P2 | 1 | Investment Appraisal Part 1 – Net Present Value

Investment decisions

Investment decisions are just one part of corporate financial strategy and they have a close relationship with financing and dividend decisions.

Corporate financial strategy	
Financing decisions	Relate to where capital investment, working capital and funds to pay for expenses will come from, e.g. from: • Equity • Debt • Retained earnings
Investment decisions	Relate to where the money needs to be invested to repay debt and achieve a good rate of return for shareholders. Investment decisions can be made using the following techniques: • **Net present value (NPV) -** The difference between the present value of cash inflows and outflows • **Internal rate of return (IRR) -** This looks at an investment in terms of the optimal rate of return for the company, rather then the net value • **Payback period -** The length of time taken for an investment to make a return on the initial expenditure • **Return on capital employed (ROCE) -** Compares a company's capital with its earnings
Dividend decisions	Relate to funds being returned to shareholders in the form of dividend payments, taking the cash requirements of the business for future investment and growth into account.

Net Present Value (NPV)

This is one way to evaluate a project.

Definition

Net Present Value (NPV)

A project appraisal technique using relevant net cash flows generated by a project over its total lifetime to calculate its net contribution to an organisation.

NPV calculates an organisation's change in wealth. A positive NPV is an increase in value, while a negative NPV is a decrease in value. Any project with a positive NPV should be undertaken.

Discounting and the time value of money

NPV takes account of the time value of money by 'discounting' future cash flows so the further away they are, the less value they have. The minimum discounting rate used is the company's cost of capital.

The timing of cash flows

The timing of cash flows is vital to NPV calculations, as amounts received at later times need a greater discounting factor applied to them.

Key points with regards the presentation of an NPV calculation:

Year 0 outflows	Cash outflows that occur at the beginning of a project are shown at their nominal value in year 0.
Year >0 out/inflows	Cash outflows or inflows that occur during any particular year are treated as if they occurred at the end of that year.
'Start of the year' out/inflows	Cash outflows or inflows that are specifically mentioned as 'occurring at the start of the year' should be included at the end of the previous year.

NPV with relevant costs and scrap value

Relevant costs to the project are included in the calculation and irrelevant expenses are removed.

Definition

Relevant costs

Future, cash and incremental costs directly arising as the result of an investment decision.

NPV calculations are made using the following proforma:

NPV calculation proforma

	Year 0	Year 1	Year 2	Year 3	Year 4
Sales receipts		X	X	X	
Costs		(X)	(X)	(X)	
Sales less costs		X	X	X	
Taxation		(X)	(X)	(X)	(X)
Capital expenditure	(X)				
Scrap value				X	
Working capital	(X)			X	
Tax benefit of tax depreciation		X	X	X	X
Net cash flow	(X)	X	X	X	(X)
Discount factors @ post tax cost of capital	Xj	X	X	X	X
Present value	(X)	X	X	X	(X)

NPV and working capital

Investment in working capital is included in the NPV calculation. The full amount is recorded in Year 0, incremental amounts are recorded in subsequent years. Working capital is recorded in the previous year. At the end of the project the full amount invested will be released.

Example

The following details are provided for a retail project:

	Year 0 £000	Year 1 £000	Year 2 £000	Year 3 £000	Year 4 £000
Turnover	0	3,320	3,600	4,000	4,700

Working capital is 20% of turnover. Calculate the relevant cash flow.

	Year 0 £000	Year 1 £000	Year 2 £000	Year 3 £000	Year 4 £000
Turnover	0	3,320	3,600	4,000	4,700
Working capital	(664)	(720)	(800)	(940)	0
Relevant cash flow	(664)	(56)	(80)	(140)	940

Notes:

The working capital required in year 1 is:

20% x £3,320,000 = £664,000 – this is required in year 1, so will be put into year 0 and so on.

The working capital required in year 2 is:

20% x £3,600,000 = £720,000 Given that the project already has £664,000 invested, the increment required is:

£720,000 - £664,000 = £56,000, hence this is entered in year 1 and so on. These are mid-project working capital requirements.

In year 4 the full amount invested is released:

£664,000 + £56,000 + £80,000 + £140, 000 = £940,000. This is the final year working capital requirement.

Mid-project working capital requirements

Relevant cash flows measure the incremental increases in working capital. The difference between the current and prior years' working capitals is recorded on the NPV calculation as this year's relevant cash flow.

Final year working capital requirements

In the last year of the project, the full amount of working capital invested is released.

Tax in an NPV calculation

Tax is usually a part of the NPV calculation and is charged against net income and not cash flows.

When tax is collected 'in the year in which it is due', it is reflected on the same year. When tax is collected 'a year in arrears', it is reflected in the following year.

Example

The table below shows the full workings of an NPV calculation including tax. In this example, tax is paid at 30% a year in arrears.

	Year 0 £000	Year 1 £000	Year 2 £000	Year 3 £000	Year 4 £000	Year 5 £000
Land and buildings	(4,125)					
Fittings and equipment	(910)					
Gross revenue		2,340	3,250	3,640	3,900	
Direct costs		(975)	(1,430)	(1,950)	(2,080)	
Marketing		(220)	(325)	(260)	(260)	
Office overheads (45%)		(74)	(74)	(74)	(74)	
Resale value					4,000	
Working capital	(234)	(91)	(39)	(26)	390	
Tax (30%)			(321)	(426)	(407)	(446)
Net cash flows	(5,269)	980	1,061	904	5,469	(446)
Discount factor	1.00	0.893	0.797	0.712	0.636	0.567
Present value	(5,269)	875	846	644	3,478	253
Net present value	321					

The tax liability is calculated on (gross revenue - all costs), i.e. it does not include the figure for working capital. Therefore for year 1, tax is calculated as:

£2,340,000 - £975,000 - £220,000 - £74,000 = £1,071,000

Therefore, the tax liability:

30% x £1,071,000 = £321,300. As tax is paid a year in arrears, £321K is entered into year 2.

Tax benefit allowed by capital allowances

Capital allowances represent a sum of money that a business can deduct from the tax on its profits. The annual amount claimed, known as a writing down allowance, is taken off the total asset value for the following year's balance.

Definition

Capital allowance

An allowed tax saving against specific purchased items, provided by government advised rates.

Writing down allowance

The annual capital allowance claimed, as deducted from the total asset value.

Looking at an example:

Example

BB purchased a battery machine for £910,000 and the capital allowance rate is 25%. The machine is sold for £75,000 in year 4. Tax rate is 30%. Calculate the annual capital allowances and tax savings.

Year	Asset value	Capital allowance @ 25%
1	£910,000	£227,500
2	£910,000 - £227,500 = £682,500	£170,625
3	£682,500 - £170,625 = £511,875	£127,969
4	£511,875 - £127,969 = £383,906	£383,906 - £75,000 = £308,906

Year	Capital allowance	Tax savings @ 30%
1	£227,500	£68,250
2	£170,625	£51,189
3	£127,969	£38,391
4	£308,906	£92,672

These should be recorded into the NPV calculation as follows:

- The annual tax saving should be recorded as a source of capital
- They should be entered as per the basis for charging tax, e.g. in the current year or a year in arrears

Example

The table below shows the workings of an NPV calculation including tax payable and the tax saving from capital allowances. As in this example the tax is paid a year in arrears, the tax saving from capital allowances is recorded as received then as well.

	Year 0 £000	Year 1 £000	Year 2 £000	Year 3 £000	Year 4 £000	Year 5 £000
Land and buildings	(4,125)					
Fittings and equipment	(910)					
Gross revenue		2,340	3,250	3,640	3,900	
Direct costs		(975)	(1,430)	(1,950)	(2,080)	
Marketing		(220)	(325)	(260)	(260)	
Office overheads		(74)	(74)	(74)	(74)	
30% Tax 1 year in arrears			(321)	(426)	(407)	(446)
Tax Saved (W1 Cap Allow)			68	51	38	93
Resale/Scrap value					4,000	
Working capital (W2)	(234)	(91)	(39)	(26)	390	
Net cash flows	(5,269)	980	1,129	955	5,507	(353)
Discount factor @ 12%	1.000	0.893	0.797	0.712	0.636	0.567
PV of future cash flows	(5,269)	875	900	680	3,502	(200)
Net present value	488					

NPV and inflation

The existence of inflation will mean that the value of cash flows will be lower in the future than in the present. To signify whether inflation as been taken into account, the terms 'real' and 'nominal' are used.

Definition

Real cash flow

The amount that would need to be spent today, taking any future inflation into consideration.

Nominal cash flow

The actual amount paid.

Cost of capital with inflation

If real cash flows are required, then the real cost of capital needs to be calculated. If nominal cash flows are asked for, nominal cost of capital needs to be found. These rates should then be used in the NPV calculation. To find these rates, the following formula should be used:

Fisher Equation

$$(1 + r) \times (1 + i) = (1 + n)$$

r = Real cost of capital

i = General inflation rate

n = Nominal cost of capital

Perpetuities

Definition

Perpetuity

A perpetuity is a constant and consistent cash flow that continues over an infinite lifetime.

Finding the perpetuity factor

$$\frac{1}{r}$$

r = Discount rate

Example

Should BB keep the shops after 4 years? Use perpetuity calculation to find out.

The management accountant at BB states:

- Cash flow estimates will remain consistent each year from year 4
- There will be no further working capital requirements or capital allowance after year 5
- The nominal discount rate is still 12%

Step 1 - Find the discount factor:

$$\frac{1}{0.12} = 8.33$$

Step 2 - Deduct the cumulative factors from years 1-5:

The perpetuity must begin from year 6. The perpetuity discount factor needs to be adjusted to take this into account.

8.333 – (0.893 + 0.797 + 0.712 + 0.636 + 0.567) = 4.728

This is the discount factor to infinity:

	Year 0 £000	Year 1 £000	Year 2 £000	Year 3 £000	Year 4 £000	Year 5 £000	Year 6 to infinity £000
Land and buildings	(4,125)						
Fittings and equipment	(910)						
Gross revenue		2,340	3,250	3,640	3,900	3,900	3,900
Direct costs		(975)	(1,430)	(1,950)	(2,080)	(2,080)	(2,080)
Marketing		(220)	(325)	(260)	(260)	(260)	(260)
Office overheads		(74)	(74)	(74)	(74)	(74)	74
		1,071	1,421	1,356	1,486	1,486	1,486
30% Tax 1 year in arrears			(321)	(426)	(407)	(446)	(446)
Tax saved			68	51	38	93	
Resale/scrap value							
Working capital	(234)	(91)	(39)	(26)			
Net cash flows	(5,269)	980	1,129	955	1,117	1,133	1,040
Discount factor @ 12%	1.000	0.893	0.797	0.712	0.636	0.567	4.728
PV of future cash flows	(5,269)	875	900	680	710	642	4,917
Net present value	3,455						

The result

Based on these figures, keeping the shops in perpetuity reveals a very good NPV.

Annuities

Investors may also choose to invest in an annuity.

Definition

Annuity

A financial instrument purchased for an initial sum which then pays out the same amount each and every year until a definitive end date.

An annuity will continue to pay out until:

- The owner of the policy dies
- The specified fixed period of time comes to an end
- An even related to the policy occurs (like the holder retiring)

The value of annuities can be calculated using the cumulative discount factor formula.

Cumulative discount factor formula

$$\frac{1}{r}\left(1 - \frac{1}{(1+r)^n}\right)$$

r = The rate of interest

n = The amount of years it is invested for

Example

Compare the following annuities:

- Annuity A will pay out £4,000 each year for 12 years
- Annuity B pays out £3,200 each year for 20 years

Annuity A

$$\frac{1}{r}\left(1- \frac{1}{(1+r)\ n}\right)$$

$$\frac{1}{0.07}\left(1- \frac{1}{(1 + 0.07)^{12}}\right)$$

$$= 14.29\ \left(1- \frac{1}{(2.252)}\right)$$

$= 14.29 \times 0.556$

$= 7.945$

£4,000 x 7.945 = £31,780

Annuity B

$$\frac{1}{0.07}\left(1 - \frac{1}{(1 + 0.07)^{20}}\right)$$

$$= 14.29 \left(1 - \frac{1}{(3.87)}\right)$$

$= 14.29 \times 0.741$

$= 10.594$

£3,200 x 10.594 = £33,901

Annuity B has the higher payout!

And finally...

Stop!

By this stage you should know:

- Investment decisions that a business undertakes
- What goes into an NPV calculation
- The treatment of working capital in an NPV calculation
- How taxation is reflected in an NPV calculation
- The importance of inflation in an NPV calculation
- How to appraise an investment in perpetuity
- How to compare annuities with different lifespans

Got it?

If not, go back and re-read the study text before moving on.

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