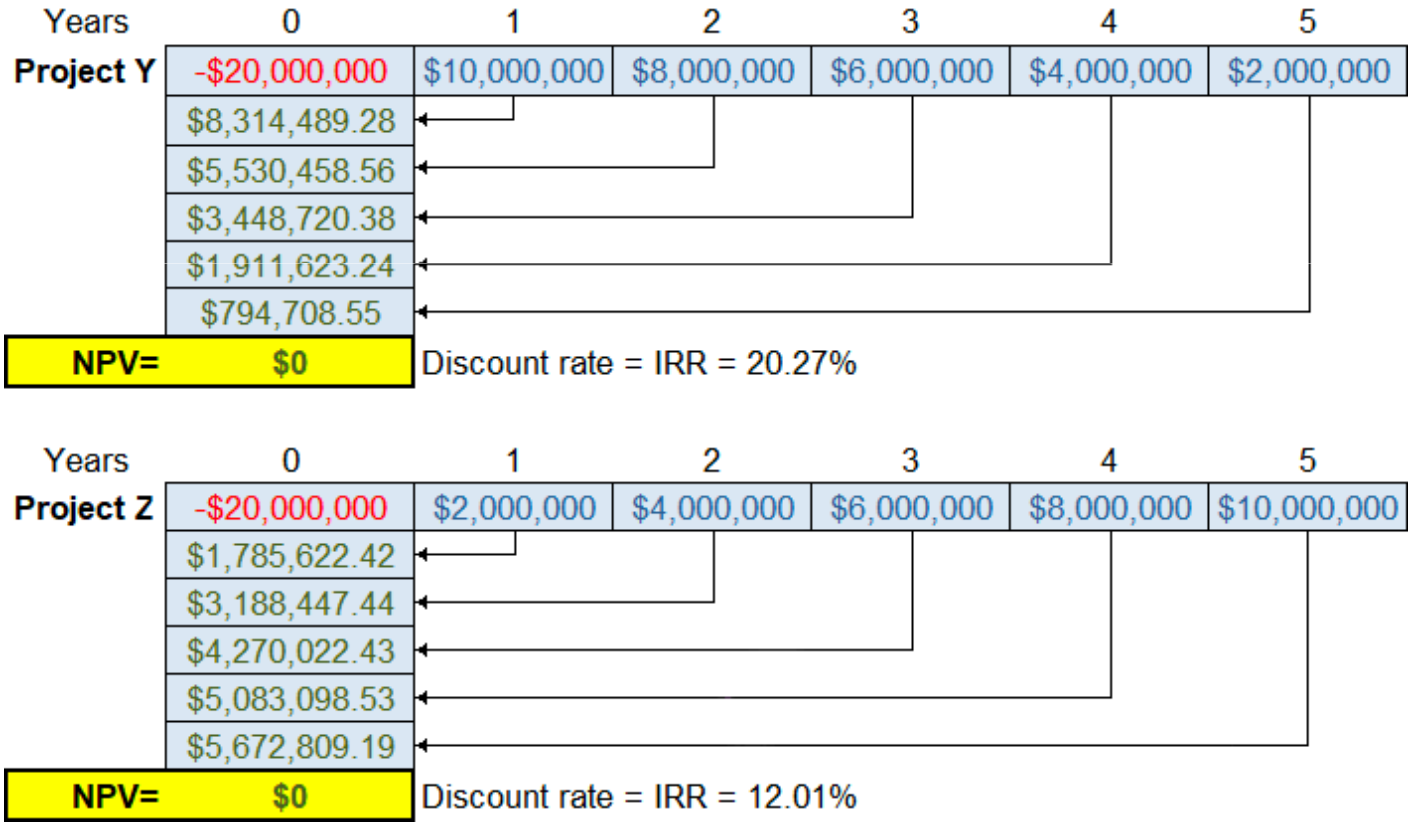
The « interest rate » or rate of return that you compute from a serie of cash flows.

There is an Excel formula that will compute it, this way no need to do succeive trial and error until finding the IRR by hand.

	A	B	C	D	E
1	**Period**	**Cash flow**	**PV**		
2	Initial investment	-$1,000	-$1,000		
3	1	$300	$275.49	=B3/(1+$B$7)^A3	
4	2	$400	$337.31	=B4/(1+$B$7)^A4	
5	3	$500	$387.20	=B5/(1+$B$7)^A5	
6					
7	**IRR**	8.90%	=IRR(B2:B5)		
8	**NPV**	$0.00	=SUM(C2:C5)		

Internal Rate of Return

Another example



Modified Internal Rate of Return

The **Modified Internal Rate of Return (MIRR)** assumes that positive cash flows are reinvested at the firm's cost of capital and that the initial outlays are financed at the firm's financing cost.
By contrast, the traditional internal rate of return (IRR) assumes the cash flows from a project are reinvested at the IRR itself. The MIRR, therefore, more accurately reflects the cost and profitability of a project.

$$MIRR = \sqrt[n]{\frac{FV(\text{Positive cash flows} \times \text{Cost of capital})}{PV(\text{Initial outlays} \times \text{Financing cost})}} - 1$$

Modified Internal Rate of Return usefullness

MIRR improves on IRR by assuming that positive cash flows are reinvested at the firm's cost of capital.

Even though the internal rate of return (IRR) metric is popular among business managers, it tends to overstate the profitability of a project and can lead to capital budgeting mistakes based on an overly optimistic estimate.

The modified internal rate of return (MIRR) compensates for this flaw and gives managers more control over the assumed reinvestment rate from future cash flow.
An IRR calculation acts like an inverted compounding growth rate. It has to discount the growth from the initial investment in addition to reinvested cash flows. However, the IRR does not paint a realistic picture of how cash flows are actually pumped back into future projects.

Cash flows are often reinvested at the cost of capital, not at the same rate at which they were generated in the first place. IRR assumes that the growth rate remains constant from project to project. It is very easy to overstate potential future value with basic IRR figures.

MIRR vs IRR

A basic IRR calculation is as follows.

Assume that a two-year project with an initial outlay of $195 and a cost of capital of 12% will return $121 in the first year and $131 in the second year. To find the IRR of the project so that the net present value (NPV) = 0 when *IRR* = 18.66% :

$$NPV = 0 = -195 + \frac{121}{(1+IRR)} + \frac{131}{(1+IRR)^2}$$

MIRR vs IRR

To calculate the MIRR of the project, assume that the positive cash flows will be reinvested at the 12% cost of capital. Therefore, the future value of the positive cash flows when *t* = 2 is computed as:

$121 x 1.12 + $131 = $266.52

Next, divide the future value of the cash flows by the present value of the initial outlay, which was $195, and find the geometric return for two periods. Finally, adjust this ratio for the time period using the formula for MIRR, given:

$$MIRR = \frac{\$266.52}{\$195}^{1/2} - 1 = 1.1691 - 1 = 16.91\%$$

In this particular example, the IRR gives an overly optimistic picture of the potential of the project, while the MIRR gives a more realistic evaluation of the project.

Profitability Index

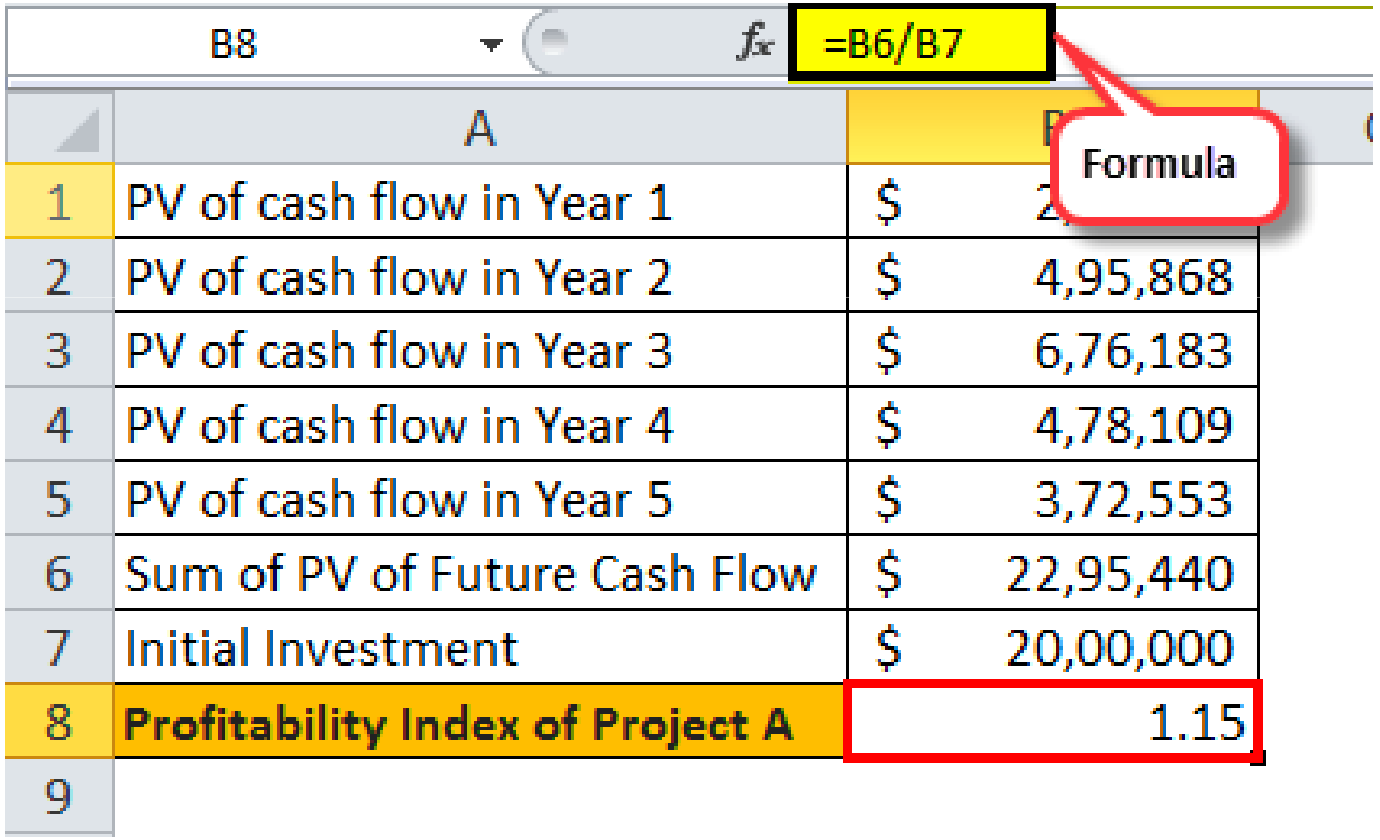
The **profitability index (PI)**, alternatively referred to as value investment ratio (VIR), or profit investment ratio (PIR), describes an index that represents the relationship between the costs and benefits of a proposed project, using the following ratio :

$$= \frac{\text{PV of Future Cash Flows}}{\text{Initial Investment}}$$

The PI is helpful in ranking various projects because it lets investors quantify the value created per each investment unit. A profitability index of 1.0 is logically the lowest acceptable measure on the index, as any value lower than that number would indicate that the project's present value (PV) is less than the initial investment. As the value of the profitability index increases, so does the financial attractiveness of the proposed project.

Profitability Index

Example



	A	B
1	PV of cash flow in Year 1	$ 2
2	PV of cash flow in Year 2	$ 4,95,868
3	PV of cash flow in Year 3	$ 6,76,183
4	PV of cash flow in Year 4	$ 4,78,109
5	PV of cash flow in Year 5	$ 3,72,553
6	Sum of PV of Future Cash Flow	$ 22,95,440
7	Initial Investment	$ 20,00,000
8	**Profitability Index of Project A**	1.15
9		