



MANAGEMENT ACCOUNTING FOR BUSINESS

FIFTH EDITION

COLIN DRURY

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Business 5e*
By Colin Drury
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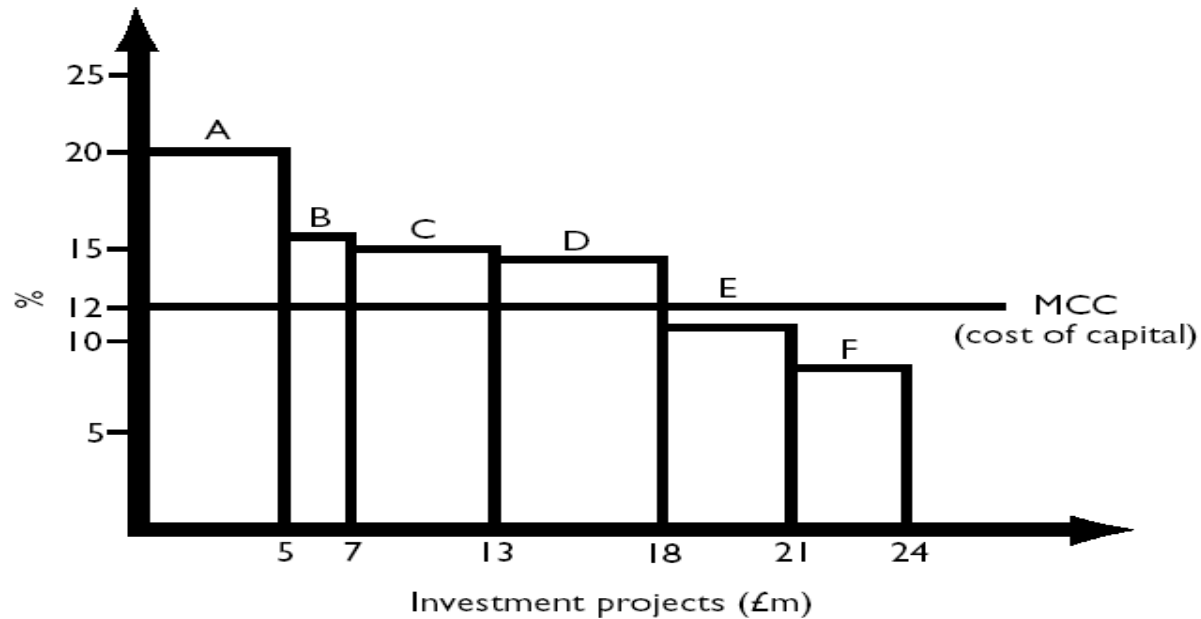


Part Two: **Information for decision-making**

Chapter Six: **Capital investment decisions**

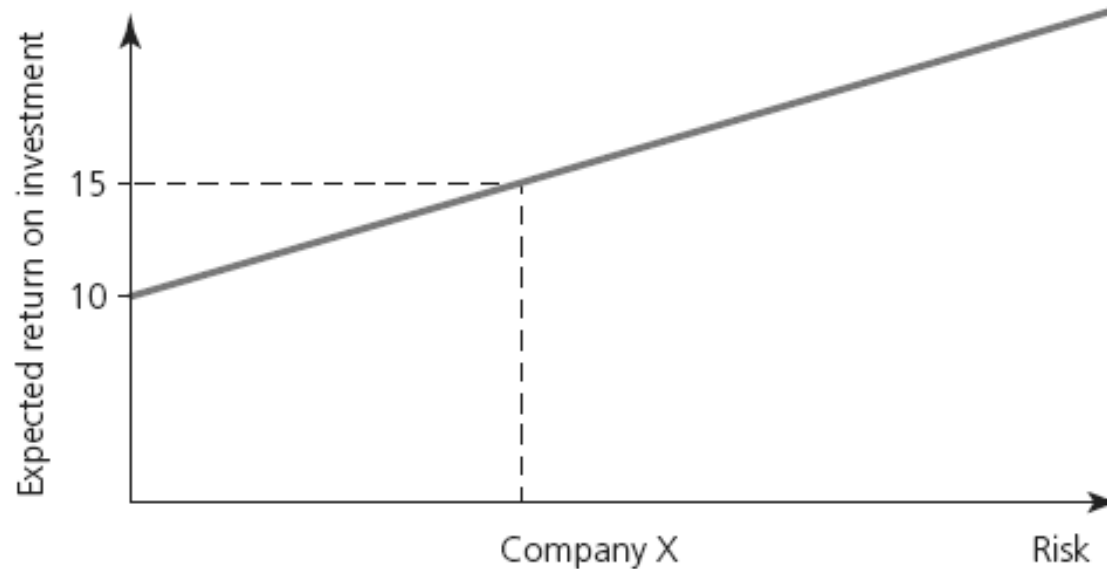


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1. The objective is to accept all those investments whose returns are in excess of the cost of capital.
2. A firm should invest in capital projects only if they yield a return in excess of the opportunity cost of an investment (also known as the minimum rate of return, cost of capital, discount/hurdle rate).





3. Opportunity cost of investment = returns available to shareholders in financial markets from investments with the same risk as the project.





Compounding and discounting

1. Compounding expresses today's cash flows in future values.

$$FV_n = V_0 (1 + K)^n$$

End of year	Interest earned £	Total investment £
0	100 000	
	$0.10 \times 100\,000$	<u>10 000</u>
1	110 000	
	$0.10 \times 110\,000$	<u>11 000</u>
2	121 000	
	$0.10 \times 121\,000$	<u>12 100</u>
3	133 100	
	$0.10 \times 133\,100$	<u>13 310</u>
4	<u>146 410</u>	





2. Discounting is the process of converting future cash flows into a value at the present time.

$$\text{Present value } (V_0) = \frac{FV_n}{(1 + K)^n}$$

3. £121 000 receivable in year 2 has a PV of:

$$\frac{£121\,000}{(1 + 0.10)^2} = £100\,000$$





The concept of net present value (NPV)

1. By using DCF techniques and calculating PVs we can compare the return on capital projects with an alternative equal risk investment in securities traded in the financial market.
2. The four projects shown below are identical to the risk-free security illustrated on sheet 3a. Therefore, they have a NPV of zero.

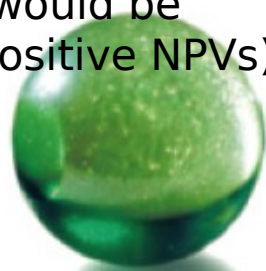




	A	B	C	D
	£	£	£	£
Project investment outlay	100 000	100 000	100 000	100 000
End of year cash flows				
Year 1	110 000	0	0	0
Year 2	0	121 000	0	0
Year 3	0	0	133 100	0
Year 4	0	0	0	146 410
Present value =	<u>110 000</u>	<u>121 000</u>	<u>133 100</u>	<u>146 410</u>
	1.10	(1.10) ²	(1.10) ³	(1.10) ⁴
	=100 000	=100 000	=100 000	=100 000

3. NPV = PV - Investment cost

4. The decision rule is to accept only those projects with positive NPVs (e.g. if the investment costs above were less than £100 000 then the projects would be preferable to investing in financial securities and they would have positive NPVs).





Calculating NPVs

$$1. \quad NPV = \frac{FV_1}{(1+K)} + \frac{FV_2}{(1+K)^2} + \frac{FV_3}{(1+K)^3} + \frac{FV_n}{(1+K)^n} - I_0$$

2. Example (£000's)

$$NPV = £300/1.10 + £1\,000/(1.10)^2 + £400/(1.10)^3 - £1\,000 = £399.7$$

or use the discount tables (appendix A)

Year	£000's	Disc. Factor	PV (£000)
1	300	0.9091	272.730
2	1 000	0.8264	826.400
3	400	0.7513	<u>300.520</u>
			1 399.650
	Less investment cost		<u>1 000.000</u>
	NPV		<u>399.650</u>

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3. If annual cash flows are constant, the cumulative discount tables can be used (appendix B):

Example (£000's)

Cash flows are £600 per annum for 3 years, the discount rate is 10% and the investment outlay is £1 000:

$$\text{NPV} = (£600 \times 2.487) - £1\ 000 = £492.2$$



Internal rate of return (IRR)



$$1. \quad NPV = FV_1 / (1+IRR) + FV_2 / (1+IRR)^2 + FV_n / (1+IRR)^n - I_0$$

Example (£000's)

$$NPV = £300/(1.31) + £1\,000/(1.31)^2 + £400/(1.31)^3 - £1\,000 = 0$$

2. IRR is approximately 31%. The decision rule is to accept the project if IRR is greater than the cost of capital.

3. Example

NPV at 25% = £84.8 (say 85)

NPV at 35% = - £66.53 (say - 67)

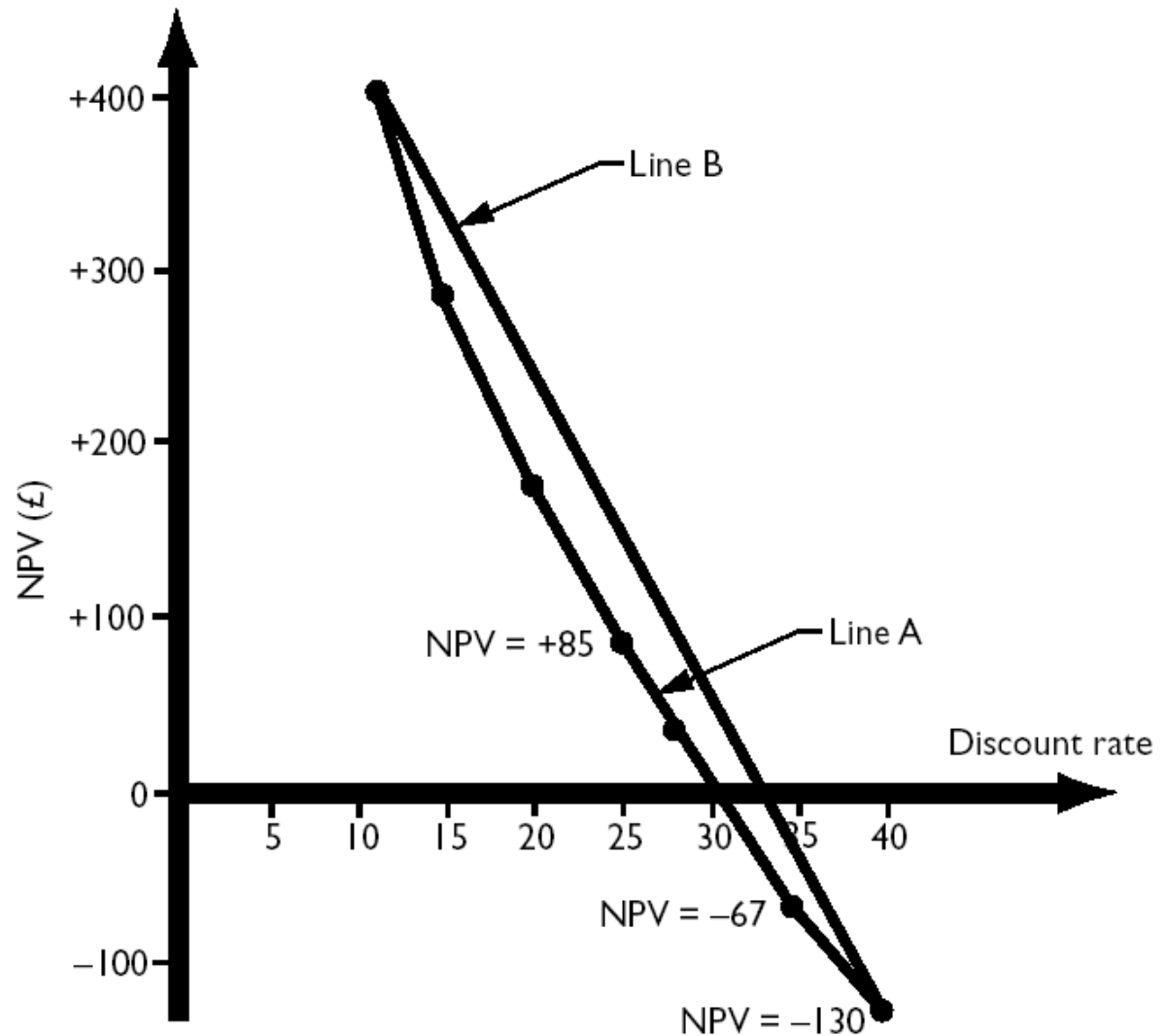
Using interpolation:

$$IRR = 25\% + 85/152 \times (35\% - 25\%) = 30.59\%$$





Fig 2
The calculation
of IRR



Comparison of NPV and IRR



1. NPV is preferred to IRR because:

- IRR can incorrectly rank mutually exclusive projects.

	IRR	NPV
	%	£
Project A	22	1 530
Project B	18	1 728

- IRR is expressed in percentage terms:

Investment Y (1 year life) yields a return of 50% ($I_0 = 100$)
=£50

Investment Z (1 year life) yields a return of 25% ($I_0 = £1\ 000$)
=£250

If the remaining £900 from Y only yields £100 then Z is preferable.

- IRR assumes internal cash flows are reinvested at the IRR, whereas NPV

assumes they are invested at the cost of capital.

- Unconventional cash flows (-, +, -) can result in multiple





Capital investment decisions

- Monthly and annual discount rates
- Typically, discount and interest rates are quoted as rates per annum using the term annual percentage rate (APR).
- To convert the annual discount rate to a monthly discount rate that takes into account the compounding effect we must use the following formula:
- Monthly discount rate = $(\sqrt[12]{1 + \text{APR}}) - 1$





Assume that the annual percentage discount rate is 12.68%:
 $(12 \sqrt{1.1268}) - 1 = 1.01 - 1 = .01$ (i.e. 1% per month).

1% compounded monthly is equivalent to 12.68% compounded annually.

Monthly discount rates can also be converted to annual percentage rates using the formula:
 $(1 + k)^{12} - 1$ (where k = the monthly discount rate)

Assuming a monthly rate of 1% the annual rate is
 $(1.01)^{12} - 1 = 0.1268$ (i.e. 12.68% per annum).





Capital investment decisions

Annuities

$$\text{Present value} = \frac{A}{r} \left(1 - \frac{1}{(1+r)^n} \right)$$

where A = Annuity amount and

r (also denoted by k) = interest/discount rate per period





Capital investment decisions

- The annuity factor for the present value for £1 received in each of three periods at an interest rate of 10% is:

$$PV = \frac{\text{£ } 1}{0.10} \left\{ 1 - \frac{1}{(1 + 0.10)^3} \right\} = 10 (0.24868) = 2.487$$

- Constant cash flows occur into perpetuity:

$$PV = \text{Annual cash flow} / r$$

A cash flow of £100 per annum into perpetuity at a discount rate of 10% is £1 000 (£100/0.10).





Payback method

1. Measures the length of time that is required for a stream of cash flows from an

i inv	Year	Year	Year	Year	Payback	NPV at 10%
	0	1	2	3		
	£000's	£000's	£000's	£000's		
A	-400	+400			1 year	-36.364
B	-400	+200	+200	+1000	2 years	+698.422

The payback method suggests A but B has the higher NPV.





2. Limitations

- Ignores time value of money.
- Ignores cash flows after the payback period.

3. Widely used

- Simple to understand.
- Appropriate where liquidity constraints exist and a fast payback is required.
- Appropriate for risky investments in uncertain markets.
- Often used as an initial screening device.



Accounting rate of return



1. Calculated by dividing the average annual profits from a project into the average investment cost.

Project X

	Years			
	0	1	2	3
	<u>£000 's</u>	<u>£000 's</u>	<u>£000 's</u>	<u>£000 's</u>
Book value	24	16	8	0
Cash flow		12	11	10
Depreciation		(8)	(8)	(8)
Profit		4	3	2

$$\text{Average return} = \frac{\text{Average profit (3)}}{\text{Average investment (12)}} = 25\%$$





2. Project Y

	Years			
	0	1	2	3
	£000 's	£000 's	£000 's	£000 's
Book value	24	16	8	
0				
Cash flow		10	11	12
Depreciation		(8)	(8)	(8)
Profit		2	3	
4				

$$\text{Average return} = \frac{3}{12} = 25\%$$

3. Project Y also has a 25% return, but the cash flows are received later and NPV is less than X.

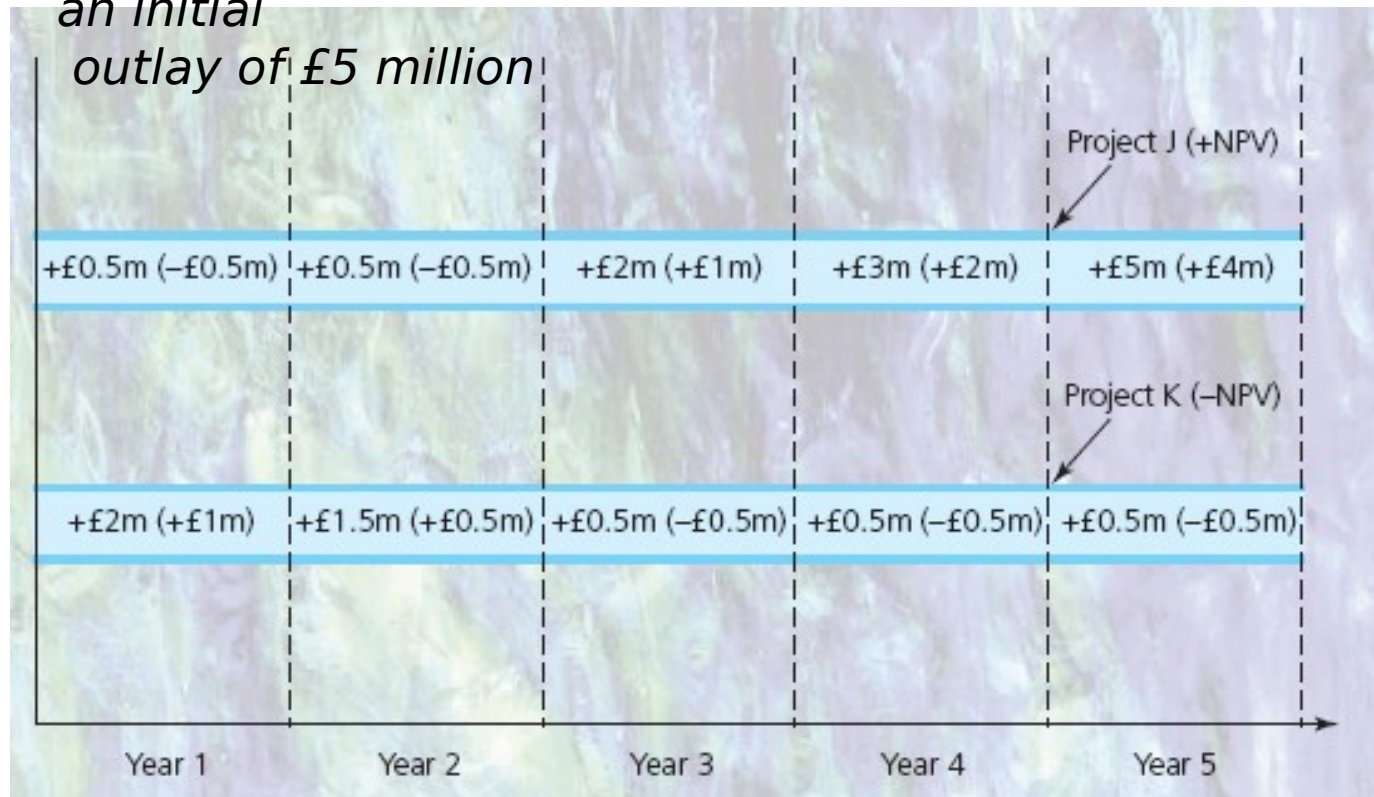




The effect of performance measurement

There is a danger that managers will be motivated to choose the investment that maximizes their performance measure rather than maximizing NPV.

Annual net cash inflows (profits/losses) for two projects, each with an initial outlay of £5 million



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Taxation and investment decisions

1. Taxation legislation specifies that net cash inflows of companies are subject to taxes, and capital allowances (writing down allowances) are available on capital expenditure.

Example

$I_0 = £100\ 000$, cash inflows	= £50 000 for four years
Estimated sale proceeds	= Tax WDV at end of year 4
Capital allowances	= 25% on a reducing balance basis
Corporate tax rate	= 35%





2. Calculation of capital allowances

Year	Annual WDAs £	WDV
0	0	100 000
1	25 000 (25% × 100 000)	75 000
2	18 750 (25% × 75 000)	56 250
3	14 063 (25% × 56 250)	42 187
4	10 547 (25% × 42 187)	31 640





3. Calculation of incremental taxes arising from the project:

	Year	Year	Year	Year
	1	2	3	4
	£	£	£	£
Incremental profits	50 000	50 000	50 000	50 000
WDAs	<u>25 000</u>	<u>18 750</u>	<u>14 063</u>	<u>10 547</u>
Taxable profits	<u>25 000</u>	<u>31 250</u>	<u>35 937</u>	<u>39 453</u>
Taxes at 35%	8 750	10 937	12 578	13 809





Taxation and investment decisions

4. If the estimated sale proceeds exceeded the WDV (say, £45 000) there would also be an additional balancing charge of £13 360 ($£45\,000 - £31\,640$) to deduct from the WDAs in year 4 (taxable profits would equal £52 813).
5. If the estimated sale proceeds were less than the WDV (say £25 000) there would be an additional balancing allowance of £6 640 ($£31\,640 - £25\,000$) to add to the WDAs in year 4.

