

Finance Management & Planning

Project Appraisal (Week 4)

This Week

- Any Questions on NPV and payback

This Week

- Internal Rate of Return.
- Maybe PI
- R&D tax credits guest lecture 21/04
- KTP Guest 14/04

Company ABC is assessing 4 projects for their business

WACC	15%
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£'000's

	A	B	C	D
Investment	30,000	50,000	70,000	100,000

Cashflow Generated from Each Project

	A	B	C	D
1	10,000	25,000	15,000	30,000
2	10,000	25,000	25,000	50,000
3	10,000	25,000	35,000	50,000
4	10,000	10,000	45,000	50,000

The company has £150k to invest , which projects if any should proceed

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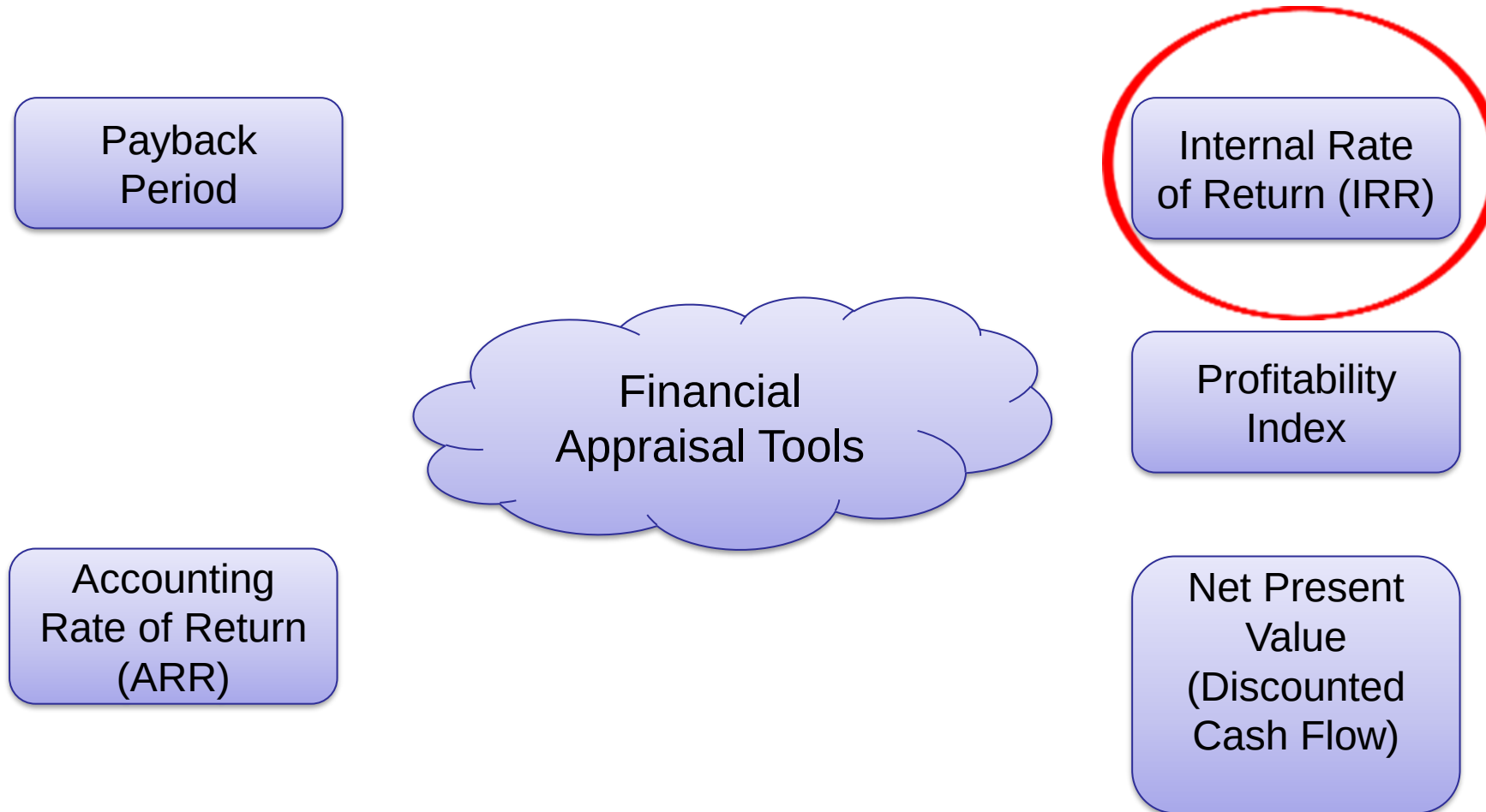
Cashflow Generated from Each Project

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4	10,000	10,000	45,000	50,000

The company has £150k to invest , which projects if any should proceed

NPV	-£1,450.22	£12,798.16	£10,689.03	£25,357.61
Payback	3 Years	2 Years	2.85 years	2.4 years

Financial Appraisals Tools



Financial Appraisals Tools

Internal Rate of Return (IRR)

- IRR calculates discount rate that causes the net present value of future cashflows from an investment to equal zero.

Formula

Internal Rate of Return:

$$= R1 + [(NPV1 \times (R2 - R1)\% \div (NPV1 - NPV2)]$$

Where:

R1 = Lower discount rate

R2 = Higher discount rate

NPV1 = Higher Net Present Value (derived from R1)

NPV2 = Lower Net Present Value (derived from R2)

Ignore the Formula

Project A		Year				
		1	2	3	4	5
Investment	(70,000)	30000	20000	20000	20000	15000
Present Value						

- Before we start – Calc the payback period ?
- Manual Calc of IRR

Example

Manual Calculation

Step 1

Positive NPV calculation and a Negative NPV Calculation

Step 2

Movement % and Movement in NPV

Step 3

Calc % to get to NPV zero

Step 4

Add to positive DCF % to get to IRR

Project A

	Investment	Year				
		1	2	3	4	5
Present Value	(70,000)	30000	20000	20000	20000	15000
Payback	3.00	Manually Calculated				
Discount Rate (WACC)	10.00%					
Denominator	1.00	0.909	0.826	0.751	0.683	0.621
Future Value	(70,000)	27,270.00	16,520.00	15,020.00	13,660.00	9,315.00
NPV	11,785					

Project A

	Investment	Year				
		1	2	3	4	5
Present Value	(70,000)	30000	20000	20000	20000	15000
Payback	3.00	Manually Calculated				
Discount Rate (WACC)	20.00%					
Denominator	1.00	0.833	0.694	0.579	0.482	0.402
Future Value	(70,000)	24,990.00	13,880.00	11,580.00	9,640.00	6,030.00
NPV	(3,880)					

	%	NPV
Movement	10.00%	15,665
Movement per %		1,567
Positive NPV	10.00%	11,785
% to NPV Zero		7.52%
IRR (rough Calc)		17.52%

Internal Rate of
Return (IRR)

Example
Project A

Project A		Year				
		1	2	3	4	5
	Investment					
Present Value	(100,000)	40000	30000	30000	30000	15000

Calculate NPV based on a Discount Rate of 10%

Rough Calculate the IRR

Project A		Year				
	Investment	1	2	3	4	5
Present Value	(100,000)	40000	30000	30000	30000	15000
Payback	3.00	Manually Calculated				
Discount Rate (WACC)	10.00%					
Denominator	1.00	0.909	0.826	0.751	0.683	0.621
Future Value	(100,000)	36,360.00	24,780.00	22,530.00	20,490.00	9,315.00
NPV	13,475					
NPV Excel Calc	13,501					

IRR Calc		%	NPV
Movement		10.00%	21,475
Movement per %			2,148
Positive NPV		10.00%	13,475
% to NPV Zero			6.27%
IRR (rough Calc)			16.27%

Project A		Year				
	Investment	1	2	3	4	5
Present Value	(100,000)	40000	30000	30000	30000	15000
Payback	3.00	Manually Calculated				
Discount Rate (WACC)	20.00%					
Denominator	1.00	0.833	0.694	0.579	0.482	0.402
Future Value	(100,000)	33,320.00	20,820.00	17,370.00	14,460.00	6,030.00
NPV	(8,000)					
NPV Excel Calc	(7,976)					

Example

Excel Formula

Project A		Year				
	Investment	1	2	3	4	5
Present Value	(100,000)	40000	30000	30000	30000	15000
Payback	3.00	Manually Calculated				
Discount Rate (WACC)	10.00%					
Denominator	1.00	0.909	0.826	0.751	0.683	0.621
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IRR Calc		%	NPV
	Movement	10.00%	21,475
	Movement per %		2,148
	Positive NPV	10.00%	13,475
	% to NPV Zero		6.27%
	IRR (rough Calc)		16.27%
	IRR Excel Calc		15.86%

Excel formulae = IRR(All Present Values , Guess Rate)

Internal Rate of Return (IRR)

•Example

	Project A	Project B
• Project Investment	£10,000	£500,000
•Net Cash Flow per year	£ 5,000	£166,667
•Payback Period	2 years	3 Years

•Calculate the IRR based on the Cashflows for the next 5 years.

•Which Project has the higher Internal Rate of Return ?

Internal Rate of Return (IRR)

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 (WACC)	41.04%					
Denominator	1.00	1.41	1.99	2.81	3.96	5.58
Future Value	(10,000)	3,545	2,513	1,782	1,264	896
NPV	0					
IRR (Excel Calculated)	41.04%					

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)	19.86%					
Denominator	1.00	1.20	1.44	1.72	2.06	2.47
Future Value	(500,000)	139,054	116,016	96,795	80,758	67,378
NPV	0					
IRR (Excel Calculated)	19.86%					

Internal Rate of Return (IRR)

- Exercise
- Calculate the IRR based on the following 3 projects using Excel
- Which project has the highest Internal Rate of Return?

Project	Investment	1	2	3	4	5	IRR
A	(100,000)	25000	25000	25000	25000	25000	7.9%
B	(100,000)	5000	20000	25000	30000	45000	6.3%
C	(100,000)	45000	35000	30000	10000	5000	11.2%

Internal Rate of Return (IRR)

•Strengths

- Takes account of the time value of money
- Reviews liquidity of projects
- Excel simplifies the process

•Weaknesses

- Doesn't allow for a clear comparison of different size projects
- Can be tedious to calculate manually

Calculate the IRR for these projects .

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Cashflow Generated from Each Project

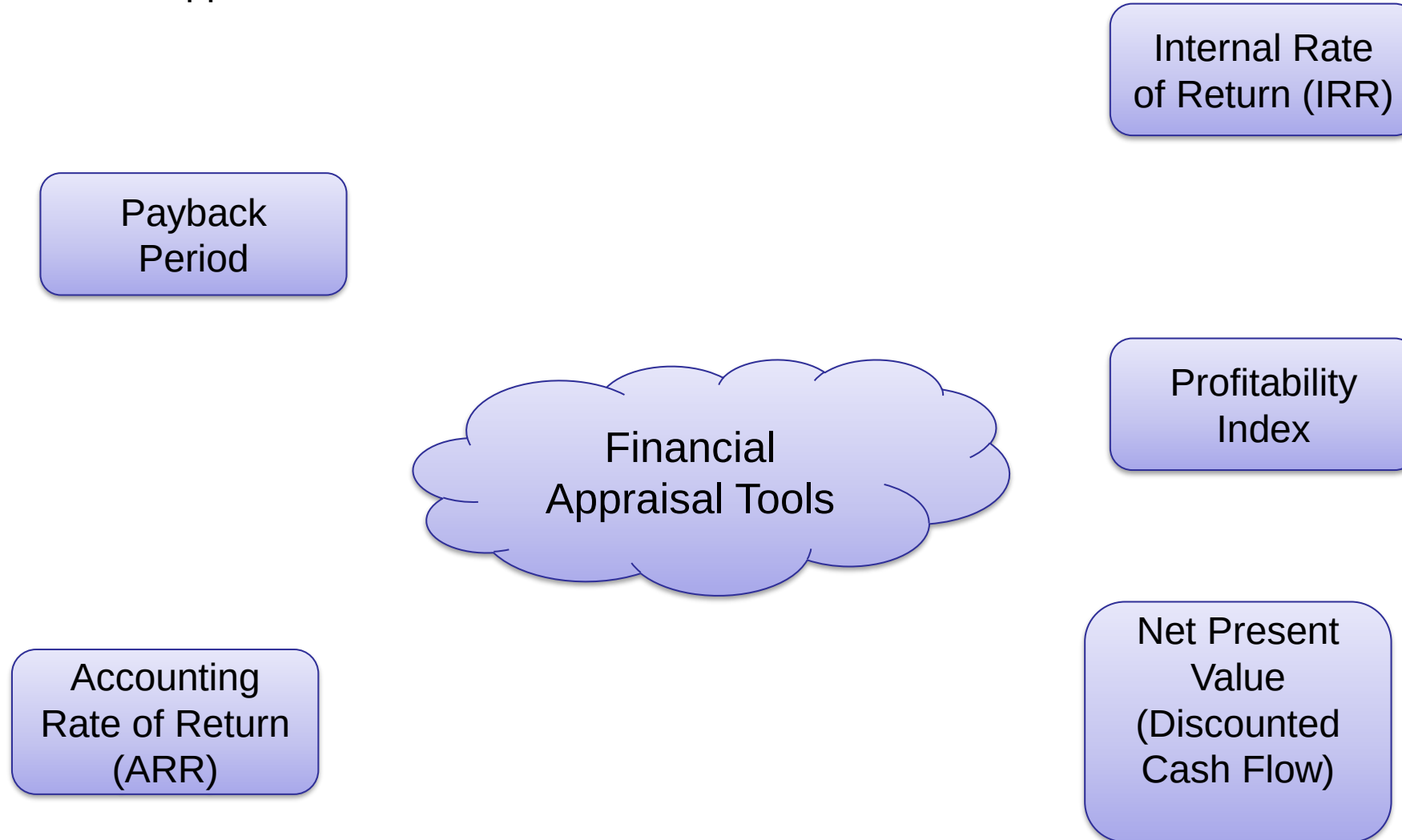
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Payback	3 Years	2 Years	2.85 years	2.4 years
IRR	12.59%	29%	21%	26%

Does this change your decision from earlier ?

Financial Appraisals Tools



Next Week

Capital Rationing
PI
BCR