Equity Valuation – Understanding what’s important

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Introduction

• We are going to consider three of the most popular and effective valuation tools
  • Returns based analysis
  • Multiple Analysis
  • DCF

• For each of them we are going to look at:
  • How they work
  • Why some work better than others, and….
  • Why they are all simply different ways of looking at the same thing
Returns Based Analysis
Key Idea
It’s all about the value-added

Excess value created by a company

Excess value attributed by the market

Versus

Actual Return versus Required Return

Actual Value versus Invested Value

CROCI

WACC

Total EV

Gross Cash Invested

For Director’s Cut, but can adjust

If these are out of line, the stock is misvalued
Why Does it Work?

You invest $100m in some assets
Your required return is 10%

The actual return is 10%
The investment **should** be worth $100m

The actual return is 20%
The investment **should** be worth $200m

The actual return is 5%
The investment **should** be worth $50m

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Value Creating

Value Destroying
Calculating CROCI

\[
\text{CROCI} = \frac{\text{Debt-Adjusted Cash Flow}}{\text{Gross Cash Invested}}
\]

Operating cash flow (ignoring Working Capital) plus after-tax interest and lease expense

Non-cash items and the company’s financial structure have no impact, making comparisons more meaningful

Pre-depreciation and write off value of tangible and intangible assets

Gross Assets plus Operating working capital plus capitalised leases plus investments

Depreciation policies do not impact this figure
Companies are compared with the sector

EV / GCI vs. CROCI/WACC

Quartile 4
Quartile 3
Quartile 2
Quartile 1

1:1 line
Line representing average valuation for the sector

Overvalued
Undervalued

DC score > 1
DC score < 1

Question: Why are these different?
Why are these different?

• Capex
• Valuable assets which are not revalued (eg. Intangibles)
• Growth…..
What about growth?

• Absolute growth is not the driver of value

• Why?

• Growth isn’t always good

• Returns, not growth, have historically been shown to drive valuations

• Returns are more stable and consistent than growth
Growth isn’t always good!

• If management are generating lower returns than required returns, then value will be destroyed.

• If management are generating higher returns than required returns, then value will be added.

- Price Down
  - Value Destroyer
    - Return < Required return
  - Value Neutral
    - Return = Required return
  - Value Adding
    - Return > Required return

- Price Stable

- Price UP
  - Good Growth
    - High Growth
    - High
  - Bad Growth
    - Low Growth
    - Low

Goldman Sachs Global Investment Research
Cash return spreads, not growth, drive valuation and performance

The market values companies on returns: The correlation between capitalization of cash invested (EV vs. GCI) and economic return spread (CROCI vs. WACC) is significantly higher than between multiples and growth.
Superior returns are more sustainable than superior growth

Top-quartile returns more sustainable than growth in AEJ...

...as well as in Japan

Average years first quartile position is sustained:
CROCI: 2.4 years
Growth: 1.3 years

Average years first quartile position is sustained:
CROCI: 2.5 years
Growth: 1.2 years

About 95% of companies display first quartile growth for 2 years or less. Approx. 80% do not make it past 1 year

More than 95% of companies display first quartile growth for 2 years or less. Approx. 85% do not make it past 1 year

CROCI is much more sustainable, with approx. 30% of companies that ever returned a top quartile CROCI, holding the position for longer than 3 consecutive years

CROCI is much more sustainable, with more than 35% of companies that ever returned a top quartile CROCI, holding the position for 3 consecutive years and longer

Source: Company data, Goldman Sachs Research estimates, Gao Hua Securities Research estimates.

And understanding the sustainability of returns is critical for valuation......
Taking the methodology one step further – understanding the behaviour of Q1 and Q4 CROCI companies

• Companies who have Q1 CROCI and who can sustain this level of CROCI will be ascribed a premium by the market (they may appear to be overvalued but they are not). The size of the premium depends on how long they will stay as a Q1 CROCI stock.

• Companies who move into Q1 CROCI but for who the market does not believe this to be sustainable will not re-rate (they may appear to be undervalued but they are not).

• Companies which are Q4 have a floor valuation and so trade at a premium to the line. The size of the premium depends on whether they are a sustained loser or not.
The adjusted Director’s Cut methodology – looking at the duration of value addition/destruction

Sustainable leaders:
Valuation premium increases over time, up to c.10% premium

Unsustainable leaders:
Trade at a c.10% valuation discount

Sustained disadvantage:
Trade at a c.5% premium

Unsustained disadvantage:
Trade at a c.20% premium

Source: Goldman Sachs Research estimates
Industry Leaders: Sustained advantage greater than four years is reflected in the valuation premium

Average premium/(discount) ascribed to stocks sustaining top-quartile CROCI for 1-6 years

Similar to our analysis in Europe, we find that 4 years of return sustainability is the key. There is a valuation premium for companies sustaining top-quartile CROCI for 4 years or more and a valuation discount for companies sustaining top quartile CROCI for 3 years or less.

Source: Goldman Sachs Research.
Industry Laggards: Sustained disadvantage leads to a lower valuation premium, which disappears after 4 years

Average premium/(discount) ascribed to stocks sustaining bottom-quartile CROCI for 1-6 years

Source: Goldman Sachs Research.
Sustained laggards tend to revert to an asset-based valuation

Continuous fourth-quartile CROCI companies find a floor at about 0.34X sector relative EV/GCI in AEJ... …and 0.27X in Japan

While CROCI may trend towards zero (or negative), enterprise values are unlikely to converge towards zero due to potential for sale or break-up, hence sustained laggards find a floor

Source: Goldman Sachs Research.
GS SUSTAIN identifies companies which stand out for their superior performance in each of the drivers of corporate performance:

- **Return on capital**  Identified by looking at CROCI quartile
- **Industry positioning**  Identified in collaboration with teams
- **Management quality with respect to ESG issues**  Using our ESG framework

Source: Bloomberg, MSCI, Goldman Sachs Research.
Backtesting shows consistent alpha generated

The Director’s Cut basic methodology generated 47% long/short performance in Asia on average (2000-2008)

Positive alpha generated each year on both the long and the short legs

Significant alpha generated by selecting top and bottom 20% of stocks - Portfolio rebalanced every month

Both in AEJ and Japan, the backtest shows strong alpha (46% and 34% p.a. in AEJ and Japan respectively)

Source: Goldman Sachs Research. 2009 corresponds to annualized ytd performance.
Issues with the methodology

• Methodology is based on a company’s cash flow over the next 12 months
  • Stocks with strong cash flow returns over medium term may screen as expensive
  • Stocks with deteriorating cash flow returns over medium term may screen as cheap
• TRG team in Asia have increased the time horizon to 2 years and 3 years
  • Increasing the time horizon to 2 years translates into small alpha gain for AEJ, and alpha reduction for Japan (and assumes perfect foresight)
  • Increasing the time horizon to 3 years generates consistently lower alpha
• Different time horizons work in different periods
  • Generally, methodology based on one year forward is better, except when markets peak when a 3 year forward works best
• We use the same WACC across sectors. Why?....
Methodology is only ever as good as your numbers

• Spending time forecasting numbers is critical

• In the recent downturn, analysts forecasted revenue well, but missed working capital and operating leverage, meaning that actual returns (especially on a cash basis) were overstated

• Understanding industry concentration also critical – work by SUSTAIN team shows that more consolidated sectors yield higher average cash returns and industry stability supports higher average returns
### Operating Leverage

<table>
<thead>
<tr>
<th></th>
<th>Co. A</th>
<th>Co. B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unit sales:</strong></td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td></td>
<td>15,000</td>
<td>15,000</td>
</tr>
<tr>
<td><strong>$000</strong></td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Turnover</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Variable costs</td>
<td>(60)</td>
<td>(20)</td>
</tr>
<tr>
<td>Contribution</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>Fixed costs</td>
<td>(20)</td>
<td>(60)</td>
</tr>
<tr>
<td>Profit</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

**+50%**

- **Co. A**
  - Turnover: $100\%$
  - Variable costs: $(60)\%$
  - Contribution: $40\%$
  - Fixed costs: $(20)\%$
  - Profit: $20\%$

- **Co. B**
  - Turnover: $100\%$
  - Variable costs: $(20)\%$
  - Contribution: $80\%$
  - Fixed costs: $(60)\%$
  - Profit: $20\%$

**Reverse in a downturn!**

- **+100%**
  - **Co. A**
    - Turnover: $(60)\%$
    - Variable costs: $(90)\%$
    - Contribution: $(30)\%$
    - Fixed costs: $(20)\%$
    - Profit: $40\%$

- **Co. B**
  - Turnover: $(60)\%$
  - Variable costs: $(30)\%$
  - Contribution: $(20)\%$
  - Fixed costs: $(60)\%$
  - Profit: $40\%$

**+200%**
How to forecast Working Capital

• The most simple way to calculate WC is as a % sales

<table>
<thead>
<tr>
<th>Sales</th>
<th>1,000</th>
<th>1,100</th>
<th>1,210</th>
<th>1,300</th>
<th>1,200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales growth</td>
<td>10.0%</td>
<td>10.0%</td>
<td>7.4%</td>
<td>-7.7%</td>
<td></td>
</tr>
<tr>
<td>WC % Sales</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>WC</td>
<td>50</td>
<td>55</td>
<td>61</td>
<td>65</td>
<td>60</td>
</tr>
<tr>
<td>Change in WC</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>(5)</td>
<td></td>
</tr>
<tr>
<td>Change in WC as % Sales</td>
<td>0.45%</td>
<td>0.45%</td>
<td>0.35%</td>
<td>-0.42%</td>
<td></td>
</tr>
</tbody>
</table>

Note that working capital is forecast from sales and change in working capital is subsequently calculated.

• However, this assumes that if sales fall, the working capital requirement is positive. It also does not allow analysis of the various components of working capital and how they are moving…
Calculating Working Capital using the Cash Conversion Cycle

Inventory Turnover = \( \frac{COGS}{Av \text{ Inventory}} \)

Inventory Holding = \( \frac{Inventory \text{ Turning} \times 365}{Period} \)

Receivables Turnover = \( \frac{Sales}{Av \text{ Receivables}} \)

Receivables Holding = \( \frac{Receivables \text{ Turning} \times 365}{Collection \text{ Period}} \)

Payables Turnover = \( \frac{Sales}{Av \text{ Payables}} \)

Payables Holding = \( \frac{Payables \text{ Turning} \times 365}{Payment \text{ Period}} \)

Could use sales

 Analyse trend in these to forecast working capital drivers
Calculating Working Capital using the Cash Conversion Cycle

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory turnover</td>
<td>23.7</td>
<td>24.1</td>
<td>20.2</td>
<td>20.2</td>
<td>20.2</td>
<td>20.1</td>
<td>20.1</td>
</tr>
<tr>
<td>Inventory days</td>
<td>15.4</td>
<td>15.2</td>
<td>18.1</td>
<td>18.1</td>
<td>18.1</td>
<td>18.1</td>
<td>18.1</td>
</tr>
<tr>
<td>Receivables turnover</td>
<td>44.0</td>
<td>43.1</td>
<td>39.5</td>
<td>39.5</td>
<td>39.5</td>
<td>39.5</td>
<td>39.5</td>
</tr>
<tr>
<td>Receivable days</td>
<td>8.3</td>
<td>8.5</td>
<td>9.2</td>
<td>9.2</td>
<td>9.2</td>
<td>9.2</td>
<td>9.2</td>
</tr>
<tr>
<td>Payable turnover</td>
<td>12.0</td>
<td>13.6</td>
<td>12.9</td>
<td>12.9</td>
<td>12.9</td>
<td>12.9</td>
<td>12.9</td>
</tr>
<tr>
<td>Payable days</td>
<td>30.4</td>
<td>26.9</td>
<td>28.4</td>
<td>28.4</td>
<td>28.4</td>
<td>28.4</td>
<td>28.4</td>
</tr>
</tbody>
</table>

- Look at the trends in each of the components to drive the calculation of the balance sheet item
- Easier to understand and analyse than simple percentage numbers
- Allows working capital to be analysed and any anomalies to be spotted
- Can also look at trends in the cash conversion cycle....
Cash Conversion Cycle

- Inventory Holding Period
- Receivables Collection Period
- Payables Payment Period

How does it compare to other companies?

Is it increasing in the current climate?

Funding gap – needs to be filled! Likely to get bigger (and more expensive to fill) during a downturn

Is the company able to negotiate payment terms with suppliers?
Deconstructing CROCI

\[
\text{CROCI} = \frac{\text{DACF}}{\text{GCI}} = \frac{\text{Revenue}}{\text{GCI}} \times \frac{\text{EBITDA}}{\text{Revenue}} \times \frac{\text{DACF}}{\text{EBITDA}}
\]

- Asset turnover
- Operating margin
- Cash conversion

Higher the operating leverage greater the sensitivity of EBITDA to changes in revenue
You are given the following information about a stock. Assuming that the sector EV/GCI vs CROCI/WACC is 1:1, what is the target price?

### Balance Sheet (GBP mn) 2009E
- **Cash & equivalents**: 27.0
- **Stocks**: 480.3
- **Accounts receivable**: 300.6
- **Other current assets**: 571.2
- **Current assets**: 1,379.1
- **Accounts payable**: (933.5)
- **Other current liabilities**: (435.2)
- **Current liabilities**: (1,368.7)
- **Gross fixed assets**: 9,027.0
- **Accumulated depreciation**: (3,582.4)
- **Net fixed assets**: 5,444.6
- **Net intangible assets**: 305.5
- **Total net depreciating assets**: 5,750.1
- **Weighted shares outstanding (mn)**: 1,586.0
- **Net debt**: 2,532.2
- **Minority interests**: 7.3
- **Unfunded pensions and other provisions**: 769.4

### Income Statement (GBP mn) 2009E
- **Sales**: 8,728.7
- **Operating costs (COGS & SG&A)**: (8,000.5)
- **Other operating income/(expense)**: 340.6
- **EBITDA**: 1,068.8
- **EBITDA (analyst) (GBP)**: 1,068.8
- **Depreciation**: (369.4)
- **Operating income (EBIT)**: 699.4
- **Net interest expense**: (121.3)
- **Pre-tax profit**: 578.1
- **Pre-tax profit (analyst) (GBP)**: 578.1
- **Effective tax rate**: 28.0%
- **Provision for income taxes**: (161.9)
- **Net income**: 416.2
- **Provision for working capital (increase)/decrease**: (27.6)
- **WACC**: 7.1%
Answer

- Operating Cash Flow = Net Income + Depreciation – increase in working capital
  = £416.2m + £369.4m - £27.6m = £758m

- DACF = Operating Cash Flow + Interest x (1 – Tax rate)
  = £758m + £121.3m x (1 – 28%) = £845.3m

- GCI = Gross fixed assets + Gross intangible assets + Operating working capital
  = £9,027.0m + £305.5m + £10.4m = £9,342.9m

- CROCI = DACF/GCI = 845.3/9,342.9 = 9.05%
- CROCI/WACC = 9.05%/7.1% = 1.2743

- Enterprise Value = 1.27 x GCI = 1.2743 x £9,342.9m = £11,906m

- Equity Value = Enterprise Value – Net Debt – Minority Interests – Unfunded Pensions
  = £11,906m - £2,532.2m - £7.3m - £769.4m = £8,597m

- Target price per share = £8,597m/1,586m = £5.42
Adapting the methodology

• We have focussed on the ‘Director’s Cut’ concept of CROCI. However, the concept of comparing excess value generated to excess value placed on the stocks by the market can be applied to different metrics

• Critical thing is to be consistent, and be aware of any issues…. 
Using ROIC instead of CROCI

- Both CROCI (Cash Return on Cash Invested) and ROIC (Return on Invested Capital) measure the return that a company is generating and so are useful valuation metrics.

- Remember to be consistent…..

\[
\text{Return on Invested Capital} = \frac{\text{Net Operating Profit Before Taxes (NOPLAT)}}{\text{Invested Capital}}
\]

\[
\text{Invested Capital} = \frac{\text{EV}}{\text{IC}} = \text{Net Book Value of Assets}
\]

\[
\text{EV} = \text{Gross Value of Assets (plus investments and working capital)}
\]

\[
\text{Cash Return on Cash Invested} = \frac{\text{DACF}}{\text{GCI}}
\]

\[
\text{Gross Cash Invested} =\text{GCI}
\]

\[
\text{ROIC} \quad \text{(Return on Invested Capital)}
\]

\[
\text{CROCI} \quad \text{(Cash Return on Cash Invested)}
\]
CROCI versus ROIC

- Key difference between CROCI and ROIC is in the asset valuation – ROIC uses accounting figures whereas CROCI is a cash based measure.

\[
\text{ROIC} = \frac{\text{NOPLAT}}{\text{IC}}
\]

- Post depreciation and provisions

\[
\text{CROCI} = \frac{\text{DACF}}{\text{GCI}}
\]

- Pre depreciation and provisions

\[
\text{EBIT} \times (1 - \text{tax rate}) \text{ ie. Post depreciation and provisions}
\]

\[
\text{Operating Cash Flow + Interest} \times (1 - \text{tax rate}) \text{ ie. Pre depreciation and provisions}
\]

- Whilst the impact of depreciation normally cancels out, provisions can cause distortions in ROIC which do not affect the CROCI number….
CROCI versus ROIC – Example

Assume that a company is being analysed over a three year period. EBIT and GCI is constant. The company has an EV of 12,000. There are no taxes or interest.

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCI</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Depreciation</td>
<td>1,000</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td>IC</td>
<td>9,000</td>
<td>8,000</td>
<td>7,000</td>
</tr>
<tr>
<td>EBIT</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>DACF</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
</tr>
<tr>
<td>CROCI</td>
<td>15.0%</td>
<td>15.0%</td>
<td>15.0%</td>
</tr>
<tr>
<td>ROIC</td>
<td>5.6%</td>
<td>6.3%</td>
<td>7.1%</td>
</tr>
</tbody>
</table>

Introducing a provision...

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCI</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Depreciation</td>
<td>1,000</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td>Provision</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>IC</td>
<td>8,700</td>
<td>7,700</td>
<td>6,700</td>
</tr>
<tr>
<td>EBIT</td>
<td>200</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>DACF</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
</tr>
<tr>
<td>CROCI</td>
<td>15.0%</td>
<td>15.0%</td>
<td>15.0%</td>
</tr>
<tr>
<td>ROIC</td>
<td>2.3%</td>
<td>6.5%</td>
<td>7.5%</td>
</tr>
</tbody>
</table>

CROCI remains constant (as does GCI) and ROIC increases in line with IC.

CROCI remains constant but ROIC is distorted by the provision in year 1. If the provision was reversed, this would create further distortion.

Therefore, analysing returns on a cash basis will give a better indication of future performance than looking at accounting returns.....
CROCI versus ROIC – Example

- For this company (EADS), provisions have distorted ROIC so that the share price/ROIC correlation is weak compared with the share price/CROCI correlation.

Provisions reduce the ROIC and subsequently increase it.
Valuing the Banks Sector

Excess value created by a company

Versus

Excess value attributed by the market

If these are out of line, the stock is misvalued

Actual Return versus Required Return

Actual Value versus Invested Value

CROAE

COE

MV

AE
Valuing the Banks Sector

- **CROAE**: Cash Return on Adjusted Equity
- **COE**: Cost of Equity
- **MV**: Market Value
- **AE**: Adjusted Equity (S/h Equity + amortised goodwill + minorities)
All our stock calls can be categorised using a returns framework
Final note.....gap between winners and losers is wide but valuations are not. Opportunities abound.....

Exhibit 27: We believe the gap between Asian leaders and laggards will continue to widen in the long term... CROCI across our Asian coverage universe (2000-09E).

Exhibit 28: ... and across almost every sector 75th-25th percentile CROCI across sectors within our Asian coverage universe (2000-05 and 2006-08 averages).

Source: Quantum database, Goldman Sachs Research estimates.
Multiple Analysis
Using Multiples in Valuation

- Unfortunately, using multiples to derive price targets directly simply leads to price targets following market moves.
- The best way to consider multiples is in the context of returns analysis, such as the Director’s Cut framework or via target multiples.
- However, simple multiples should always be used to sanity check price targets that have been derived from other analysis.
  - What EV/DACF multiple is implied by the DCF?
- Multiples can also be used when carefully considered against history.
- Fundamental multiple analysis can also be useful....
Using multiples as a sanity check

Exhibit 1: PGS would trade on 3.4x 2012E EV/DACF in our high-activity scenario
EV/DACF multiple in different scenarios

Source: Datastream, Goldman Sachs Research estimates.
Multiples change over time

Exhibit 1: The market appears to be moving towards a mid-on-trough valuation approach
Market EV/EBITDA from January 2007 to date, and the distribution of sectors on the basis of current multiples vs mid-on-trough

- Defensives still see significant upside to mid on trough; further stock performance likely to be driven by multiple expansion

- Some cyclical already valued above mid on trough; arguably more appropriate to value these stocks on peak multiples or historic earnings

Exhibit 30: Potential rights issue candidates?
Stocks with weak balance sheets but high returns and inexpensive valuations

Exhibit 31: Potential converts candidates?
Stocks which may be able to issue bonds at low yields due to the attractiveness of the embedded call option in the convert

Exhibit 27: Stocks where we expect over 40% EBITDA growth from 2009 to 2011E, yet they still trade below mid on trough

Exhibit 28: Stocks which have fallen more than 75% absolute and are trading below trough

Exhibit 29: Stocks where we expect less than 10% EBITDA growth from 2009 to 2011E, yet they trade above (or within 10% of) trough

Source: Goldman Sachs Research estimates
Target or Fundamental Multiples

- A target multiple is the maximum multiple that an investor could pay and receive the **required** return on the investment.
- For example, if Co. A shares are currently trading at $140 and year end eps was $11.73, with a 6 month required return of 6%, an investor with perfect foresight could have paid 11.3x earnings and generated their required return.
- 11.3x is the target or fundamental multiple, and there are obvious benefits to being able to identify this multiple.
Fundamental P/E

If ROE = COE, then the equation collapses down to:

\[ \frac{1}{\text{ROE}} \]

If the ROE is 10% and COE is 10% then P/E will be 10x regardless of g

If ROE < COE, then the P/E will be less than 1/ROE

If the ROE is 10%, COE is 12% and g is 5%, the P/E is 7.14x

If ROE > COE, then the P/E will be greater than 1/ROE

If the ROE is 12%, COE is 10% and g is 5%, the P/E is 11.67x

\[ \frac{P}{E} = \frac{\text{ROE} - \text{growth}}{\text{ROE} \times (\text{COE} - \text{growth})} \]

If COE increases (for example, the risk of the equity rises) then the P/E will fall

An increase in g will increase the P/E (if the company is adding value) or reduce the P/E (if the company is destroying value)

If the ROE rises, the P/E will rise
Fundamental P/E

Perpetual growth rate (less than ke)

\[
\text{Price} = \frac{\text{Dividend}}{k_e - g}
\]

Cost of equity

\[
\text{Growth} = \frac{\text{ROE} \times b}{\text{ROE}}
\]

So \( b = \frac{\text{growth}}{\text{ROE}} \)

\[
\text{Price} = \frac{\text{Earnings} \times (1 - \text{retention rate (b)})}{k_e - g} = \frac{\text{Earnings} \times (1 - \text{growth/ROE})}{k_e - g} = \frac{\text{ROE} - g}{\text{ROE} \times (k_e - g)}
\]
If ROE = COE, then the P/B will be 1

If ROE < COE, then the P/B will be less than 1

If ROE > COE, then the P/B will be greater than 1

\[
\frac{P}{B} = \frac{\text{ROE - growth}}{\text{COE - growth}}
\]

If COE increases (for example, the risk of the equity rises) then the P/B will fall

An increase in g will increase the P/B (if the company is adding value) or reduce the P/B (if the company is destroying value)

If the ROE rises, the P/B will rise
Fundamental P/B

\[
\text{Price} = \frac{\text{Dividend}}{k_e - g} = \frac{\text{Book Value} \times \text{return on equity}}{k_e - g}
\]

\[
\frac{\text{Price}}{\text{Book}} = \frac{r \times \text{payout ratio}}{k_e - g} = \frac{r \times (1 - b)}{k_e - g} = \frac{r - r \times b}{k_e - g}
\]

\[
= \frac{r - g}{k_e - g}
\]

Which is the actual return on equity versus the required return on equity (cost of equity)!!
Other uses of P/E and P/B

What if growth is zero?....

\[
\frac{\text{ROE} - g}{\text{ROE} \times (k_e - g)} = \frac{1}{k_e}
\]

P/E differentiation based on:
- Growth
- Risk

\[
\frac{\text{ROE} - g}{k_e - g} = \frac{\text{ROE}}{k_e}
\]

P/BV differentiation based on:
- Value-added

The formulas then give us a minimum level for the P/E and P/BV
Linking Multiples and Value Drivers

Multiples can be plotted against value drivers such as growth and value added to try to identify anomalies in the market.

Relative Valuation
- P/E to earnings growth (PEG ratio)
- EV/EBITDA to EBTIDA growth
- Ignores factors such as return on capital
- Assumes a linear relationship between P/E and growth

Multiple to Return on Capital/
Excess Return
- P/BV vs ROE
- EV/Invested Capital vs Return on Capital
- EV/Invested Capital vs Excess Return

Director’s Cut!
Discounted Cash Flow Analysis
Overview

• DCF is one of the fundamental valuation techniques, but it needs to be carefully constructed
• In any DCF analysis, must define
  • Competitive advantage period (forecast period)
  • Free cash flow (to firm or to equity)
  • WACC
  • Terminal Value

Will go through each of these in turn and also consider sensitivity analysis
Selecting the forecast period

• Analysts often select the forecast period by reference to a certain time period such as ten years
• The forecast period should be the period where the company has a competitive advantage or disadvantage
  • Finite period for all companies
  • Economic forces mean that return will converge to required return and growth to macroeconomic growth
  • Requires judgement and knowledge of the industry, but the last year of the forecast period should be a return that you believe the company can sustain FOREVER
Selecting the forecast period

Returns = WACC

Growth settled to market levels

Dynamic therefore need to forecast explicitly

Settled therefore formulate terminal value
What if your forecast period is too long?

• If the competitive advantage period for your company is longer than you feel able to forecast, you must not simply stop your forecasts and run a terminal value.
• The terminal value MUST be driven from a sustainable cash flow.
• One option is to forecast a simple linear trend from the end of the period to which you feel comfortable forecasting to a sustainable cash flow level, creating a three stage DCF model.
Three stage DCF

There are many ways of approaching a fade period. One way is to look at the FCF at the end of the forecast period, work out what the ROIC should be at the end of the fade period and then back out the FCF.

For example, assume that the following company has a WACC of 10% and the competitive advantage period is forecast to be another 10 years. Capex growth is expected to be 3%.

End of Forecast Period

- NOPLAT = $800
- IC = $5,333
- ROIC = 15%
  - Capex
  + Depreciation
- FCF = $750

End of Fade Period

- $717
- $7,168
- $67

Value of fade period is PV of

- $750  - $650
  10% - (-1.42%)  10% - (-1.42%)

Implied growth = -1.42%

Use this to derive the terminal value in the normal way
Free Cash Flow

• It is very important to get the cash flow calculation correct
• Key things to remember are
  • You need to calculate cash returns
  • Cash flow to the firm is pre-interest, but the tax shield on interest is taken into account in the WACC, not the cash flow
  • One-off cash returns or costs should be included, but ensure there are none in the final ‘terminal-value driving’ year
  • If a company is growing, capex will be higher than depreciation. This is especially important in the ‘terminal-value driving’ year
Calculation of Free Cash Flow

EBIT x (1 – tax rate) \[ \rightarrow X \]
+ Depreciation \[ \rightarrow X \]
- Capex \[ \rightarrow X \]
-/+/ increase/decrease in working capital \[ \rightarrow X \]
-/+/ other non cash items \[ \rightarrow X \]

Free Cash Flow to the Firm \[ \rightarrow X \]
- Interest x (1 – tax rate) \[ \rightarrow X \]
+ New debt raised \[ \rightarrow X \]
- Debt repaid \[ \rightarrow X \]

Free Cash Flow to Equity \[ \rightarrow X \]

**NOPLAT**

**Non-cash**

**Should be higher than depreciation**

**Not available to investors**

**Non-cash**

**Discount at WACC for EV**

**Not available to equity holders**

**Discount at cost of equity for equity value**
Forecasting Free Cash Flow

• Free cash flow forecasts should be created indirectly by forecasting the income statement and balance sheet
• Revenue is the key driver – most other items can be calculated from this by looking at past relationships
• Always calculate ratios such as gross profit, operating leverage and ROIC to sanity-check numbers
• Capex should be bigger than depreciation – if it isn’t, there must be a good reason why and it must always be bigger in the terminal-value driver year (if growth is positive)
Weighted Average Cost of Capital (WACC)

\[
WACC = K_e \times \frac{E}{V} + K_d \times \frac{D}{V}
\]

- Market Value of Equity
- Market Value of Net Debt + Equity
- Market Value of Net Debt
- Company’s cost of debt (interest rate)

\[= r_f + \beta(r_m - r_f)\]

4 variables just to calculate Ke and Kd!

From long-term government securities

Circularity!
Terminal Value

- A large proportion of a DCF is in the terminal value, and yet it is often given a disproportionately small amount of consideration.
- There are two main ways of calculating the terminal value.

**Gordon growth model**

\[
\frac{\text{FCFF}(1 + g)}{\text{WACC} - g}
\]

Must be a sustainable FCF

Must be sustainable growth (NOT higher than the growth rate in GDP)

**Multiple analysis**

What multiple do you expect the company to be trading on in the future?

Multiples should be used to sanity check Gordon growth

Should be the industry average (end of the competitive period)
1) Sensitivity to accounting inputs

<table>
<thead>
<tr>
<th>Gross margin</th>
<th>2.0%</th>
<th>3.0%</th>
<th>4.0%</th>
<th>5.0%</th>
<th>6.0%</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.0%</td>
<td>139.6</td>
<td>158.5</td>
<td>177.4</td>
<td>196.3</td>
<td>215.2</td>
</tr>
<tr>
<td>20.0%</td>
<td>256.0</td>
<td>276.1</td>
<td>296.1</td>
<td>316.1</td>
<td>336.2</td>
</tr>
<tr>
<td>21.0%</td>
<td>372.5</td>
<td>393.6</td>
<td>414.8</td>
<td>436.0</td>
<td>457.1</td>
</tr>
<tr>
<td>22.0%</td>
<td>488.9</td>
<td>511.2</td>
<td>533.5</td>
<td>555.8</td>
<td>578.1</td>
</tr>
<tr>
<td>23.0%</td>
<td>605.3</td>
<td>628.7</td>
<td>652.2</td>
<td>675.6</td>
<td>699.1</td>
</tr>
</tbody>
</table>

Top line (2016E)

2) Sensitivity to WACC and terminal growth

<table>
<thead>
<tr>
<th>Perpetual growth</th>
<th>-1%</th>
<th>0%</th>
<th>1%</th>
<th>2%</th>
</tr>
</thead>
<tbody>
<tr>
<td>426.7</td>
<td>207</td>
<td>223</td>
<td>244</td>
<td>270</td>
</tr>
<tr>
<td>9.0%</td>
<td>237</td>
<td>258</td>
<td>286</td>
<td>323</td>
</tr>
<tr>
<td>8.0%</td>
<td>274</td>
<td>303</td>
<td>342</td>
<td>397</td>
</tr>
<tr>
<td>6.0%</td>
<td>321</td>
<td>363</td>
<td>421</td>
<td>507</td>
</tr>
</tbody>
</table>

Not as straight forward as you might think……
Sensitivity Analysis

- If terminal growth increases then capex in the terminal-value driver year will be higher and FCF in that year will be lower.
- For this reason, it is useful to use the Value Driver formula for the terminal value in sensitivity analysis.

Converting NOPLAT to FCF allowing for the fact that higher g leads to higher capex and lower FCF:

\[
\text{Terminal Value} = \frac{\text{NOPLAT}_{t+1} \left(1 - \frac{g}{\text{ROIC}}\right)}{\text{WACC} - g}
\]

- If ROIC = WACC in the terminal value driving year, there is no sensitivity to the terminal growth rate.
DCF – the good and the bad

• Academically, DCF is the best way of valuing companies
• In reality, it is not due the number of variables (particularly in the WACC) and the mistakes made when calculating the terminal value
• DCF can be a good way of forcing people to think about company fundamentals, but better to think about the fundamentals and then use returns based valuation techniques if possible
Bringing it all together
All methods are the same – so what do different results mean?
Back to Basics – it’s all about the Value-Added

• Which methodologies do GS teams use?
  • DCF
  • Director’s Cut
  • EVA
  • Multiples
The big question

Q: Why do different teams use different methods??

A: THEY DON’T!

All of the methodologies come down to the same underlying theme….

Value Added
DCF and value-added

- DCF is all about comparing actual return (free cash flow) with required return (WACC)
- For example, imagine that you are given $100m to start a company. The required return of investor’s is 10%
  - If you deliver return of 13%, the value of the firm will be:
    \[
    \frac{13$m}{10\%} = 130$m
    \]
  - If you deliver return of 7%, the value of the firm will be:
    \[
    \frac{7$m}{10\%} = 70$m
    \]
  - If you deliver return of 10%, the value of the firm will be:
    \[
    \frac{10$m}{10\%} = 100$m
    \]

It’s all about the value-added!
Goldman Sachs Global Investment Research

Director’s Cut and value-added

**Excess** value created by a company

**Excess** value attributed by the market

**Versus**

Actual Return versus Required Return

Actual Value versus Invested Value

CROCI

WACC

Total EV

Gross Cash Invested

If these are out of line, the stock is misvalued

It’s all about the value-added!
EV/GCI vs CROCI/WACC is equivalent to DCF

The basis of Director’s Cut is that:

\[
\frac{EV}{GCI} = \frac{CROCI}{WACC}
\]

So….\[
\frac{EV}{GCI} = \frac{DACF}{GCI} \times \frac{1}{WACC}
\]

So….\[
EV = \frac{DACF}{WACC}
\]

Which is a DCF assuming no growth

So how do we deal with the growth?....
A company has the following predicted CROCI...

Will the market pay for the growth this far out? If so, base DC on 2012 or use DCF
EVA®, DCF and Director’s Cut

Enterprise Value = GCI + PV (Future EVAs)

Assume NOPAT equals cash returns

\[ EV = GCI + \frac{(\text{NOPAT} - (GCI \times WACC))}{WACC} \]
\[ EV = GCI + \frac{[\text{DACF} - (GCI \times WACC)]}{WACC} \]
\[ EV = GCI + \frac{[(\text{CROCI} \times GCI) - (GCI \times WACC)]}{WACC} \]
\[ EV = GCI + \frac{[GCI \times (\text{CROCI} - WACC)]}{WACC} \]
\[ EV = 1 + \frac{\text{CROCI} - WACC}{GCI} \]
\[ EV = 1 + \frac{\text{CROCI}}{WACC} - 1 \]
\[ EV = \frac{\text{CROCI}}{WACC} \]

Assume NOPAT equals cash returns

\[ EV = GCI + \frac{\text{NOPAT} - (GCI \times WACC)}{WACC} \]
\[ EV = GCI + \frac{[\text{DACF} - (GCI \times WACC)]}{WACC} \]
\[ EV = GCI + \frac{\text{DACF} - (GCI \times WACC)}{WACC} \]
\[ EV = GCI + \frac{\text{DACF} - (GCI \times WACC)}{WACC} \]
\[ EV = GCI + \frac{\text{DACF}}{WACC} - GCI \]
\[ EV = \frac{\text{DACF}}{WACC} \]

Director’s Cut!
P/E and value-added

If ROE = COE, then the equation collapses down to:

\[ \frac{1}{\text{ROE}} \]

If the ROE is 10% and COE is 10% then P/E will be 10x regardless of g

If ROE < COE, then the P/E will be less than \( \frac{1}{\text{ROE}} \)

If the ROE is 10%, COE is 12% and g is 5%, the P/E is 7.14x

If ROE > COE, then the P/E will be greater than \( \frac{1}{\text{ROE}} \)

If the ROE is 12%, COE is 10% and g is 5%, the P/E is 11.67x

\[ \frac{P}{E} = \frac{\text{ROE} - \text{growth}}{\text{ROE} \times (\text{COE} - \text{growth})} \]

If COE increases (for example, the risk of the equity rises) then the P/E will fall

An increase in g will increase the P/E (if the company is adding value) or reduce the P/E (if the company is destroying value)

If the ROE rises, the P/E will rise

It’s all about the value-added!
P/B and value-added

If ROE = COE, then the P/B will be 1

If ROE < COE, then the P/B will be less than 1

If ROE > COE, then the P/B will be greater than 1

\[
\frac{P}{B} = \frac{\text{ROE} - \text{growth}}{\text{COE} - \text{growth}}
\]

If COE increases (for example, the risk of the equity rises) then the P/B will fall

An increase in g will increase the P/B (if the company is adding value) or reduce the P/B (if the company is destroying value)

If the ROE rises, the P/B will rise

It’s all about the value-added!
When are different methods more appropriate

- Director’s Cut works best with mature, homogenous sectors driven by company-specific returns; technology, retail, consumer staples and industrials but can be used or adapted for other sectors unless there is heterogeneity in the sector e.g. media and internet

- EVA is useful for sector with a large tangible asset base which generates cash-like operating profit such as real estate

- DCF can be used for most sectors with predictable cash flows, but it very easy to manipulate and do badly

- Multiple analysis is useful for sectors with no cash returns such as financials and should also be used as a cross check against other methodologies
What does it mean when you get different results

• Understanding why results are different can tell you a lot about a company

• If DCF says buy and Director’s Cut says sell, says that the stock is not generating returns near term but is generating returns in the medium to long term

  • Look at Director’s Cut a few years about

  • Be aware that the market does not tend to pay for returns which are more than 3 years away

• If a 2010E P/E multiple says sell and 2010E Director’s Cut says buy, suggests company is not turning earnings into cash
Summary

- There are many different ways to look at stock valuation, but they are all doing the same thing – measuring value add.
- Returns methodology, in particular cash returns, provides a simple and effective framework to value stocks.
- The market pays a premium to companies that can sustain top quartile returns.
- Any methodology is only as good as its numbers put into it.