Overview of Valuation Series

The intrinsic value of a business can be estimated using techniques that consider future cash flows or income or consider what a comparable business might be worth if it was quoted or acquired (relative valuation with multiples). A value estimated by discounting future cash flows at a 'Discount Rate' to their 'Present Value' ('PV') ('Discounted Cash Flow' / 'DCF' valuation), represents the value expected to be received from the business in the future, expressed in economically equivalent terms as if received today. A DCF requires cash flows to be estimated over a forecast period, usually 5 – 10 years, at the end of which a single formula can be used to capture the PV of remaining cash flows in perpetuity ('Terminal Value' / 'TV'). *Part 1* discusses the general DCF methodology, including basic PV formulae (Appendix 1), forecast period cash flows, 'steady state' assumptions and TV formulae (Appendix 2), with a simplified example (Appendix 3).

A discount rate is adjusted to reflect the riskiness of the expected cash flows being valued (uncertainty as to their amount and timing), and represents the return required by the providers of capital ('Cost of Capital'). Discount rates are discussed in *Part 2* of this series, along with theory relating to the tax benefits of debt finance and impact on the cost of capital ('Tax Shield').

A number of different approaches can be used to value cash flows or income, which should give the same value. The first set of cash flows to forecast are pre-financing operating cash flows net of operating taxes paid ('Free Cash Flows to the Firm' / 'FCFF'), the subject of this paper. These are available for distribution to all providers of financial capital, starting with debt investors who have priority over equity investors. The second type of cash flows ('Free Cash Flows to Equity' / 'FCFE') equal FCFF less debt cash flows (net borrowings / (repayments) less interest paid net of tax relief) that are free to be distributed to equity investors. These are the two main DCF approaches, but other methods can be used (discussed in *Part 3* of the series, along with a multiples approach that applies a factor to a specific financial measure, like net profits, to estimate a value).

When FCFF are discounted, the resulting PV is the operating Enterprise Value ('Ent'V'). Net non-operating assets that do not generate FCFF (e.g.surplus cash, head office properties, investments in associates and joint ventures, equity investments etc) need to be valued separately and added to produce the total EntV. The market value of debt (e.g.borrowings, preference shares, leases) and 'debt-equivalents' (e.g. pension deficits) is then deducted to arrive at the Equity Value ('EqV'). This amount is shared between current equity investors (ordinary shareholders) and 'equity equivalents' (e.g. employee stock options). Some of the many claims to total EntV that lie ahead of the residual entitlement of ordinary shareholders (the 'Bridge') are discussed in *Parts 4 and 5* of this series.

Free Cash Flows to the Firm (FCFF)

FCFF can be defined in a number of ways when providing non-GAAP financial information in annual reports, but for the purpose of a DCF valuation they are defined as after-tax cash flows derived from operating activities (ignoring after-tax financing cash flows), being operating income and operating investments required to generate the operating income. FCFF can be calculated from the cash flow or income statement, shown here with some numbers:

Cash flows from operating activities:		
Profit after tax	2,066.7	
Dividends	(1,760.1)	
Profit retained	306.6	
Add back: dividends and tax	2,449.1	
Profit before tax	2,755.6	
Add back: Finance costs	387.3	1
Less: Finance income	(12.2)	1
Operating profit continuing operations (EBITA)	3,130.7	
Depreciation	631.5	2
Operating cash flows before working capital change (EBITDA)	3,762.2	
Change in inventories	(44.5)	
Change in trade receivables (including long term)	(44.7)	
Change in other receivables and current assets	(54.5)	
Change in trade payables	39.0	
Change in other current liabilities (excl. dividend payable)	21.2	
Change in working capital	(83.5)	2
Change in other current and long term provisions	16.7	
Cash generated from operations	3,695.4	
Income tax paid (net of repayments)	(688.9)	
Net cash generated from operating activities	3,006.5	
Remove: tax relief on financing items	(93.8)	1
Remove: change in non-operating provisions	(16.7)	
Purchases of property, plant and equipment	(1,265.8)	2
Free Cash Flows to the Firm	**1,630.3**	
Add back: New Invested Capital	717.7	2
Net Operating Profit After Taxes (NOPAT)	**2,348.0**	

Note 1: (387.3 - 12.2) x 25.0% = 93.8

Note 2: - 631.5 + 83.5 + 1,265.8 = 717.7

Net cash generated from operating activities	3,006.5
Cash flows from investing activities	
Purchases of property, plant and equipment	(1,265.8)
Interest received	12.2
Net cash used in investing activities	(1,253.5)
Net cash flow before financing activities	1,753.0
Cash flows from financing activities	
Proceeds from borrowings	1,564.7
Repayment of borrowings	(1,158.1)
Interest paid (plus fees)	(387.3)
Dividends paid to company shareholders	(1,760.1)
Net cash from (used in) financing activities	(1,740.8)
Net cash flows	12.2
Opening cash	244.9
Closing cash	257.1

ASSETS	
Intangible assets	116.3
Property, plant and equipment	13,266.8
Investment in associates	1,000.4
Financial Assets	2,480.9
Deferred Tax	119.4
Inventories	936.6
Trade Receivables	939.3
Other receivables	939.3
Prepayments and accrued income	171.4
Tax repayable	34.4
Operating Cash	257.1
ASSETS	**20,261.9**
EQUITY	
Ordinary Share Capital	1,449.4
Share Premium	153.0
Retained Earnings at start	7,023.0
Retained profits	306.6
Other Reserves	164.1
Total Equity	**9,096.1**
LIABILITIES	
Retirement Benefit Obligations	(387.4)
Provisions for Other Liabilities	(344.5)
Deferred Tax	(1,009.1)
Other liabilities	(6.5)
Borrowings	(8,153.0)
Trade Payables	(819.7)
Accruals and deferred income	(342.8)
Other Current Liabilities	(102.8)
Total Liabilities	**(11,165.8)**
EQUITY AND LIABILITIES	**20,261.9**

Profit after tax	2,066.7
add back: Interest expense (net of tax)	290.5
add back: Interest income (net of tax)	(9.2)
NOPAT	2,348.0
Net interest after tax	(281.3)
Purchases of property, plant and equipment	(1,265.8)
Depreciation	631.5
(Incr.)/Decr. in Operating Working Capital	(83.5)
New Invested Capital	(717.7)
Change in non-operating provision	16.7
Debt borrowing	1,564.7
Debt repaymets	(1,158.1)
Change in gross debt	406.7
Change in cash	(12.2)
Free Cash Flows to Equity	**1,760.1**

Net Operating Profits After Tax ('NOPAT')

Operating 'Invested Capital' ('IC') represents operating net assets used to generate FCFF and NOPAT:

Invested Capital - balance	
Inventories	936.6
Trade Receivables	939.3
Other receivables	939.3
Tax repayable, prepayments and accruals	205.9
Operating Current Assets	*3,021.0*
Trade Payables	(819.7)
Accruals and deferred income	(342.8)
Other Current Liabilities and provisions	(102.8)
Operating Current Liabilities	*(1,265.4)*
Operating Working Capital	1,755.6
Intangible Assets (excl. goodwill)	19.3
add back: cumulative amortisation and impairment	30.6
Property, Plant & Equipment	13,266.8
Goodwill	97.0
Cumulative Goodwill Impairments	7.3
Operating Invested Capital (post- Goodwill)	**15,176.6**

Investor Funds - balance	
Borrowings	8,153.0
less: operating cash (if not treated as working capital)	(257.1)
Net debt	*7,895.9*
Retirement Benefit Deficit / (Surplus)	387.4
Long term non-operating liabilities and provisions	351.0
Debt equivalents	*738.3*
Net debt equivalents	*8,634.2*
Equity & Non-Controlling Interests	9,096.1
add back: cumulative amortisation and impairment	37.9
Deferred Tax Liability / (Asset)	889.7
Financial Assets	(2,480.9)
Investment in Associates	(1,000.4)
Net equity equivalents	*6,542.4*
Investor Funds	**15,176.6**

Invested Capital - movement	
Capex	1,265.8
less: depreciation and impairments	(631.5)
Change in net PP&E	*634.3*
Working Capital Investment	83.5
Net change in Invested Capital (pre-Goodwill)	717.7
Opening Invested Capital (pre Goodwill)	14,354.6
Opening Goodwill at cost	104.3
Closing Invested Capital (post- Goodwill)	**15,176.6**

Net Assets	9,096.1
remove: net debt and debt equivalents	8,634.2
remove: financial assets	(2,480.9)
remove: investment in associates	(1,000.4)
remove: deferred tax liability	889.7
remove: cumulative amortisation	37.9
Closing Invested Capital (post- Goodwill)	**15,176.6**

In this example, net cash in excess of the amount estimated as required for daily operations ('operating cash') is paid out in full to shareholders. The dividend equals the Free Cash Flow to Equity (this assumes sufficient distributable profits under company law exist).

NOPAT represents operating Earnings Before Interest & Tax (EBIT) after operating taxes paid have been deducted. NOPAT can be used for valuation purposes because of its relationship to FCFF:

NOPAT	x
less: New Invested Capital ('NIC' = capex – depreciation + increase in working capital)	(x)
FCFF	x

Where NIC is the increase in IC:

Property, Plant & Equipment	x
Working Capital	x
Other operating net assets and intangibles	x
IC at start	x
NIC (capex – depreciation + change in working capital)	x
IC at end	x

The proportion of NOPAT that is reinvested in NIC is the 'Reinvestment Rate' ('RR"):

$$RR\ \% = \frac{NIC}{NOPAT}$$

$$FCFF = NOPAT\ (1 - RR\ \%)$$

Rates of Return

ROIC

'Return on Invested Capital' ('ROIC') equals NOPAT for the period t ($NOPAT_t$) divided by opening (or average) Invested Capital (IC_{t-1}):

$$ROIC_t = \frac{NOPAT_t}{IC_{t-1}} \quad \therefore \quad NOPAT_t = ROIC_t \times IC_{t-1}$$

$ROIC_t$ can be expressed in terms of a margin and net operating asset turnover ratio:

$$ROIC_t = \frac{NOPAT_t}{Revenue_t} \times \frac{Revenues_t}{IC_{t-1}}$$

$$= \frac{NOPAT\ margin}{\frac{Net\ PP\&E_{t-1}}{Revenues_t} + \frac{Working\ Capital_{t-1}}{Revenues_t}}$$

Taking the example in Appendix 3

		Forecast Year				
		1	2	3	4	5
$NOPAT_t$		106.90	80.29	71.80	73.95	76.17
$Revenues_t$		2,121.80	2,229.16	2,296.04	2,364.92	2,435.87
÷	=	*5.04%*	*3.60%*	*3.13%*	*3.13%*	*3.13%*
$Net\ PP\&E_{t-1}$		400.00	424.36	445.83	459.21	472.98
$Revenues_t$		2,121.80	2,229.16	2,296.04	2,364.92	2,435.87
+	=	*18.85%*	*19.04%*	*19.42%*	*19.42%*	*19.42%*
$Working\ Capital_{t-1}$		115.00	126.93	133.35	137.35	141.47
$Revenues_t$		2,121.80	2,229.16	2,296.04	2,364.92	2,435.87
	=	*5.42%*	*5.69%*	*5.81%*	*5.81%*	*5.81%*
	=	*20.76%*	*14.56%*	*12.40%*	*12.40%*	*12.40%*
$NOPAT_t$		106.90	80.29	71.80	73.95	76.17
$Invested\ Capital_{t-1}$		515.00	551.29	579.18	596.56	614.45
	=	*20.76%*	*14.56%*	*12.40%*	*12.40%*	*12.40%*

RONIC

Part of ROIC will incorporate the return on new invested capital, termed marginal ROIC or 'Return On New Invested Capital' ('RONIC'), which can be calculated on the assumption that the growth in NOPAT in the period is due to NIC made at the end of the prior period:

$$RONIC_t = \frac{\text{Change in NOPAT in year}}{\text{NIC in previous year}}$$

$$= \frac{NOPAT_t - NOPAT_{t-1}}{NIC_{t-1}}$$

$$= \frac{g.\ NOPAT_{t-1}}{NIC_{t-1}}$$

$$\therefore \quad g_t = RONIC_t \times \frac{NIC_{t-1}}{NOPAT_{t-1}}$$

$$= RONIC_t \times RR_{t-1}$$

$$\therefore \quad RR_{t-1} = \frac{\text{Growth}_{NOPAT\ t}}{RONIC_t}$$

$$NOPAT_{t-1} = NOPAT_t + \left(RONIC_t \times NIC_{t-1} \right)$$

Taking the example in Appendix 3:

		Forecast Year				
		1	2	3	4	5
$NOPAT_{t-1}$			106.90	80.29	71.80	73.95
+			+	+	+	+
($RONIC_t$			*-73.34%*	*-30.45%*	*12.40%*	*12.40%*
x			*x*	*x*	*x*	*x*
NIC_{t-1})			36.29	27.90	17.38	17.90
			=	=	=	=
$NOPAT_t$	=		80.29	71.80	73.95	76.17

ROIC and RONIC

Average ROIC is the return on all invested capital, including NIC made this year and in prior years, so will incorporate RONIC

$$ROIC_t = \frac{\text{NOPAT prior year} + \text{Change in NOPAT this year}}{\text{Invested Capital at start of last year} + \text{New Invested Capital last year}}$$

$$= \frac{NOPAT_{t-1} + g_{NOPAT\,t} \times NOPAT_{t-1}}{IC_{t-2} + g_{IC\,t-1} \times IC_{t-2}}$$

$$= \frac{NOPAT_{t-1}}{IC_{t-2}} \times \left(\frac{1 + g_{NOPAT\,t}}{1 + g_{IC\,t-1}} \right)$$

$$= ROIC_{t-1} \times \left(\frac{1 + g_{NOPAT\,t}}{1 + g_{IC\,t-1}} \right)$$

$$= ROIC_{t-1} \times \frac{1 + [RR_{t-1} \times RONIC_t]}{1 + g_{IC\,t-1}}$$

From Appendix 3:

			Forecast Year				
			1	2	3	4	5
	$ROIC_{t-1}$				14.56%	12.40%	12.40%
	x						
	$RONIC_t$				-30.45%	12.40%	12.40%
x	RR_{t}-1				34.74%	24.20%	24.20%
=	1 +	a			89.42%	103.00%	103.00%
	IC growth $_{t-1}$				5.06%	3.00%	3.00%
=	1 +	b			105.06%	103.00%	103.00%
	c =	a / b			85.11%	100.00%	100.00%
=	$ROIC_t$				12.40%	12.40%	12.40%

Forecasting Cash Flows

General Approach

The length of the forecast period and when cash flows are deemed to arise during the year (usually at the end of the year or mid year) needs to be determined first. The accuracy of any forecast beyond two or three years has to be questioned, meaning a long term forecast period creates more uncertainty. However, if the value of the business calculated at the end of the forecast period is based on a single formula, as is popular for a TV calculation, the components of that formula need to be reasonably justifiable over the long term terminal period.This requires a long enough time period for cash flows and other relevant financial measures to reach some 'Steady State' (when growth in income and net assets is sustainable), which would depend on where the business is in its life cycle, competition in the industry, growth rates, risk profile etc.

Operating profits

A forecast would typically start with revenue, with annual price and volume estimates based on either a top-down (market share) or bottom-up approach (simulation or scenario analysis can also be used to derive expected revenues based on weighted probabilities), growing at various rates over the period. Fixed costs that do not vary with revenue should be treated separately, whilst other operating costs (excluding depreciation and amortisation) can be assumed to be a percentage of revenues. A review of financial statements over the past few years, once adjusted for abnormal items (acquisitions, discontinued operations, restructuring, capitalised expenses, etc), should help forecasting.

Earnings Before InterestTax Depreciation & Amortisation (EBITDA) can be calculated directly by applying an assumed EBITDA margin to revenues or indirectly by calculating operating expenses (ignoring depreciation and amortisation), as a percentage of revenues.

Investing for operating profits

EBITDA should be adjusted for non-cash items, which, in this simple case, involves deducting the increase in operating working capital ('OWC')(or adding a decrease), calculated as the closing less opening OWC balance. OWC represents net current assets used in the daily operations which are expected to be consumed or converted into cash in the year or operating cycle (inventory + trade receivables – trade payables) and which require financing. Each component can be estimated based on a percentage of sales.

Capex (net of disposals) represents the increase in operating Gross Property, Plant & Equipment (PP&E) after adding back asset retirements that have been removed. As the closing book value of PP&E (cost net of accumulative depreciation) equals the opening net PP&E + capex – depreciation charge, capex will be the balancing item if net PP&E and depreciation are assumed (this avoids the need to forecast retirements).

Net PP&E can be based on a percentage of revenues (inverse of the Asset Turnover):

$$\text{Net PP\&E}_n = \text{Assumed \%} \times R_n$$

Depreciation can be estimated as a percentage of opening gross or net PP&E (the latter is preferred to avoid problems with retirements):

$$\text{Depreciation}_n = \text{Assumed \%} \times \text{Net PP\&E}_{n-1}$$

Capex will then be the balancing figure from:

$$\text{Net PP\&E}_n = \text{Net PP\&E}_{n-1} + \text{Capex}_n - \text{Depreciation}_n$$

$$\therefore \quad \text{Capex}_n = \text{Net PP\&E}_n - \text{Net PP\&E}_{n-1} + \text{Depreciation}_n$$

(see Koller et al. (McKinsey) (2025) p.266, p.273)

A more detailed estimate would assume a depreciation profile for PP&E existing at the valuation date balance sheet and would calculate depreciation on capex each year in the forecast period using a 'vintage' approach (straight line depreciation on each year's capex based on average asset lives).

Depreciation could also be a multiple of capex if capex is assumed to be a percentage of revenues rather than as estimated as above. Capex is required to increase the productive capacity ('growth' capex) and maintain existing capacity ('maintenance' capex). The latter would represent true economic depreciation rather than accounting depreciation, which is often used as a proxy. Ignoring OWC, Invested Capital will only grow if capex exceeds accounting depreciation, so the capex / depreciation ratio must exceed 1.0 if growth is assumed. Capex and the increase in OWC represent the gross cash investment in Invested Capital (before depreciation), required to generate the forecast EBITDA.

Taxes

The final calculation to arrive at FCFF (in this simple case) is to deduct the operating cash taxes that would be paid on pre-financing operating and investing cash flows. A tax computation based on taxable profits (net of permanent differences to pre-tax profits), incorporating tax relief on capex rather than depreciation (capital allowances in the UK) and adjustments for accumulated tax losses, would be preferred, but the required information is unlikely be available. An estimate of taxable profits from the income statement should be made, excluding financing items, to which the statutory tax rate can be applied before the increase in operating 'Deferred Taxes' (discussed in Part 4) is deducted to arrive at taxes paid on operating cash flows (see Koller et al. (McKinsey) (2025) ch.20, Damodaran (2025) ch.10, Bodmer (2015) ch.12).

Towards the Terminal Value: Achieving Steady State

Competition should drive down ROIC (see Appendix 2), so that new investments generate less value (zero value if the returns equal the discount rate) and the returns and growth rates remain constant thereafter. Once the final forecast period has been reached, a steady state should be in place to allow a reasonable long term growth rate to be assumed in the TV calculation (such as the long term economic growth rate in the country where the business operates) and to ensure revenues, net profits and balance sheet items grow at the same rate.

The steady state growth rate g* (usually revenue growth) should be in place by the final year of the forecast period (year n), so that in the first year of the terminal period (n+1) all balance sheet items (including debt and equity) and flows (free cash flows, profit after tax, dividends and 'Residual Income' – discussed in Part 3) also grow at g*. If interest expense is calculated on opening balances, then steady state should apply to year n-1 (so that debt grows at g* in year n-1 and interest grows at g* in year n).

Appendx 3 provides a simple illustration of steady state (3.0% growth is achieved in year n-1 or year 4). The following assumptions are made:

- Revenues grow at g* and margins are constant from year 4.

- Other assumptions are made to ensure all income components and balance sheet items grow at g* (including debt and equity):

  - The carrying amount of operating fixed assets (Property, Plant & Equipment 'PP&E') at the year end is calculated as a % of revenues for the year:

$$\text{Net PP\&E}_{n+1} = (\text{Net PP\&E}_n \;/\; \text{Revenue}_n) \times \text{Revenue}_{n+1}$$

$$= \text{Net PP\&E}_n \times (1 + g^*)$$

  - The depreciation expense for the year is calculated a % of opening Net PP&E

$$\text{Depreciation (D)}_{n+1} = \text{Net PP\&E}_n \times \text{assumed depreciation rate \%}$$

  - Capex is implied from the above:

$$\text{Capex}_{n+1} = \text{Net PP\&E}_{n+1} - \text{Net PP\&E}_n + D_{n+1} = g^*. \text{Net PP\&E} + D_{n+1}$$

  - The carrying amount of working capital at the year end is calculated as a % of revenues for the year:

$$\text{Working capital (WC)}_{n+1} = (WC_n \;/\; R_n) \times R_{n+1}$$

$$= WC_n \times (1 + g^*)$$

$$\therefore \quad \text{Change in WC}_{n+1} = g^* . WC_n$$

- As a result RONIC and the Reinvestment Rate are constant and equal to the final forecast year (the average ROIC is also constant)

Integrated Forecast Financial Statements

Once the main components of FCFF have been forecasted (revenues, operating costs, changes in invested capital, tax), non-operating forecasts can be made, principally debt and equity cash flows (after tax), which allows forecast financial statements to be prepared. Although a DCF using FCFF to estimate the EntV does not require financial statements for each forecast period, it is useful to produce them for a number of reasons:

- to identify risk and return measures: credit risk ratios can indicate financial strain, whilst return measures are an important 'value driver'

- to calculate net profits and equity cash flows for other calculation methods (discussed in Part 3): residual net income and equity cash flow methods that should give similar equity values as under the traditional FCFF valuation method (after debt is deducted from Enterprise Value)

- to compare capital structure to assumptions used in the discount rate: the discount rate is calculated based on capital structure assumptions that may or may not be consistent with forecast leverage ratios

Terminal Value

TV based on FCFF

The TV can be determined using a growing perpetuity model:

$$TV_n = \frac{FCFF_{n+1}}{r - g^*}$$

Where n is the last year of the forecast period, $FCFF_{n+1}$ the steady state FCFF in the first year of the terminal period, r the discount rate and g* the steady state growth rate. This would then be discounted back over the forecast period to the valuation date:

$$\text{PV at valuation date} = \frac{TV_n}{(1 + r)^n}$$

TV based on 'NOPAT'

We can replace the FCFF growing perpetuity formula with the following:

$$TV_n = \frac{NOPAT_{n+1} \times (1 - RR)}{r - g^*}$$

$$= \frac{NOPAT_{n+1} \times \left(1 - \frac{g^*}{RONIC_{n+1}}\right)}{r - g^*}$$

In the presence of inflation, g* and RONIC should be expressed in real terms (see Appendix 2).

TV based on multiples

An alternative would be to calculate the TV based on a multiple applied to $FCFF_{n+1}$ (the equivalent to 1 / (r – g*)) or some other measure such as EBITDA, so long as the multiple was suitable for enterprise value (i.e. a Price / Earnings multiple could not be used):

$TV_n = EBITDA_{n+1} \times \text{multiple}$

A perpetuity approach would be more traditional, although this could be used to derive the implied multiple as a reasonableness check.

Scenarios

The assumptions that significantly affect the DCF value should be identified so that scenarios can be modelled to indicate a valuation range. Typical 'value drivers' would be revenue growth (including the TV growth rate), EBITDA margins, investments and the discount rate. In the simple case, a best and worst case scenario would be shown in addition to the base case.

DCF Values

The sum of the PV of FCFF over the forecast period (n years) and the PV of the TV represents the operating Enterprise Value:

$$\text{Enterprise Value}_0 = \underbrace{\frac{FCFF_1}{(1+r)^1} + \frac{FCFF_2}{(1+r)^2} + \ldots\ldots\ldots + \overbrace{\frac{FCFF_{n-1}}{(1+r)^{n-1}} + \frac{FCFF_n}{(1+r)^n}}^{\text{Stready state FCFF}}}_{\text{Forecast FCFF PV}} + \underbrace{\frac{FCFF_{n+1}}{(1+r)^n}}_{\text{TV PV}}$$

This assumes the discount rate is constant and FCFF is received at the end of the year.

Suggested reading

Books:

Arzac, E.R. (2008) *Valuation for Mergers, Buyouts and Restructurings* (2nd ed.) Wiley.
Benninga, S. & Sarig, O.H.(1996) *Corporate Finance: A Valuation Approach*, McGraw Hill
Bodmer, E. (2015) *Corporate and Project Finance Modeling* Wiley
Damodaran, A. (2025) *Investment Valuation: Tools and Techniques for Determining the Value of Any Asset* (4th ed.) Wiley
Fernàndez, P. (2002) *Valuation Methods and Shareholder Value Creation.* San Diego/London: Academic Press.
Holthausen, R.W & Zmijewski, M.E. (2020) *Corporate Valuation: Theory, Evidence & Practice* (2nd ed.). Cambridge.
Koller,T.,Goedhart, D.,Wesells, D., McKinsey & Co. (2025) *Valuation: Measuring and Managing the Value of Companies* (8th ed.). Wiley.
Penman, S. & Pope, P. (2025) *Financial Statement Analysis for Value Investing*, Columbia University Press
Tham, J. & Vélez Pareja, I. (2004) *Principles of Cash Flow Valuation*. Elsevier.

Papers:

Bradley, M. & Jarrell, G.A. (2003) "Inflation and the Constant-Growth Valuation Model: A Clarification" http://ssrn.com/abstract=356540
Buttignon, F. (2012) "Terminal Value, Growth and Inflation in DCF Models: Some Problems and Practical Solutions" http://ssrn.com/abstract=2041289
Caness, J.L. & Jarrell, G.A (2022) "The Proper Treatment of Cash Holdings in DCF Valuation Theory and Practice" *Journal of Business Valuation and Economic Loss Analysis* 2022: 17(1) pp.39-64
Cooper, I.A. (2019) "Setting the horizon value using DCF-based methods: Teaching note" https://ssrn.com/abstract=3159030
Cooper, I.A. (2021) "Using the constant growth formula to set the horizon value in corporate valuation: The case of growth firms and why you need a longer horizon" https://ssrn.com/abstract=4094896
Cornell, B. & Gerger, R. (2017) "Estimating Terminal Values with Inflation: The Inputs Matter—It Is Not a Formulaic Exercise" *Business Valuation Review* Vol.36 No.4
Forsyth, J.A. (2018) "An alternative formula for the constant growth model" https://www.researchgate.net/publication/332952318_An_alternative_formula_for_the_constant_growth_model
Fuller, R.J. & Hsia, C-C (1984), "A Simplified Common Stock Valuation Model" *Financial Analysts Journal* Sept-Oct 1984
Gordon, M.J and Shapiro, E. (1956) "Capital Equipment Analysis: The Required Rate of Profit," *Management Science*, 3,(1) (October 1956)
Gordon, M. J. (1959). "Dividends, Earnings and Stock Prices". *Review of Economics and Statistics.* 41 (2). The MIT Press: 99–105
Holland, D.A., and Matthews, B (2016): "Don't Suffer from a Terminal Flaw, Add Fade to Your DCF" (Credit Suisse, Holt Market Commentary, 14 June 2016)
Holland, D.A. (2018) "An Improved Method for Valuing Mature business and Estimating Terminal Value" *Journal of Applied Corporate Finance*, Winter 2018
Jennergren, L.P. (2008) "Continuing Value in Firm Valuation by the Discounted Cash Flow Model." European *Journal of Operational Research*, 185, 1548-1563.
Jennergren, L.P. (2011) "A Tutorial on the Discounted Cash Flow Model for Valuation of Companies" Stockholm School of Economics, https://swoba.hhs.se/hastba/papers/hastba0001.pdf
Mauboussin, M.J. & Callahan, D. (2022) "Return on Invested Capital: How to Calculate ROIC and Handle Common Issues," Morgan Stanley 6 October 2022
Nissim, D. (2022) "Profitability Analysis" https://ssrn.com/abstract=4064824
Nissim, D. (2022) "Reformulated Financial Statements" https://ssrn.com/abstract=4064722
O'Brien, T (2003) "A Simple and Flexible DCF Valuation Formula," *Journal of Applied Finance,* Fall / Winter 2003
Vélez–Pareja, I. (2009) "Constructing Consistent Financial Planning Models for Valuation" http://ssrn.com/abstract=1455304

Finite Period

If an amount invested (capital or principle) is certain to be recovered at some future date, together with income (investment or interest income based on some rate of return), we can say the investment is risk free as to the amount and timing of the cash flow. The risk free rate of return should apply, meaning the investor is rewarded for the 'time value of money'.

An investment or deposit of PV would, in this case, grow to C at the risk free rate, such that after 1 year C = PV x (1 + r), where C = the cash flow received at the end of the year or the Future Value, PV = Present Value and r = the risk free rate (effective annual rate). The risk free rate is the rate required by the investor for the zero risk investment. Of course, business cash flows are risky and investors will expect a risk premium to be added to the risk free rate.

If C is received after more than 1 year, PV will be compounded if interest is retained on deposit: interest (assumed in this case to be paid annually at the end of each year) will accrue on the opening balance (interest on interest). The future value will equal the present value when the income return has been factored out (discounted, the reverse of compounding):

$$PV = \frac{C}{(1+r)} \qquad \text{C received after 1 year}$$

$$PV = \frac{C}{(1+r)(1+r)(1+r)\ldots} = \frac{C}{(1+r)^n} \qquad \text{C received after n years}$$

The present value of multiple cash flows received over a specified forecast period can be estimated from:

$$PV = \frac{C}{(1+r)^1} + \frac{C}{(1+r)^2} + \frac{C}{(1+r)^3} + \ldots\ldots\ldots\ldots \frac{C}{(1+r)^n}$$

This can be simplified to:

$$PV = C \times \frac{1}{r} \times \left(1 - \frac{1}{(1+r)^n}\right)$$

PV of constant cash flow received annually for n years

$$= £1.00 \times \frac{1}{r} \times \left(1 - \frac{1}{(1+r)^n}\right)$$

$$= £1.00 \times \frac{1}{0.10} \times \left(1 - \frac{1}{(1+0.1)^\wedge 3}\right)$$

$$= £2.49$$

C	Cash Flow received at period n	£1
r	Discount rate p.a.	10.00%
n	Time in years	3

	1	2	3	
	1.00	1.00	1.00	Cash Flow
2.49	0.91	0.83	0.75	PV

If PV is already known (the fair price in the market), the rate r* that discounts cash flows to PV is the 'Internal Rate of Return' or 'IRR' (if the IRR is greater than the required return r, making the investment and paying PV for it would be worthwhile). The IRR can be calculated in Excel using the XIRR function or determined using trial and error (goal seek). Problems arise (i.e. multiple IRR can result) if there is more than one change in the sign of the cash flow, although this can be avoided using another method to calculate IRR (as when calculating the effective interest rate for measuring amortised cost or the implicit rate for a lease, discussed in Part 4).

If C grows at a rate g over the finite period n:

$$PV = C\frac{(1+g)^1}{(1+r)^1} + C\frac{(1+g)^2}{(1+r)^2} + C\frac{(1+g)^3}{(1+r)^3} + \ldots\ldots\ldots\ldots C\frac{(1+g)^n}{(1+r)^n}$$

This can be simplified to:

$$PV = C \times \frac{1}{r-g} \times \left(1 - \frac{(1+g)^n}{(1+r)^n}\right)$$

PV of growing cash flow received annually for n years

$$= £1.00 \times \frac{(1+0.03)}{r-g} \times \left(1 - \frac{(1+g)^n}{(1+r)^n}\right)$$

$$= £1.00 \times \frac{1.03}{0.1-0.03} \times \left(1 - \frac{(1+0.03)^\wedge 3}{(1+0.1)^\wedge 3}\right)$$

$$= £2.63$$

C	Cash Flow received at period n	£1
r	Discount rate p.a.	10.00%
n	Time in years	3
g	Growth rate p.a.	3.00%

	1	2	3	
	1.03	1.06	1.09	Cash Flow
2.63	0.94	0.88	0.82	PV

If C varies each year, as one would expect in a DCF, we have to discount each period, using the long formulae, until such time as we assume it is constant or growing at a constant rate.

Perpetuity

If C is received in perpetuity (infinite period) without growing (an annuity):

$$PV = C \times \frac{1}{r}$$

If F is received in perpetuity growing at g each year:

$$PV = C \times \frac{1}{r-g}$$

This is the Gordon Growth Model, used in the Dividend Discount Model (discussed in Part 3 of this series) (Gordon & Shapiro (1956), Gordon (1959))

The constant growth perpetuity formula can be adjusted to allow for g to reduce or 'fade' at a linear rate 'f' over time (Holland (2016)):

$$PV = C \times \frac{1}{r - g + f}$$

One Finite Period + Perpetuity ('2-Stage Model')

The 2-stage model combines the equations for finite (time 0 to n) and infinite (time n+1 on) cash flows, allowing for different growth rates (for example an initial high rate g_H followed by a low rate g_L):

$$PV = \underbrace{C_1 \times \frac{1}{r - g_H} \times \left(1 - \frac{(1+g_H)^n}{(1+r)^n}\right)}_{\text{PV today of stage 1}} + \underbrace{\underbrace{C_{n+1} \times \frac{1}{r - g_L}}_{\text{PV at } t_n \text{ of stage 2}} \times \frac{1}{(1+r)^n}}_{\text{PV today of stage 2}}$$

where

C_{n+1} is the cash flow at the end of the first period after the finite period (n + 1). As C_1 is the cash flow received at the end of year 1, $C_{n+1} = C_1 \times (1 + g_H)^{n-1} \times (1 + g_L)$

If we assume a cash flow received today (C_0) grows at g_H to C_1 after one year, then the above formula becomes:

$$PV = C_0 \times \left\{ \frac{1+g_H}{r - g_H} \times \left(1 - \frac{(1+g_H)^n}{(1+r)^n}\right) + \frac{(1+g_H)^n (1+g_L)}{r - g_L} \times \frac{1}{(1+r)^n} \right\}$$

PV of growing cash flow received annually for n years at a high growth followed by a low rate in perpetuity

$$\begin{aligned}
&= £1.00 \times \left\{ \frac{(1+5.0\%)}{(10.0\% - 5.0\%)} \times \left(1 - \frac{(1+5.0\%)\text{^}3}{(1+10.0\%)\text{^}3}\right) + \left(\frac{(1+5.0\%)\text{^}3}{(10.0\% - 3.0\%)} \times \frac{(1+3.0\%)}{(1+10.0\%)\text{^}3}\right) \right\} \\
&= £1.00 \times \left\{ \frac{1.05}{5.00\%} \times \left(1 - \frac{1.1576}{1.3310}\right) + \left(\frac{1.1576}{7.00\%} \times \frac{1.03}{1.3310}\right) \right\} \\
&= £1.00 \times \left\{ \left(21.00 \times 0.1303\right) + \left(16.5375 \times 0.7739\right) \right\} \\
&= £1.00 \times \left(2.7354 + 12.7976 \right) \\
&= £15.5331
\end{aligned}$$

			PV	1	2	3	4	
C	Cash Flow received at period n	£1		5.00%	5.00%	5.00%	3.00%	Growth
r	Discount rate p.a.	10.00%		1.05	1.10	1.16	1.19	Cash Flows
n	Time in years	3	2.7354	0.95	0.91	0.87		
gH	High growth	5.00%					17.03	Perpetuity PV
gL	Low growth (perpetuity	3.00%	12.7976				12.80	
			15.5331					

If there is an immediate linear decrease in the growth rate from g_H to g_L over period 2H followed by a constant growing perpetuity at g_L, the 'H' fade model can be used (Fuller and Hsia 1984):

$$\text{PV at time 0} = C_0\left(\frac{1 + g_L}{r - g_L}\right) + C_0\left(\frac{H\,(g_H - g_L)}{r - g_L}\right)$$

$$\text{PV with H Model} = £1.00 \times \left(\frac{(1 + 3.0\%)}{(10.0\% - 3.0\%)} + \frac{(5.0\% - 3.0\%)}{(10.0\% - 3.0\%)}\ H = 1.5\right)$$

$$= £1.00 \times \left(\underset{\textit{Low g}}{14.7143} + \underset{\textit{Fading high g}}{0.4286}\right)$$

$$= £15.1429$$

C	Cash Flow received at period 0		£1
r	Discount rate p.a.		10.00%
n	Time in years	2H	3
H	Time in years	H	1.5
gH	High growth		5.00%
gL	Low growth (perpetuity		3.00%

(see Damodaran (2025) ch.14 for further discussion on the H model)

Two Finite Periods + Perpetuity ('3-Stage Model')

The 3-stage model shows cash flows growing at three different rates, an initial phase (with growth g_1), an interim phase (with growth g_2) and a perpetuity phase (with growth g_3). Growth rates would typically reduce from g_1 to g_3, although the transition period can incorporate a reducing growth rate that 'fades' over the period from g_1 to g_3, following the H model above.

The 3-stage model can be shown as:

$$PV = C_1 \times \frac{1}{r - g_1} \times \left(1 - \frac{(1 + g_1)^{n1}}{(1 + r)^{n1}}\right) \quad \text{1st stage}$$

$$+ C_{n1+1} \times \frac{1}{r - g_2} \times \left(1 - \frac{(1 + g_2)^{n2}}{(1 + r)^{n2}}\right) \quad \text{2nd stage (Typically modelled as a 'fade' period)}$$

$$+ C_{n2+1} \times \frac{1}{r - g_3} \times \frac{1}{(1 + r)^{n2}} \quad \text{3rd stage}$$

The main growing perpetuity TV formula that decomposes FCF into NOPAT, g and RONIC is:

$$TV_n = \frac{NOPAT_{n+1} \times \left(1 - \frac{g^*}{RONIC_{n+1}}\right)}{r - g^*}$$

where:

NOPAT = Free Cash Flows to the Firm (FCFF) + New Invested Capital (NIC)
NIC = (Capital expenditures – Depreciation) + Increase / (decrease) in working capital
RONIC = Return On New Invested Capital
g* = Steady state (sustainable) growth rate of NOPAT (and Invested Capital)

Replacing NOPAT with $ROIC_{n+1} \times IC_n$:

$$TV_n = \frac{ROIC_{n+1} \times IC_n \times \left(1 - \frac{g^*}{RONIC_{n+1}}\right)}{r - g^*} \qquad \text{A2.1}$$

The TV in Appendix 3 can be shown as:

$$\frac{12.40\% \times 632.89 \left(1 - \frac{3.00\%}{12.40\%}\right)}{10.00\% - 3.00\%}$$

$$= \frac{78.45 \left(1 - 24.20\%\right)}{7.00\%}$$

$$= \frac{59.47}{7.00\%}$$

$$= 849.52$$

As Invested Capital grows at the steady state rate of g* and NIC = growth x Invested Capital at the start of the period:

$$NIC_{n+1} = g^* \times IC_n$$

We can replace these expression in the FCFF – NOPAT equation:

$$FCFF_{n+1} = NOPAT_{n+1} - NIC_{n+1}$$

$$= (ROIC_{n+1} \times IC_n) - (g^* \times IC_n)$$

$$= IC_n \quad x \quad (ROIC_{n+1} - g^*)$$

$$TV_n = IC_n \quad x \quad \left(\frac{ROIC_{n+1} - g^*}{r - g^*} \right) \qquad \text{A2.2}$$

The TV in Appendix 3 can be shown as:

$$632.89 \quad x \quad \left(\frac{12.40\% - 3.00\%}{10.00\% - 3.00\%} \right)$$

$$= 849.52$$

This TV formula can be rewritten in a number of ways:

(see Koller et al. (McKinsey) 2025 p.866, p288)

$$TV_n = IC_n + IC_n \left(\frac{ROIC_{n+1} - r}{r - g^*} \right) \qquad \text{A2.3}$$

$$632.89 + 632.89 \left(\frac{12.40\% - 10.00\%}{10.00\% - 3.00\%} \right)$$

$$= 632.89 + 216.63$$

$$= 849.52$$

This formula will be mentioned again when alternative DCF methods are covered in Part 3 of this series. The formula shows the TV as the value of net operating assets (Invested Capital) existing at the start of the terminal period (IC_n) and the value derived from future investments (NIC) made in perpetuity. Value will be created if the expected return on assets (ROIC) exceeds the required return ('excess returns'). The average return on all assets (ROIC) is used here as it is being calculated on total net operating assets (IC).

The second term $IC_n \left(\frac{ROIC_{n+1} - r}{r - g^*} \right)$ can also be shown as follows:

(see Koller et al. (McKinsey) 2025 p.288)

$$= \frac{IC_n \; (ROIC_{n+1} - r)}{r} + \frac{\left\{ \frac{NOPAT_{n+1} \left(\frac{g^*}{RONIC_{n+1}} \right) \left(RONIC_{n+1} - r \right)}{r} \right\}}{r - g^*} \qquad \text{A2.4}$$

$$= 632.89 \left(\frac{12.40\% - 10.00\%}{10.00\%} \right) + \frac{\left[\frac{78.45 \left(\frac{3.00\%}{12.40\%} \right) \left(12.40\% - 10.00\% \right)}{10.00\%} \right]}{10.00\% - 3.00\%}$$

$$= \frac{15.16}{10.00\%} + \frac{4.55}{10.00\% - 3.00\%}$$

$$= 151.64 + 64.99$$

$$= 216.63$$

This breaks the return on all assets down into a constant perpetuity value (first terminal year excess returns on all assets received in perpetuity) and a growing perpetuity value (second terminal year excess returns on new investments growing in perpetuity). If RONIC = r the second term is zero as new investments will not create value (until RONIC is greater than r).

We can also write theTV as a no growth value (NOPAT / r) plus the value of future growth:

(see Arzac 2008 p.90)

A2.5

$$TV_n = \frac{NOPAT_{n+1}}{r} + \frac{NOPAT_{n+1}}{r} \left(\frac{ROIC_{n+1} - r}{ROIC_{n+1}} \right) \left(\frac{g^*}{r - g^*} \right)$$

$$\frac{78.45}{10.00\%} + \frac{78.45}{10.00\%} \left(\frac{12.40\% - 10.00\%}{12.40\%} \right) \left(\frac{3.00\%}{10\% - 3\%} \right)$$

$$= 784.53 + 784.53 \left(19.33\% \times 42.86\% \right)$$

$$= 784.53 + 64.99$$

$$= 849.52$$

Inflation

In a high inflation environment growth, rates and returns should be expressed in real terms to account for inflation:

$$TV_n = \frac{NOPAT_{n+1} \times \left(1 - \frac{g^{*real}}{RONIC_{n+1}^{real}} \right)}{(r^{real} - g^{*real})(1 + i)}$$

where

i	=	the inflation rate
g^{*real}	=	$(1 + g^{*nominal}) / (1 + i) - 1 = (g^{*nominal} - i) / (1 + i)$
$RONIC_{n+1}^{real}$	=	reinvestment rax x g^{*real}

The real RONIC is here implied from the fixed reinvestment rate, so that the implied $RONIC_{n+1}^{nominal}$ will differ when ignoring inflation. From Appendix 3, if we assume inflation is 1.98% so the real growth rate is 1.0%, the implied nominal RONIC drops from 12.40% if inflation is zero to 6.19% taking into account inflation (this is based on Arzac 2005 p.17 - see Koller et al. (McKinsey) 2025 p.502 for a discussion about converting all figures, including NOPAT, into real terms).

Inflation	1.98%			
RR	24.20%			
		Nominal	Real	
Growth		3.00%	1.00%	= (1 + 3.00%) / (1 + 1.98%) - 1
r		10.00%	7.86%	= (1 + 10.00%) / (1 + 1.98%) - 1
Implied Real RONIC			4.13%	= 1.00% / 24.20%
Implied Nominal RONIC		6.19%		= (1 + 4.13%) x (1 + 1.98%) - 1
RONIC (ignoring inflation)		12.40%		

$$\frac{78.45\left(1 - \frac{1.00\%}{4.13\%}\right)}{\left(7.86\% - 1.00\%\right) \times 101.98\%}$$

$$= \frac{78.45\left(1 - 24.20\%\right)}{6.86\% \times 101.98\%}$$

$$= \frac{59.47}{7.00\%}$$

$$= 849.52$$

This simplified example illustrates the basic principles of DCF Enterprise Valuation, particularly the requirement for a steady state towards the end of the forecast period. A detailed discussion of steady state cash flows, along with a DCF model can be found in Jennergren (2011). To simplify things, deferred tax and adjustments to the EntV to arrive at Equity Value ('EqV')(see Parts 4 and 5) have been ignored.

In the base case, revenues have reached the long term sustainable growth rate used in the perpetuity (3.0%) by year 3, and by year 4 all flows and balances in the financial statements grow at this rate. ROIC and RONIC are both constant and equal at 12.40% (and will remain this way happily forever), since the proportion of NOPAT reinvested as New Invested Capital (NIC) is fixed at the year 5 level[1]. Discounting the year 5 TV and forecast period cash flows at a constant 10.0% gives a base case EnV of 750.00 and EqV of 600.00.

If revenue growth, operating expenses / revenues and the discount rate are changed by 1.0% increase / decrease, 0.5% decrease / increase and 1.0% decrease / increase respectively, the EntV ranges from 1,120.87 to 544.69. Over 85% of the variation is due to the TV, because the based case growth adjusted perpetuity discount rate ranges 7.0% +/- 2.0%. Also RONIC in the worst case scenario has decreased below the discount rate (WACC), meaning new investments are value destructive.

It is assumed the book value of debt equals market value ('MV') and all 'excess cash' is paid out to shareholders. This valuation illustrates the approach of some experts by assuming cash required to operate the business ('Operating Cash') approximates 2.0% of annual revenue (see Koller et al. (McKinsey) 2025 p.213, p.336). Some argue that cash should not be separated into operating and excess cash (see Caness & Jarrell (2022)), but is shown in this example. Some also question whether operating cash should be included in working capital rather than treated separately as cash. It is treated here as part of working capital, so the increase in working capital includes the increase in operating cash. How cash is treated in general will be discussed in Parts 2 and 4 of this Series.

Calculation of the discount rate assumes the MV of debt as a percentage of the MV of debt and equity (the EntV) is constant at 20%, and debt levels have been set to ensure this occurs. This requires circularity and a 'recursive' procedure, where the EntV Terminal Value ('TV') is first calculated in order to set the debt at the end of the forecast period. The EntV at the prior period (year 4) equals the TV plus the year 5 Free Cash Flow to the Firm (FCFF) both discounted back one period, which allows year 4 debt to be calculated. This procedures is carried on back to the valuation date, at which time interest can be calculated (going forward) and net income determined (allowing for tax relief).

1 If, instead, RR were to increase to 30% and growth rates remain at 3.0%, RONIC would reduce to 10.0% (ROIC reduces to 10.0% very slowly over some 200 years) since more investment would be required to generate the same growth (RONIC = g / RR). As this equals the discount rate, the NIC will not add any value.

			Forecast Year				
			1	2	3	4	5
PROFIT & LOSS							
Revenues			2,121.80	2,229.16	2,296.04	2,364.92	2,435.87
Operating expenses			(1,909.62)	(2,048.22)	(2,122.69)	(2,186.37)	(2,251.96)
EBITDA			212.18	180.94	173.35	178.55	183.91
Depreciation			(69.64)	(73.89)	(77.62)	(79.95)	(82.35)
EBIT			142.54	107.05	95.73	98.60	101.56
Interest			(11.76)	(11.83)	(12.19)	(12.56)	(12.94)
Pre-tax profits			130.77	95.22	83.53	86.04	88.62
Tax			(32.69)	(23.81)	(20.88)	(21.51)	(22.16)
Post-tax profits			98.08	71.42	62.65	64.53	66.47
Dividends			(62.67)	(48.13)	(49.94)	(51.44)	(52.98)
Retained profits			35.41	23.29	12.71	13.09	13.48

			1	2	3	4	5
CASH FLOWS							
EBITDA			212.18	180.94	173.35	178.55	183.91
less: capital expenditures			(94.00)	(95.36)	(91.00)	(93.73)	(96.54)
less: increase in working capital			(11.93)	(6.42)	(4.00)	(4.12)	(4.24)
less: taxes paid (excluding financing)			(35.63)	(26.76)	(23.93)	(24.65)	(25.39)
Free Cash Flows to the Firm	FCFF		**70.62**	**52.39**	**54.42**	**56.05**	**57.73**
Debt cash flows (after tax relief on interest)			(7.95)	(4.27)	(4.48)	(4.61)	(4.75)
Dividends paid to ordinary shareholders			(62.67)	(48.13)	(49.94)	(51.44)	(52.98)
Net cash flows			-	-	-	-	-
Opening cash			-	-	-	-	-
Closing cash			-	-	-	-	-
EBITDA			212.18	180.94	173.35	178.55	183.91
Depreciation			(69.64)	(73.89)	(77.62)	(79.95)	(82.35)
EBIT			142.54	107.05	95.73	98.60	101.56
less: taxes paid (excluding financing)			(35.63)	(26.76)	(23.93)	(24.65)	(25.39)
Net Operating Profits After Taxes	NOPAT		**106.90**	**80.29**	**71.80**	**73.95**	**76.17**
Capital expenditures ('capex')			94.00	95.36	91.00	93.73	96.54
less: replacement capex (depreciation)			(69.64)	(73.89)	(77.62)	(79.95)	(82.35)
Growth capex			24.36	21.47	13.37	13.78	14.19
Increase in working capital			11.93	6.42	4.00	4.12	4.24
New Invested Capital	NIC		36.29	27.90	17.38	17.90	18.43
Free Cash Flows	FCFF		**70.62**	**52.39**	**54.42**	**56.05**	**57.73**

		Opening	1	2	3	4	5
BALANCE SHEET							
At cost		500.00	533.25	564.16	587.45	611.43	636.14
Accumulated depreciation		(100.00)	(108.89)	(118.33)	(128.24)	(138.45)	(148.97)
Fixed assets		400.00	424.36	445.83	459.21	472.98	487.17
Working capital (including operating cash)		115.00	126.93	133.35	137.35	141.47	145.71
Invested Capital		**515.00**	**551.29**	**579.18**	**596.56**	**614.45**	**632.89**
Opening Invested Capital		515.00	515.00	551.29	579.18	596.56	614.45
New Invested Capital	NIC	-	36.29	27.90	17.38	17.90	18.43
Closing Invested Capital		515.00	551.29	579.18	596.56	614.45	632.89
Gross debt		150.00	150.88	155.49	160.15	164.95	169.90
Excess cash		-	-	-	-	-	-
Net debt		150.00	150.88	155.49	160.15	164.95	169.90
Share Capital		100.00	100.00	100.00	100.00	100.00	100.00
Reserves		265.00	300.41	323.69	336.41	349.50	362.98
Equity		365.00	400.41	423.69	436.41	449.50	462.98
Financial Capital		**515.00**	**551.29**	**579.18**	**596.56**	**614.45**	**632.89**

	Forecast Year				
	1	2	3	4	5
ASSUMPTIONS					
Revenue growth rate	6.09%	5.06%	3.00%	3.00%	3.00%
Operating expenses / revenues	90.00%	91.88%	92.45%	92.45%	92.45%
Operating cash / revenues	1.90%	1.90%	1.90%	1.90%	1.90%
Working capital / Revenues	4.08%	4.08%	4.08%	4.08%	4.08%
Depreciation / Opening Net PP&E	17.41%	17.41%	17.41%	17.41%	17.41%
Retirements / Opening Net PP&E	15.19%	15.19%	15.19%	15.19%	15.19%
Net PP&E / Revenues	20.00%	20.00%	20.00%	20.00%	20.00%
Tax rate	25.0%	25.0%	25.0%	25.0%	25.0%
METRICS					
Growth rates					
Revenue growth		5.06%	3.00%	3.00%	3.00%
EBITDA growth		-14.72%	-4.19%	3.00%	3.00%
Depreciation growth		6.09%	5.06%	3.00%	3.00%
EBIT growth		-24.89%	-10.58%	3.00%	3.00%
NOPAT growth		-24.89%	-10.58%	3.00%	3.00%
Capex growth		1.44%	-4.57%	3.00%	3.00%
Working capital growth		5.06%	3.00%	3.00%	3.00%
Free Cash Flow growth		-25.80%	3.87%	3.00%	3.00%
Fixed Assets growth		5.06%	3.00%	3.00%	3.00%
Invested Capital growth		5.06%	3.00%	3.00%	3.00%
Interest growth		0.58%	3.05%	3.00%	3.00%
Net Profit growth		-27.19%	-12.27%	3.00%	3.00%
Net debt growth		3.05%	3.00%	3.00%	3.00%
Equity growth		5.82%	3.00%	3.00%	3.00%
Ratios					
EBIT margin	6.72%	4.80%	4.17%	4.17%	4.17%
Capex / depreciation	x 1.35	x 1.29	x 1.17	x 1.17	x 1.17
Capex / revenue	4.43%	4.28%	3.96%	3.96%	3.96%
Change Working Capital / Revenues	0.56%	0.29%	0.17%	0.17%	0.17%
Invested Capital / Revenues	25.98%	25.98%	25.98%	25.98%	25.98%
Reinvestment Rate	33.94%	34.74%	24.20%	24.20%	24.20%
ROIC	20.76%	14.56%	12.40%	12.40%	12.40%
RONIC		-73.34%	-30.45%	12.40%	12.40%
WACC	10.00%	10.00%	10.00%	10.00%	10.00%

WACC is the discount rate, or the 'Weighted Average Cost of Capital', which is the subject of Part 2 of this Valuation Series.

DCF VALUATION

		Forecast Year 1	2	3	4	5
Free Cash Flows to the Firm		70.62	52.39	54.42	56.05	57.73
Terminal Value		-	-	-	-	849.52
Post-Tax WACC at start of year		10.00%	10.00%	10.00%	10.00%	10.00%
Discount factor		0.9091	0.8264	0.7513	0.6830	0.6209
PV of cash flows today	**750.00**	64.20	43.30	40.89	38.28	563.33
less: market value of debt at valuation date	(150.00)					
Equity Value	**600.00**					
Enterprise value at year end	750.00	754.38	777.43	800.75	824.77	849.52
Debt	(150.00)	(150.88)	(155.49)	(160.15)	(164.95)	(169.90)
Equity	600.00	603.51	621.94	640.60	659.82	679.61
Debt / Enterprise Value		20.00%	20.00%	20.00%	20.00%	20.00%

FCFF Perpetuity TV

Final year FCFF	57.73
Growth rate	3.00%
Discount rate	10.00%
TV = 57.73 x (1 + 3.00%) / (10.00% - 3.00%)	849.52

Final year NOPAT	76.17		
Reinvestment Rate	24.20%	g	3.00%
FCFF	57.73	RONIC	12.40%
First terminal period EBITDA			189.43
Implied Forward EBITDA x			x 4.5

			BEST CASE Forecast Year 1	2	3	4	5		WORST CASE Forecast Year 1	2	3	4	5
EBITDA			224.70	195.47	189.91	197.51	205.41		199.50	166.35	157.05	160.19	163.40
Depreciation			(69.64)	(74.52)	(78.99)	(82.15)	(85.44)		(69.64)	(73.13)	(76.05)	(77.57)	(79.12)
EBIT			155.06	120.95	110.92	115.36	119.97		129.86	93.23	81.00	82.62	84.27
less: taxes paid (excluding financing)			(38.76)	(30.24)	(27.73)	(28.84)	(29.99)		(32.46)	(23.31)	(20.25)	(20.66)	(21.07)
Net Operating Profits After Taxes	NOPAT		**116.29**	**90.71**	**83.19**	**86.52**	**89.98**		**97.39**	**69.92**	**60.75**	**61.97**	**63.20**
Capital expenditures ('capex')			97.64	100.20	97.14	101.02	105.06		89.64	89.93	84.79	86.48	88.21
less: replacement capex (depreciation)			(69.64)	(74.52)	(78.99)	(82.15)	(85.44)		(69.64)	(73.13)	(76.05)	(77.57)	(79.12)
Growth capex			28.00	25.68	18.15	18.87	19.63		20.00	16.80	8.74	8.91	9.09
Increase in working capital			13.01	7.68	5.43	5.64	5.87		10.62	5.02	2.61	2.67	2.72
New Invested Capital	NIC		41.01	33.36	23.57	24.52	25.50		30.62	21.82	11.35	11.58	11.81
Free Cash Flows	**FCFF**		**75.28**	**57.35**	**59.62**	**62.00**	**64.48**		**66.77**	**48.09**	**49.40**	**50.39**	**51.40**
Revenue growth rate		+ 1.00%	7.00%	6.00%	4.00%	4.00%	4.00%	- 1.00%	5.00%	4.00%	2.00%	2.00%	2.00%
Op. expenses / revenues		- 0.50%	89.50%	91.38%	91.95%	91.95%	91.95%	+ 0.50%	90.50%	92.38%	92.95%	92.95%	92.95%
EBIT growth				-22.00%	-8.29%	4.00%	4.00%			-28.21%	-13.11%	2.00%	2.00%
Free Cash Flow growth				-23.82%	3.95%	4.00%	4.00%			-27.97%	2.72%	2.00%	2.00%
Invested Capital growth				6.00%	4.00%	4.00%	4.00%			4.00%	2.00%	2.00%	2.00%
Net debt growth				4.00%	4.00%	4.00%	4.00%			2.06%	2.00%	2.00%	2.00%
Equity growth				7.41%	4.00%	4.00%	4.00%			4.48%	2.00%	2.00%	2.00%
Free Cash Flows to the Firm			75.28	57.35	59.62	62.00	64.48		66.77	48.09	49.40	50.39	51.40
Terminal Value			-	-	-	-	1,341.18		-	-	-	-	582.50
Post-Tax WACC at start		- 1.00%	9.00%	9.00%	9.00%	9.00%	9.00%	+ 1.00%	11.00%	11.00%	11.00%	11.00%	11.00%
Discount factor			0.9174	0.8417	0.7722	0.7084	0.6499		0.9009	0.8116	0.7312	0.6587	0.5935
PV of cash flows today		**1,120.87**	69.06	48.27	46.03	43.92	913.58	**544.69**	60.15	39.03	36.12	33.19	376.19

Final year FCFF	64.48
Growth rate	4.00%
Discount rate	9.00%
TV = 64.48 x (1 + 4.00%) / (9.00% - 4.00%)	1,341.18

Final year FCFF	51.40
Growth rate	2.00%
Discount rate	11.00%
TV = 51.40 x (1 + 2.00%) / (11.00% - 2.00%)	582.50

Final year NOPAT	89.98		
Reinvestment Rate	28.34%	g	4.00%
FCFF	64.48	RONIC	14.11%
First terminal period EBITDA			213.62
Implied Forward EBITDA x			x 6.3

Final year NOPAT	63.20		
Reinvestment Rate	18.68%	g	2.00%
FCFF	51.40	RONIC	10.71%
First terminal period EBITDA			166.66
Implied Forward EBITDA x			x 3.5