

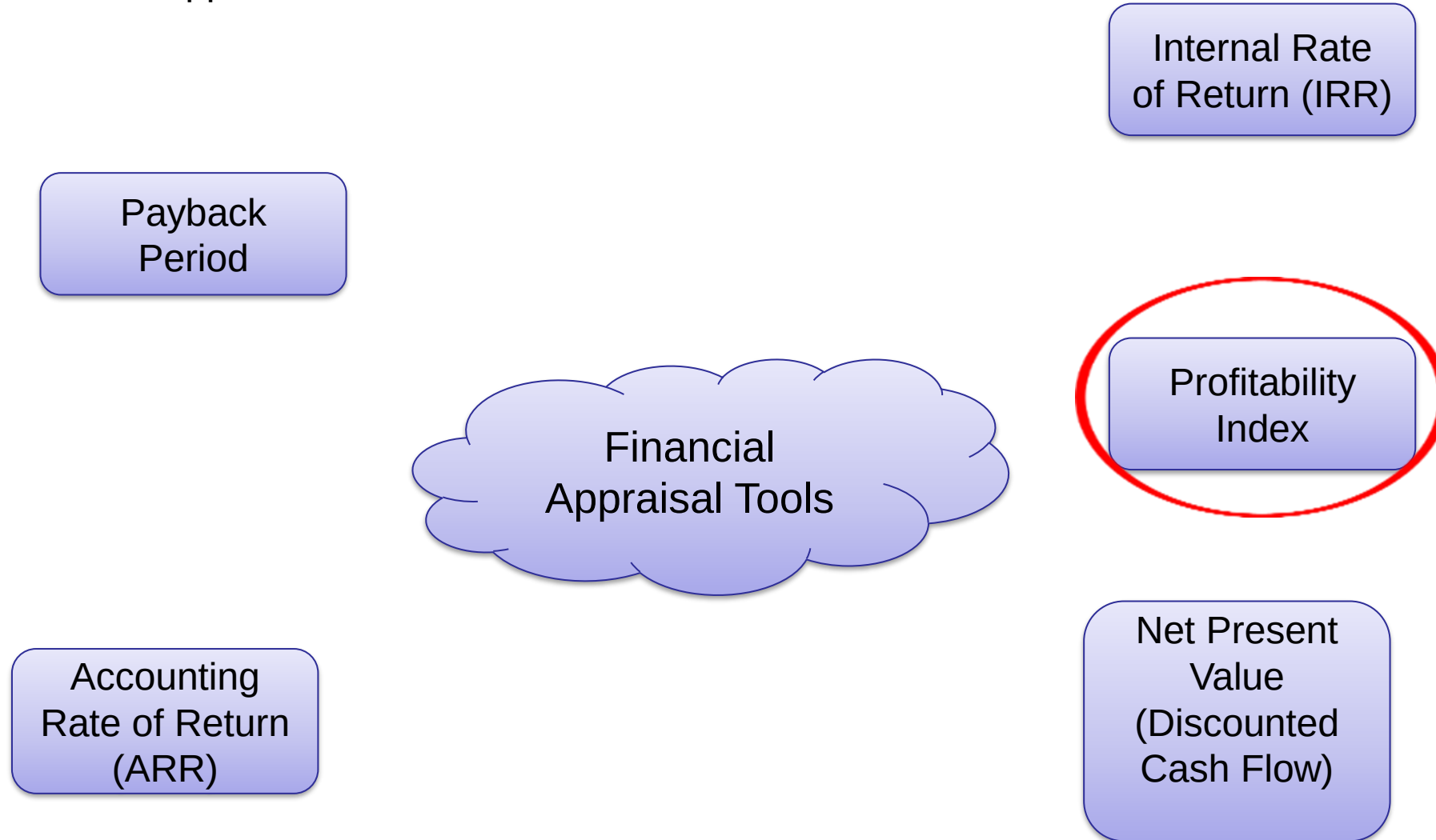
Finance Management & Planning

Project Appraisal (Week 5)

This Week

- Any Questions on NPV, Payback , IRR
- Profitability Index
- Capital Rationing
- BCR

Financial Appraisals Tools



Financial Appraisals Tools

Profitability Index

- Profitability index is a calculation of the potential profit of the proposed project.
- The rule is that a profitability index or ratio greater than 1 indicates that the project should proceed.
- A profitability index or ratio below 1 indicates that the project should be abandoned.
- Profitability index is a variation of the NPV rule
- The formula for PI is the future value of future cash flows divided by the initial cost of the project.

Profitability Index

Example

Project A has an investment of £10,000 with a positive cashflow of £4000 per annum, the companies WACC is 8%
Calculate the PI?

Project A

	Investment	Yr1	Yr2	Yr3	Yr4	Yr5
Present Value	(10,000)	4000	4000	4000	4000	4000
Payback	2.5 Years					
Discount Rate (WACC)	8%					
Denominator	1.00	0.926	0.857	0.794	0.735	0.681
Future Value	(10,000)	3,704.00	3,428.00	3,176.00	2,940.00	2,724.00
NPV	5,972					
NPV (Excel Calculated)	5,971					

Profitability Index = $\frac{\text{NPV of Cash Flows}}{\text{Investment}}$ = $\frac{15,971}{10,000}$ = 1.60

Profitability Index

- Example

	Project A	Project B
• Project Investment	£10,000	£500,000
• Net Cash Flow per year	£ 5,000	£166,667

- Each Project has a life span of 5 years

- Calculate Payback , NPV and PI

- WACC is 15%

$$\text{Profitability Index} = \frac{\text{NPV of Cash Flows}}{\text{Investment}} = \frac{15,971}{10,000} = 1.60$$

Profitability Index

Does this change your stance on which project should proceed ?

Project A						
	Investment	Yr1	Yr2	Yr3	Yr4	Yr5
Present Value	(10,000)	5,000	5,000	5,000	5,000	5,000
Payback	2 Year					
Discount Rate	15.00%					
Denominator	1.00	0.870	0.756	0.658	0.572	0.497
Future Value	(10,000)	4,350	3,780	3,290	2,860	2,485
NPV	£6,765					
NPV (Excel Calculated)	£6,761					
				PI	1.68	

Project B						
	Investment	Yr1	Yr2	Yr3	Yr4	Yr5
Present Value	(500,000)	166,667	166,667	166,667	166,667	166,667
Payback	3 Years					
Discount Rate (WACC)	15.00%					
Denominator	1.00	0.870	0.756	0.658	0.572	0.497
Future Value	(500,000)	145,000	126,000	109,667	95,334	82,833
NPV	£58,834					
NPV (Excel Calculated)	£58,694					
				PI	1.12	

Profitability Index

- Exercise
- Calculate the PI and payback for the following 3 projects
- WACC is 8%
- Which Project has the stronger return?

Project	Investment	1	2	3	4	5	NPV	PI	Payback
A	(100,000)	25000	25000	25000	25000	25000	-182	1.00	4.00 Years
B	(100,000)	5000	20000	25000	30000	45000	-5,701	0.94	4.44 Years
C	(100,000)	45000	35000	30000	10000	5000	6,242	1.06	2.33 Years

Profitability Index

- **Strengths**

- Takes account of the time value of money
- Reviews liquidity of projects
- Simple calculation

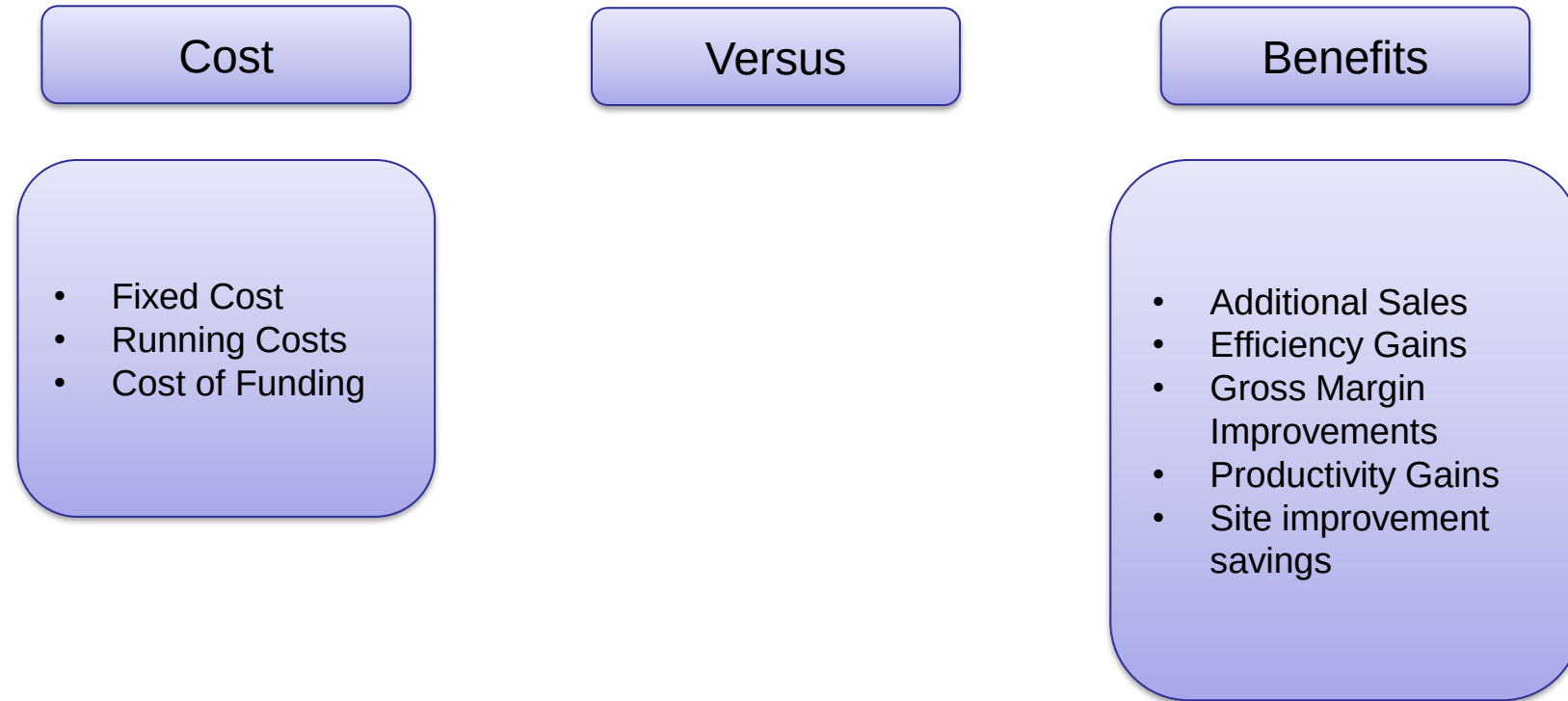
- **Weaknesses**

- Ignores the sizes of projects
- How do you define your companies cost of capital

Capital Investment Appraisal

- Making capital investment decisions
- Methods of investment appraisal
- Capital rationing

Financial Appraisals



Remember your analysis is only as good as the strength of your data

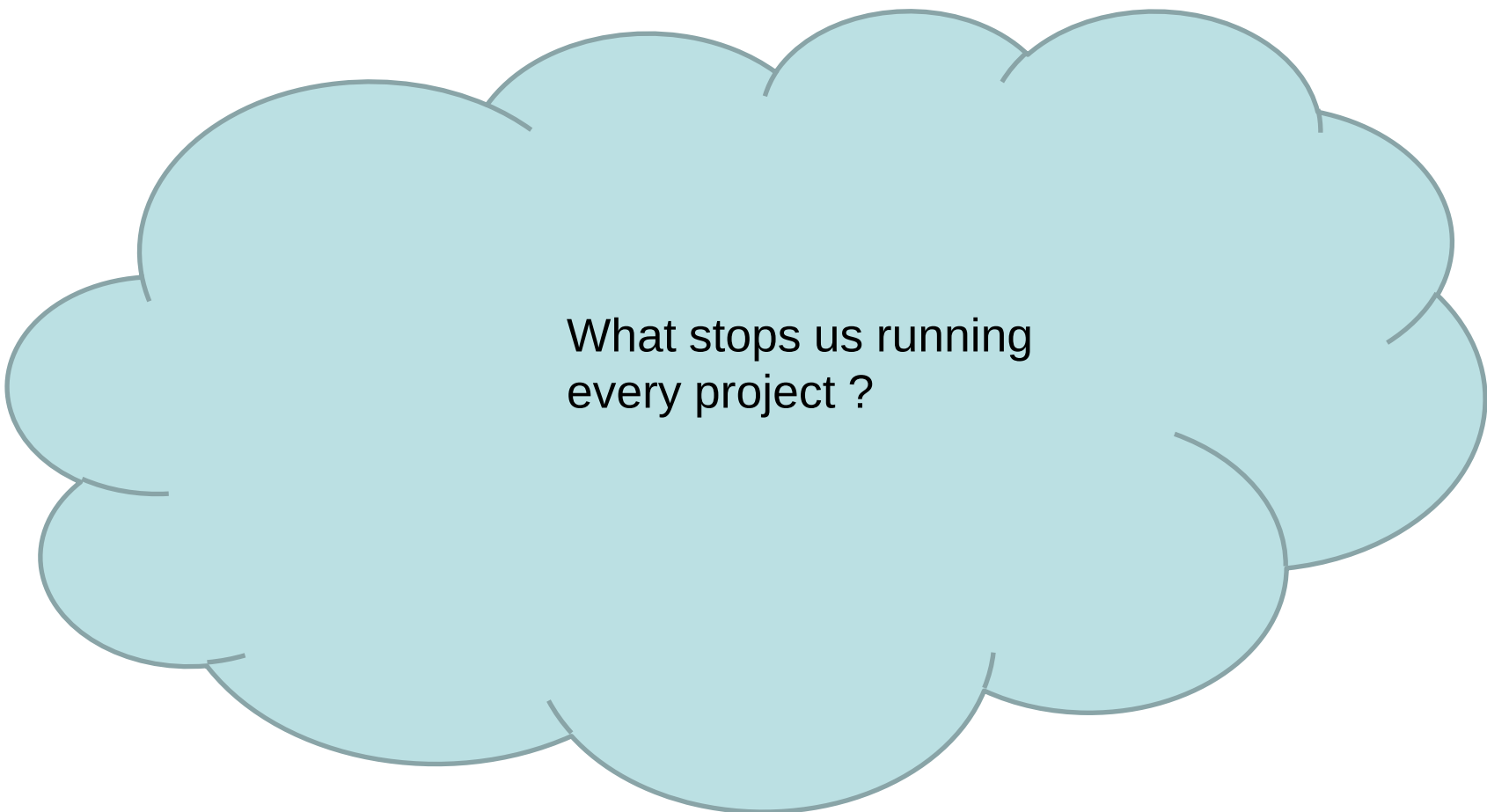
Project	Investment	1	2	3	4	5	IRR	Payback
A	(150,000)	50000	50000	50000	50000	50000	19.9%	3 years
B	(200,000)	60000	50000	40000	30000	20000	0.0%	5 Years
C	(175,000)	50000	60000	65000	60000	70000	20.7%	3 years

Calculate

- 1) Payback Period
- 2) Calculate the IRR (Internal Rate of Return)

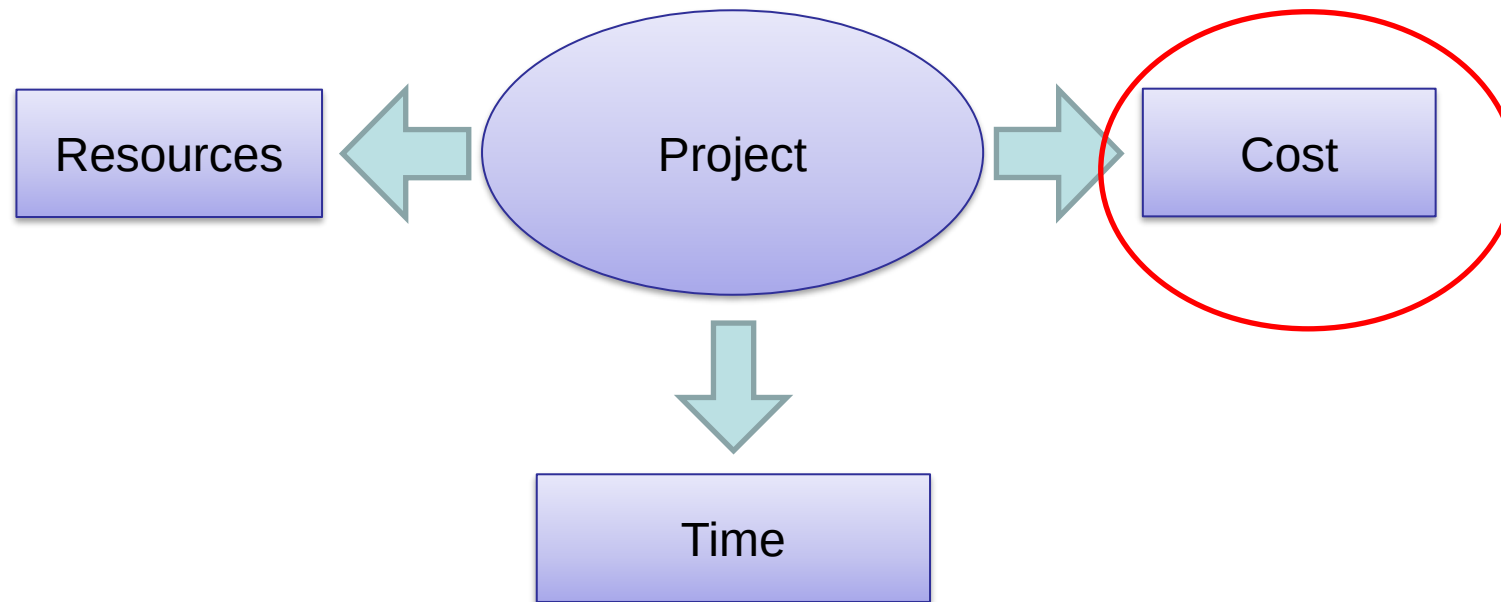
Do any of the above project pass the Company Criteria of:

- 1) Payback Period of 3 years or less and Internal Rate of Return greater than 20 %

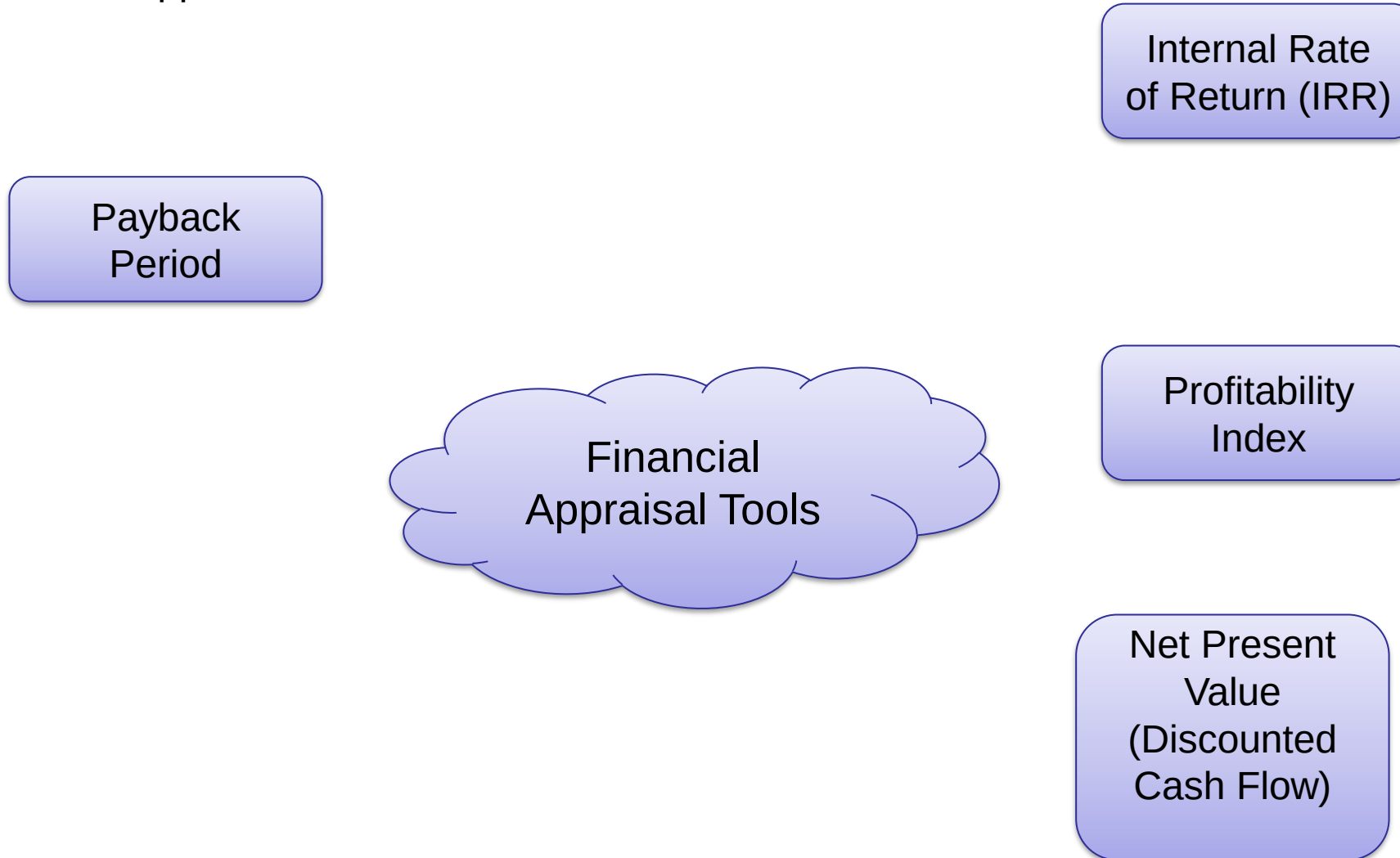
A large, light blue, cloud-like shape with a dark blue outline, centered on the slide. It has several rounded, overlapping lobes.

What stops us running
every project ?

- Limiting Factors



Financial Appraisals Tools



- Businesses may use more than one method to assess each investment decision – this is particularly so in larger businesses
- Payback period methods continue to be popular as a screening method
- There has been increased use of the discounting methods (NPV and IRR) over time – again in larger businesses this is the case

- All projects appraised that pass the decision rule should be selected
- This assumes unlimited funds available for investment
- If funds are **limited** then choices have to be made regarding project selection

In the latter case capital has to be **rationed**!!

- Types of rationing:
 - Soft rationing
 - Hard rationing
 - One-period rationing
- Soft rationing are internally imposed limits by the business
- Hard rationing relates to capital made available from external sources
- One-period rationing is the simplest because limits are placed on finance availability for one year only; for subsequent years funds are unlimited

- One-period capital rationing carry two options:
 - Divisible projects
 - Indivisible projects
- Divisible projects are projects for which a fraction can be undertaken
e.g. plan to open 5 new stores but only open 3.
- Indivisible projects are projects which have to be completed in full
e.g. project to build a bridge

Example of projects with capital allocation of £4.5M

Time (years)	Cost			NPV at 10% €m
	0 €m	1 €m	2 €m	
Project A	-2	6	1	4.281
Project B	-1	1	4	3.215
Project C	-1	1	3	2.389
Project D	-3	10	10	14.355

Relying on **NPV** as an indicator would give a priority order of **D,A,B,C** and with only £4.5M capital available then result would be as follows:

Rank according to absolute NPV

	<i>Initial outlay</i>	<i>NPV ((€m))</i>
All of Project D	3	14.355
$\frac{3}{4}$ of Project A	1.5	3.211
	-----	-----

The resulting NPV for doing Project D and $\frac{3}{4}$ of Project A is $14.355 + 3.211 =$
£17.566M

We need to determine the optimal combination for project selection within the capital constraints

Selecting highest NPV projects in order of rank will favour large projects only, when a combination of smaller projects might be optimal

To find the optimal combination we deploy either:

- Profitability Index
- Benefit-cost ratio

Profitability index:

Gross present value*

Initial outlay

*GPV is total present value of all cash flows excluding the initial investment

Benefit-cost ratio:

Net present value

Initial outlay

Both ratios provide a measure of profitability per unit of monetary value invested; selection of these ratios is down to individual choice

Using the Profitability Index / Benefit-cost ratio

<i>Project</i>	<i>NPV (@10%)</i>	<i>GPV (@10%)</i>	<i>Profitability index</i>	<i>Benefit-cost ratio</i>
A	4.281	6.281	$\frac{6.281}{2} = 3.14$	$\frac{4.281}{2} = 2.14$
B	3.215	4.215	$\frac{4.215}{1} = 4.215$	$\frac{3.215}{1} = 3.215$
C	2.389	3.389	$\frac{3.389}{1} = 3.389$	$\frac{2.389}{1} = 2.389$
D	14.355	17.355	$\frac{17.355}{3} = 5.785$	$\frac{14.355}{3} = 4.785$

Arrange projects in order of the highest profitability index **or** benefit-cost ratio and work down the list until the capital limit is reached.

This **now** changes the priority order to **D,B,C,A** from D,A,B,C

Example of projects with capital allocation of £4.5M

<i>Project</i>	<i>Profitability index</i>	<i>Initial outlay €m</i>	<i>NPV €m</i>
D	5.785	3	14.355
B	4.215	1	3.215
½ of C	3.389	0.5	1.195
Nothing of A	3.14	0	0
Total investment		4.5	18.765

Assumes projects are divisible.

Project A no longer ranks second because this provides the lowest return per unit of initial investment.

Net result is that an extra **£1.199M** ($18.765 - 17.566$) is created for shareholders by selecting projects via ratios rather than relying on NPV alone

In summary.....comparing the two approaches!

	€M	€M		€M	€M		€M	€M	€M
	Initial outlay	NPV @ 10%	Rank against NPV only	Against available funds of €4.5M	Total NPV using NPV ranking	Rank against Profit Index	Against available funds of €4.5M	Total NPV using PI ranking	NPV gained
Project A	2	4.281	2	1.5	3.21	4			
Project B	1	3.215	3			2	1	3.215	
Project C	1	2.389	4			3	0.5	1.1945	
Project D	3	14.355	1	3	14.355	1	3	14.355	
NPV ranking only =>					17.57	PI ranking =>			18.76
								1.199	<= increase in NPV

The return on the project will be increased by £1.199M by using Profitability Index ranking as opposed to NPV alone

If projects were **not divisible** then only projects D and B could be completed with the investment funds available as insufficient funds remain to complete the **whole** of Project C.

Next Week

Capital Rationing part 2
Accounting Rate of Return
Funding options