

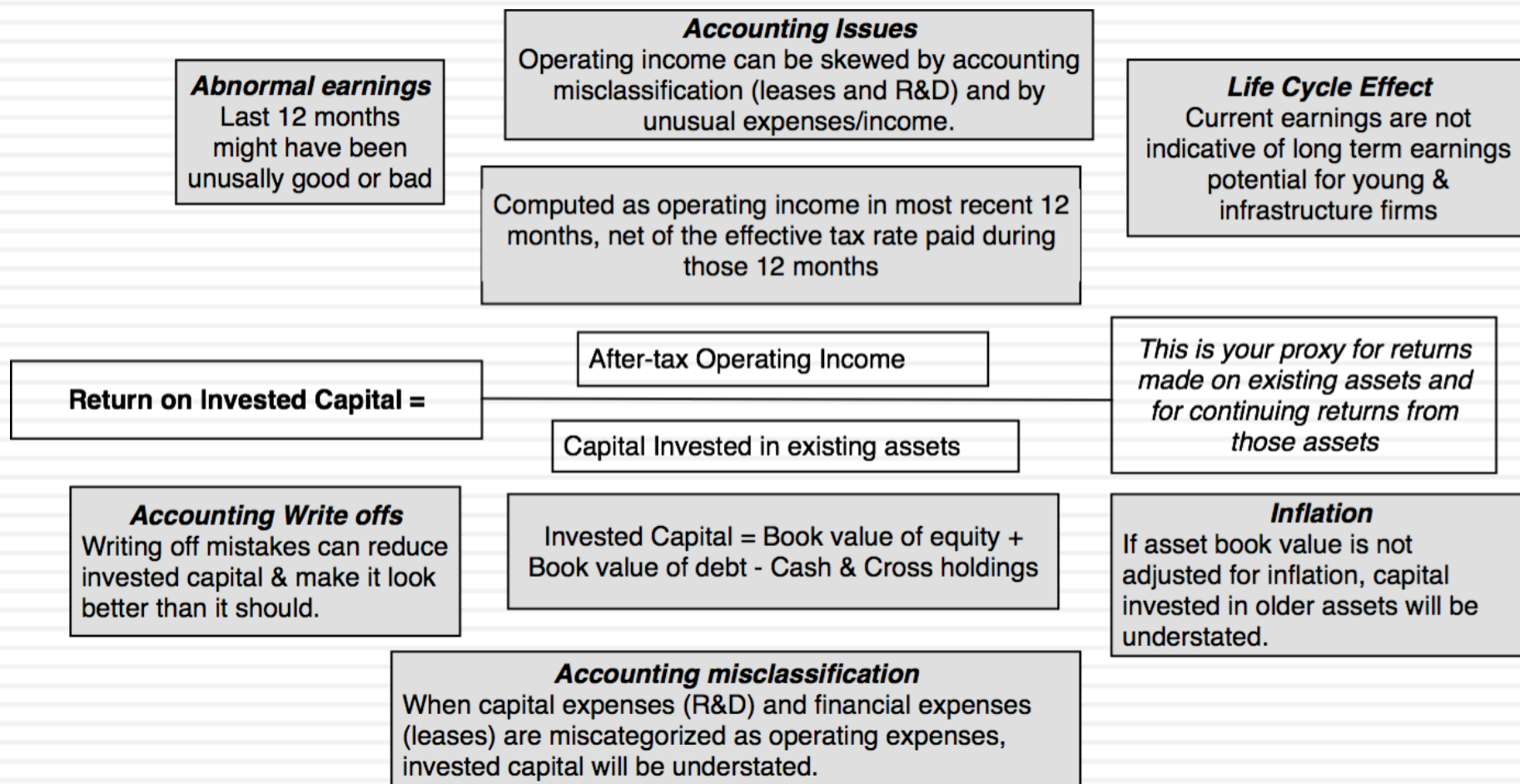
Estimating Growth in Operating Income, if fundamentals stay unchanged

184

- Cisco's Fundamentals
 - ▣ Reinvestment Rate = 106.81%
 - ▣ Return on Capital = 34.07%
 - ▣ Expected Growth in EBIT = $(1.0681)(.3407) = 36.39\%$
- Motorola's Fundamentals
 - ▣ Reinvestment Rate = 52.99%
 - ▣ Return on Capital = 12.18%
 - ▣ Expected Growth in EBIT = $(.5299)(.1218) = 6.45\%$
- Cisco's expected growth rate is clearly much higher than Motorola's sustainable growth rate. As a potential investor in Cisco, what would worry you the most about this forecast?
 - a. That Cisco's return on capital may be overstated (why?)
 - b. That Cisco's reinvestment comes mostly from acquisitions (why?)
 - c. That Cisco is getting bigger as a firm (why?)
 - d. That Cisco is viewed as a star (why?)
 - e. All of the above

The Magical Number: ROIC (or any accounting return) and its limits

185



IV. Operating Income Growth when Return on Capital is Changing

186

- When the return on capital is changing, there will be a second component to growth, positive if the return on capital is increasing and negative if the return on capital is decreasing.
- If ROC_t is the return on capital in period t and ROC_{t+1} is the return on capital in period $t+1$, the expected growth rate in operating income will be:

$$\text{Expected Growth Rate} = ROC_{t+1} * \text{Reinvestment rate} \\ + (ROC_{t+1} - ROC_t) / ROC_t$$

- If the change is over multiple periods, the second component should be spread out over each period.

Motorola's Growth Rate

187

- Motorola's current return on capital is 12.18% and its reinvestment rate is 52.99%.
- We expect Motorola's return on capital to rise to 17.22% over the next 5 years (which is half way towards the industry average)

Expected Growth Rate

$$\begin{aligned}
 &= \text{ROC}_{\text{Current}}^{\text{New Investments}} * \text{Reinvestment Rate}_{\text{Current}} + \{ [1 + (\text{ROC}_{\text{In 5 years}} - \text{ROC}_{\text{Current}}) / \text{ROC}_{\text{Current}}]^{1/5} - 1 \} \\
 &= .1722 * .5299 + \{ [1 + (.1722 - .1218) / .1218]^{1/5} - 1 \} \\
 &= .1629 \text{ or } 16.29\%
 \end{aligned}$$

- One way to think about this is to decompose Motorola's expected growth into
 - Growth from new investments: $.1722 * .5299 = 9.12\%$
 - Growth from more efficiently using existing investments: $16.29\% - 9.12\% = 7.17\%$

Note that I am assuming that the new investments start making 17.22% immediately, while allowing for existing assets to improve returns gradually

The Value of Growth

188

	Firm 1	Firm 2	Firm 3	Firm 4	Firm 5
Reinvestment Rate	20.00%	100.00%	200.00%	20.00%	0.00%
ROIC on new investment	50.00%	10.00%	5.00%	10.00%	10.00%
ROIC on existing investments before	10.00%	10.00%	10.00%	10.00%	10.00%
ROIC on existing investments after	10.00%	10.00%	10.00%	10.80%	11.00%
Expected growth rate	10.00%	10.00%	10.00%	10.00%	10.00%

$$\begin{aligned}\text{Expected growth} &= \text{Growth from new investments} + \text{Efficiency growth} \\ &= \text{Reinv Rate} * \text{ROC} + (\text{ROC}_t - \text{ROC}_{t-1}) / \text{ROC}_{t-1}\end{aligned}$$

Assume that your cost of capital is 10% . As an investor, rank these firms in the order of most value growth to least value growth.

189

Growth IV

Top Down Growth

Estimating Growth when Operating Income is Negative or Margins are changing

190

- All of the fundamental growth equations assume that the firm has a return on equity or return on capital it can sustain in the long term.
- When operating income is negative or margins are expected to change over time, we use a three step process to estimate growth:
 - ▣ Estimate growth rates in revenues over time
 - Determine the total market (given your business model) and estimate the market share that you think your company will earn.
 - Decrease the growth rate as the firm becomes larger
 - Keep track of absolute revenues to make sure that the growth is feasible
 - ▣ Estimate expected operating margins each year
 - Set a target margin that the firm will move towards
 - Adjust the current margin towards the target margin
 - ▣ Estimate the capital that needs to be invested to generate revenue growth and expected margins
 - Estimate a sales to capital ratio that you will use to generate reinvestment needs each year.

Tesla in July 2015: Growth and Profitability

191

Year	Revenues	Revenue Growth	Operating Income	Operating Margin
Base year	\$2,013.50		\$(21.81)	-1.08%
1	\$3,322.28	65.00%	\$7.48	0.23%
2	\$5,481.75	65.00%	\$84.06	1.53%
3	\$9,044.89	65.00%	\$257.03	2.84%
4	\$14,924.07	65.00%	\$619.36	4.15%
5	\$24,624.72	65.00%	\$1,344.12	5.46%
6	\$37,565.02	52.55%	\$2,541.92	6.77%
7	\$52,628.59	40.10%	\$4,249.78	8.08%
8	\$67,180.39	27.65%	\$6,303.78	9.38%
9	\$77,391.81	15.20%	\$8,274.48	10.69%
10	\$79,520.08	2.75%	\$9,542.41	12.00%

Revenues in year 10 reflect successful "high end auto" company revenues (Volvo, Audi, BMW etc.)

Pre-tax operating margin in year 10 is at the 75th percentile of high end auto companies.

Tesla: Reinvestment and Profitability

192

Operating losses carried forward
save taxes in years 3 & 4

Sales/Capital
measures revenues
generated for every
dollar of investment

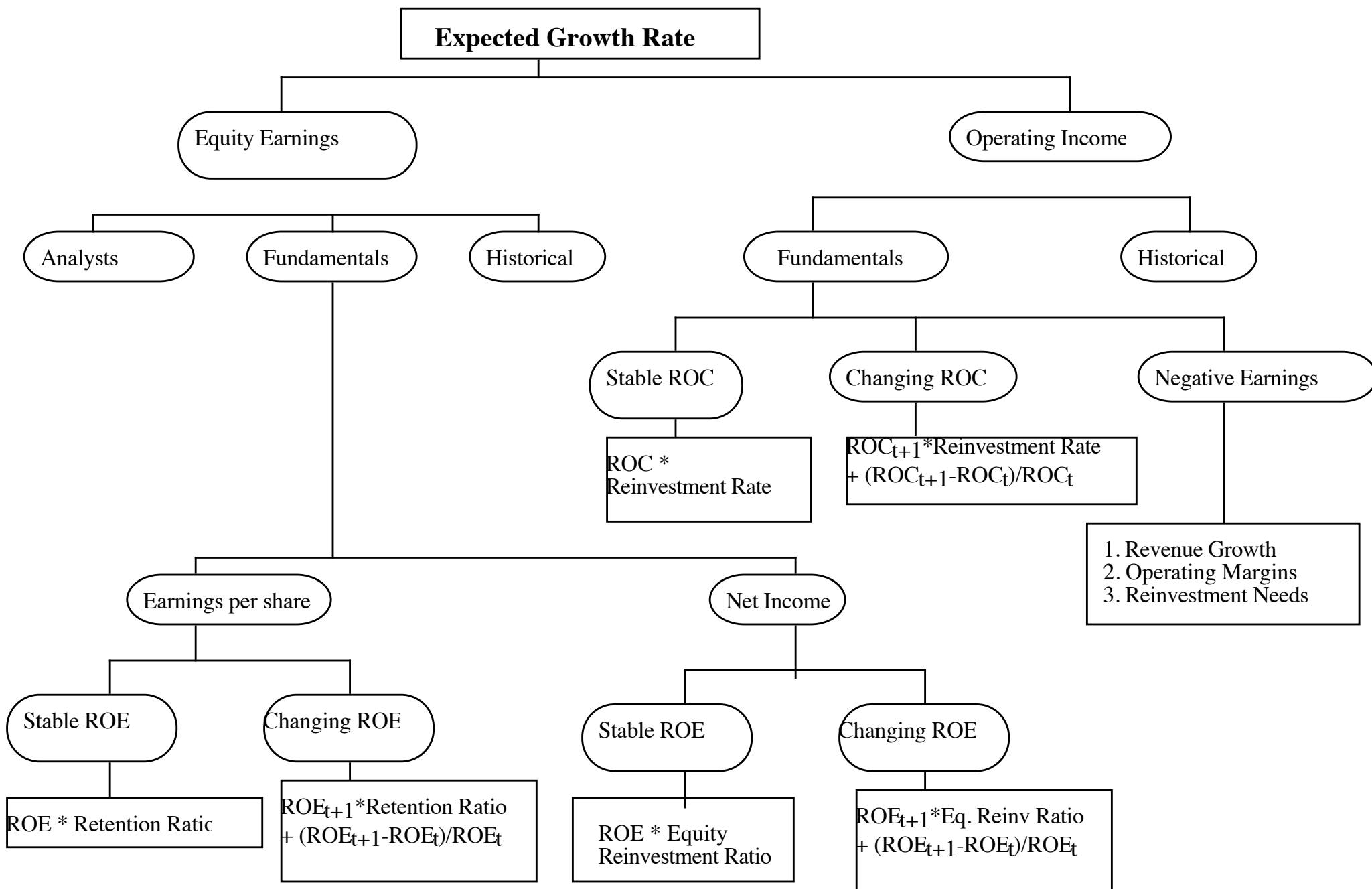
Reinvestment =
Change in
Revenue/ Sales
to capital

Year	Revenues	EBIT	EBIT (1-t)	Change in Revenues	Sales/Capital	Reinvestment	FCFF	Invested Capital	ROIC	Cost of Capital
Base	\$ 2,013.50	\$ (21.81)	\$ (21.81)					\$ 1,045.00	-2.09%	8.74%
1	\$ 3,322.28	\$ 7.48	\$ 7.48	\$ 1,308.78	1.55	\$ 844.37	\$ (836.89)	\$ 1,889.37	0.40%	8.74%
2	\$ 5,481.75	\$ 84.06	\$ 84.06	\$ 2,159.48	1.55	\$ 1,393.21	\$ (1,309.15)	\$ 3,282.58	2.56%	8.74%
3	\$ 9,044.89	\$ 257.03	\$ 254.44	\$ 3,563.14	1.55	\$ 2,298.80	\$ (2,044.36)	\$ 5,581.38	4.56%	8.74%
4	\$ 14,924.07	\$ 619.36	\$ 402.58	\$ 5,879.18	1.55	\$ 3,793.02	\$ (3,390.44)	\$ 9,374.40	4.29%	8.74%
5	\$ 24,624.72	\$ 1,344.12	\$ 873.68	\$ 9,700.65	1.55	\$ 6,258.48	\$ (5,384.81)	\$ 15,632.89	5.59%	8.59%
6	\$ 37,565.02	\$ 2,541.92	\$ 1,652.25	\$ 12,940.29	1.55	\$ 8,348.58	\$ (6,696.33)	\$ 23,981.46	6.89%	8.44%
7	\$ 52,628.59	\$ 4,249.78	\$ 2,762.36	\$ 15,063.57	1.55	\$ 9,718.43	\$ (6,956.08)	\$ 33,699.89	8.20%	8.29%
8	\$ 67,180.39	\$ 6,303.78	\$ 4,097.46	\$ 14,551.80	1.55	\$ 9,388.26	\$ (5,290.81)	\$ 43,088.15	9.51%	8.15%
9	\$ 77,391.81	\$ 8,274.48	\$ 5,378.41	\$ 10,211.42	1.55	\$ 6,588.01	\$ (1,209.60)	\$ 49,676.17	10.83%	8.00%
10	\$ 79,520.08	\$ 9,542.41	\$ 6,202.57	\$ 2,128.27	1.55	\$ 1,373.08	\$ 4,829.49	\$ 51,049.25	12.15%	8.00%

Tesla Story: Tesla will be able to grow efficiently (sales to capital ratio) and continue to generate excess returns as it gets bigger.

Invested Capital in year t =
Invested Capital in year t-1
+ Reinvestment in year t

Cost of capital
decreases as
company gets larger
and more profitable.





CLOSURE IN VALUATION

The Big Enchilada

Getting Closure in Valuation

195

- A publicly traded firm potentially has an infinite life. The value is therefore the present value of cash flows forever.

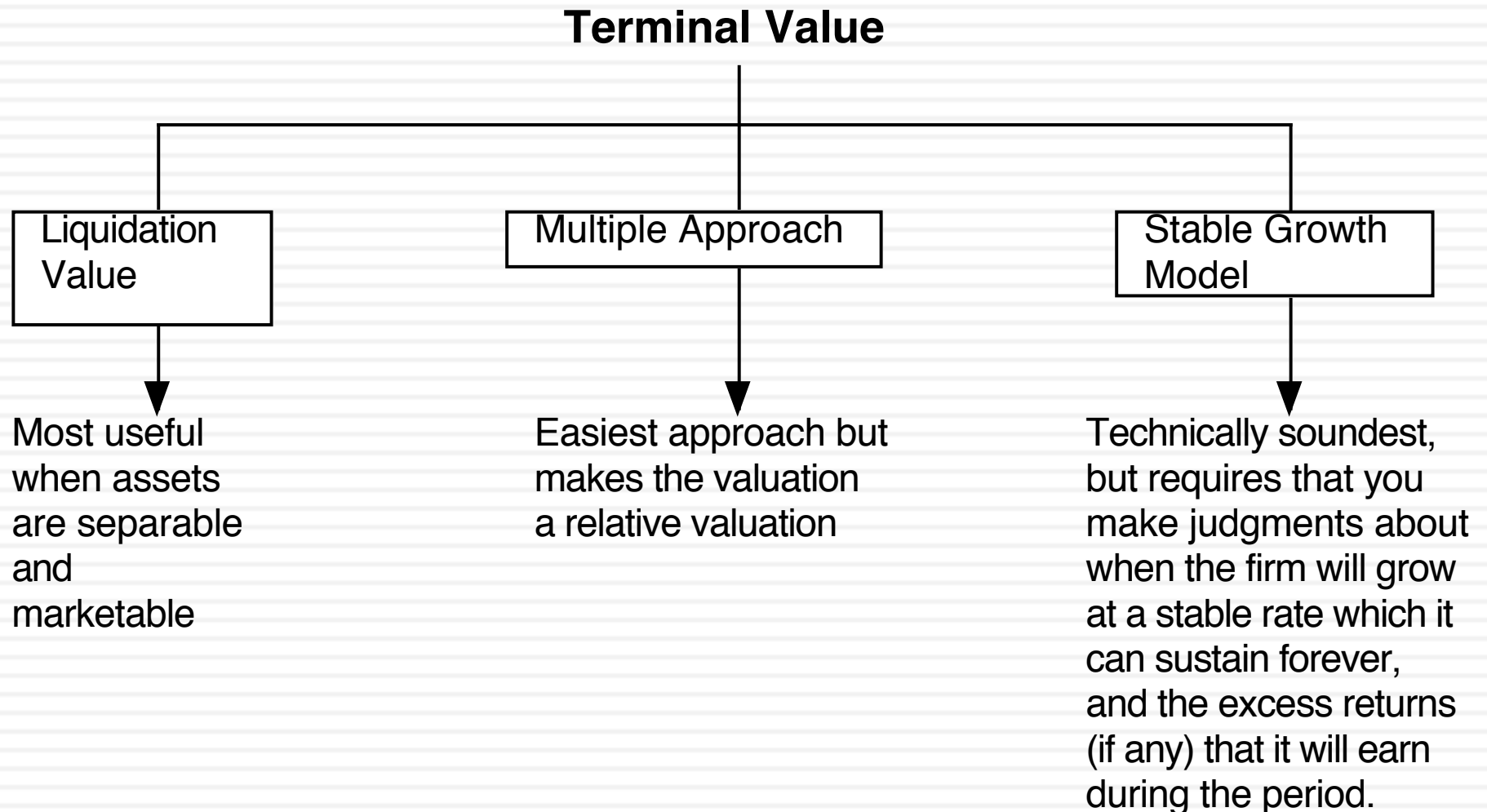
$$\text{Value} = \sum_{t=1}^{t=\infty} \frac{CF_t}{(1+r)^t}$$

- Since we cannot estimate cash flows forever, we estimate cash flows for a “growth period” and then estimate a terminal value, to capture the value at the end of the period:

$$\text{Value} = \sum_{t=1}^{t=N} \frac{CF_t}{(1+r)^t} + \frac{\text{Terminal Value}}{(1+r)^N}$$

Ways of Estimating Terminal Value

196



1. Obey the growth cap

197

- When a firm's cash flows grow at a “constant” rate forever, the present value of those cash flows can be written as:
Value = Expected Cash Flow Next Period / (r - g)
where,
r = Discount rate (Cost of Equity or Cost of Capital)
g = Expected growth rate
- The stable growth rate cannot exceed the growth rate of the economy but it can be set lower.
 - If you assume that the economy is composed of high growth and stable growth firms, the growth rate of the latter will probably be lower than the growth rate of the economy.
 - The stable growth rate can be negative. The terminal value will be lower and you are assuming that your firm will disappear over time.
 - If you use nominal cashflows and discount rates, the growth rate should be nominal in the currency in which the valuation is denominated.
- One simple proxy for the nominal growth rate of the economy is the riskfree rate.

Risk free Rates and Nominal GDP Growth

- **Risk free Rate** = Expected Inflation + Expected Real Interest Rate
- The real interest rate is what borrowers agree to return to lenders in real goods/services.
- **Nominal GDP Growth** = Expected Inflation + Expected Real Growth
- The real growth rate in the economy measures the expected growth in the production of goods and services.

The argument for Risk free rate = Nominal GDP growth

1. In the long term, the real growth rate cannot be lower than the real interest rate, since the growth in goods/services has to be enough to cover the promised rate.
2. In the long term, the real growth rate can be higher than the real interest rate, to compensate risk taking. However, as economies mature, the difference should get smaller and since there will be growth companies in the economy, it is prudent to assume that the extra growth comes from these companies.

<i>Period</i>	<i>10-Year T.Bond Rate</i>	<i>Inflation Rate</i>	<i>Real GDP Growth</i>	<i>Nominal GDP growth rate</i>	<i>Nominal GDP - T.Bond Rate</i>
1954-2015	5.93%	3.61%	3.06%	6.67%	0.74%
1954-1980	5.83%	4.49%	3.50%	7.98%	2.15%
1981-2008	6.88%	3.26%	3.04%	6.30%	-0.58%
2009-2015	2.57%	1.66%	1.47%	3.14%	0.57%

A Practical Reason for using the Risk free Rate Cap – Preserve Consistency

199

- You are implicitly making assumptions about nominal growth in the economy, with your risk free rate. Thus, with a low risk free rate, you are assuming low nominal growth in the economy (with low inflation and low real growth) and with a high risk free rate, a high nominal growth rate in the economy.
- If you make an explicit assumption about nominal growth in cash flows that is at odds with your implicit growth assumption in the denominator, you are being inconsistent and bias your valuations:
 - If you assume high nominal growth in the economy, with a low risk free rate, you will over value businesses.
 - If you assume low nominal growth rate in the economy, with a high risk free rate, you will under value businesses.

2. Don't wait too long...

200

- Assume that you are valuing a young, high growth firm with great potential, just after its initial public offering. How long would you set your high growth period?
 - a. < 5 years
 - b. 5 years
 - c. 10 years
 - d. >10 years
- While analysts routinely assume very long high growth periods (with substantial excess returns during the periods), the evidence suggests that they are much too optimistic. Most growth firms have difficulty sustaining their growth for long periods, especially while earning excess returns.

And tie to competitive advantages

201

- It is not growth per se that creates value but growth with excess returns.
- For growth firms to continue to generate value creating growth, they have to be able to keep the competition at bay.
 - Proposition 1: The stronger and more sustainable the competitive advantages, the longer a growth company can sustain “value creating” growth.
 - Proposition 2: Growth companies with strong and sustainable competitive advantages are rare.

3. Do not forget that growth has to be earned..

202

- In the section on expected growth, we laid out the fundamental equation for growth:
Growth rate = Reinvestment Rate * Return on invested capital
+ Growth rate from improved efficiency
- In stable growth, you cannot count on efficiency delivering growth and you have to reinvest to deliver the growth rate that you have forecast.
- Consequently, your reinvestment rate in stable growth will be a function of your stable growth rate and what you believe the firm will earn as a return on capital in perpetuity:
 - ▣ Reinvestment Rate = Stable growth rate/ Stable period ROC = g / ROC
- Your terminal value equation can then be rewritten as:

$$\text{Terminal Value in year } n = \frac{\text{EBIT}_{n+1} (1-t)(1-\frac{g}{\text{ROC}})}{(\text{Cost of Capital}-g)}$$

The Big Assumption

203

		Return on capital in perpetuity				
		6%	8%	10%	12%	14%
Growth rate forever	0.0%	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000
	0.5%	\$965	\$987	\$1,000	\$1,009	\$1,015
	1.0%	\$926	\$972	\$1,000	\$1,019	\$1,032
	1.5%	\$882	\$956	\$1,000	\$1,029	\$1,050
	2.0%	\$833	\$938	\$1,000	\$1,042	\$1,071
	2.5%	\$778	\$917	\$1,000	\$1,056	\$1,095
	3.0%	\$714	\$893	\$1,000	\$1,071	\$1,122

Terminal value for a firm with expected after-tax operating income of \$100 million in year $n+1$ and a cost of capital of 10%.

Excess Returns to Zero?

204

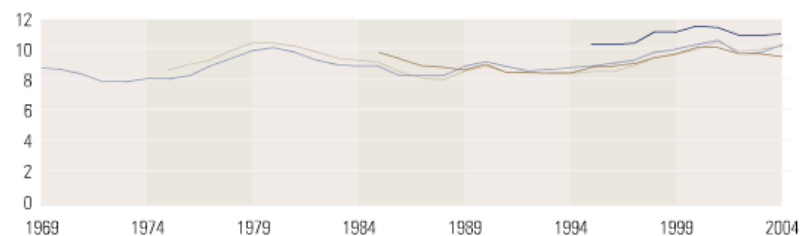
- There are some (McKinsey, for instance) who argue that the return on capital should always be equal to cost of capital in stable growth.
- But excess returns seem to persist for very long time periods.

A more sustainable measure

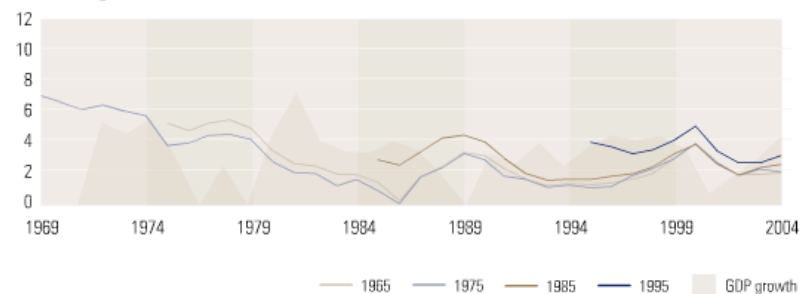
Median for top 500 publicly listed US companies by revenues in 1965, 1975, 1985, and 1995

Returns on invested capital (ROIC) is sustainable over time, but growth inevitably declines.

ROIC,¹ %



Real revenue growth,¹ %



— 1965 — 1975 — 1985 — 1995 GDP growth

¹ROIC shown is 7-year simple average, including goodwill; growth shown is 7-year compound annual growth rate for revenues adjusted for inflation.

And don't fall for sleight of hand...

205

- A typical assumption in many DCF valuations, when it comes to stable growth, is that capital expenditures offset depreciation and there are no working capital needs. Stable growth firms, we are told, just have to make maintenance cap ex (replacing existing assets) to deliver growth. If you make this assumption, what expected growth rate can you use in your terminal value computation?
- What if the stable growth rate = inflation rate? Is it okay to make this assumption then?

4. Be internally consistent

206

- Risk and costs of equity and capital: Stable growth firms tend to
 - ▣ Have betas closer to one
 - ▣ Have debt ratios closer to industry averages (or mature company averages)
 - ▣ Country risk premiums (especially in emerging markets should evolve over time)
- The excess returns at stable growth firms should approach (or become) zero. $ROC \rightarrow \text{Cost of capital}$ and $ROE \rightarrow \text{Cost of equity}$
- The reinvestment needs and dividend payout ratios should reflect the lower growth and excess returns:
 - ▣ Stable period payout ratio = $1 - g / ROE$
 - ▣ Stable period reinvestment rate = g / ROC



BEYOND INPUTS: CHOOSING AND USING THE RIGHT MODEL

Choosing the right model

Summarizing the Inputs

208

- In summary, at this stage in the process, we should have an estimate of the
 - ▣ the current cash flows on the investment, either to equity investors (dividends or free cash flows to equity) or to the firm (cash flow to the firm)
 - ▣ the current cost of equity and/or capital on the investment
 - ▣ the expected growth rate in earnings, based upon historical growth, analysts forecasts and/or fundamentals
- The next step in the process is deciding
 - ▣ which cash flow to discount, which should indicate
 - ▣ which discount rate needs to be estimated and
 - ▣ what pattern we will assume growth to follow

Which cash flow should I discount?

209

□ Use Equity Valuation

- (a) for firms which have stable leverage, whether high or not, and
- (b) if equity (stock) is being valued

□ Use Firm Valuation

- (a) for firms which have leverage which is too high or too low, and expect to change the leverage over time, because debt payments and issues do not have to be factored in the cash flows and the discount rate (cost of capital) does not change dramatically over time.
- (b) for firms for which you have partial information on leverage (eg: interest expenses are missing..)
- (c) in all other cases, where you are more interested in valuing the firm than the equity. (Value Consulting?)

Given cash flows to equity, should I discount dividends or FCFE?

210

- Use the Dividend Discount Model
 - (a) For firms which pay dividends (and repurchase stock) which are close to the Free Cash Flow to Equity (over an extended period)
 - (b) For firms where FCFE are difficult to estimate (Example: Banks and Financial Service companies)
- Use the FCFE Model
 - (a) For firms which pay dividends which are significantly higher or lower than the Free Cash Flow to Equity. (What is significant? ... As a rule of thumb, if dividends are less than 80% of FCFE or dividends are greater than 110% of FCFE over a 5-year period, use the FCFE model)
 - (b) For firms where dividends are not available (Example: Private Companies, IPOs)

What discount rate should I use?

211

- Cost of Equity versus Cost of Capital
 - ▣ If discounting cash flows to equity -> Cost of Equity
 - ▣ If discounting cash flows to the firm -> Cost of Capital
- What currency should the discount rate (risk free rate) be in?
 - ▣ Match the currency in which you estimate the risk free rate to the currency of your cash flows
- Should I use real or nominal cash flows?
 - ▣ If discounting real cash flows -> real cost of capital
 - ▣ If nominal cash flows -> nominal cost of capital
 - ▣ If inflation is low (<10%), stick with nominal cash flows since taxes are based upon nominal income
 - ▣ If inflation is high (>10%) switch to real cash flows

Which Growth Pattern Should I use?

212

- If your firm is
 - ▣ large and growing at a rate close to or less than growth rate of the economy, or
 - ▣ constrained by regulation from growing at rate faster than the economy
 - ▣ has the characteristics of a stable firm (average risk & reinvestment rates)

Use a Stable Growth Model

- If your firm
 - ▣ is large & growing at a moderate rate (\leq Overall growth rate + 10%) or
 - ▣ has a single product & barriers to entry with a finite life (e.g. patents)

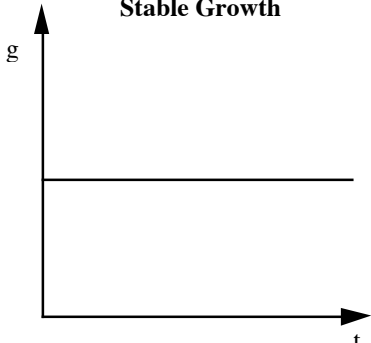
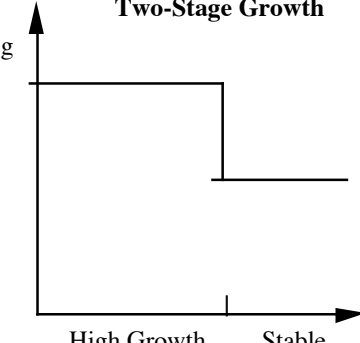
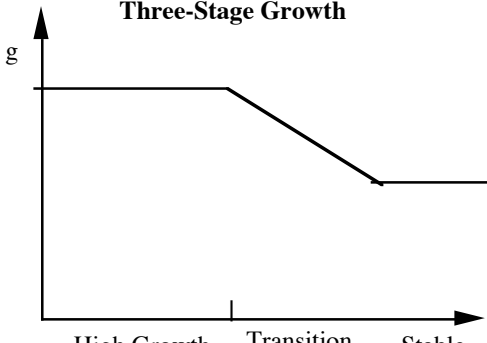
Use a 2-Stage Growth Model

- If your firm
 - ▣ is small and growing at a very high rate ($>$ Overall growth rate + 10%) or
 - ▣ has significant barriers to entry into the business
 - ▣ has firm characteristics that are very different from the norm

Use a 3-Stage or n-stage Model

The Building Blocks of Valuation

213

Choose a			
Cash Flow	<p><i>Dividends</i></p> <p>Expected Dividends to Stockholders</p>	<p><i>Cashflows to Equity</i></p> <p>Net Income - $(1 - \delta) (\text{Capital Exp.} - \text{Deprec'n})$ - $(1 - \delta) \text{Change in Work. Capital}$ = Free Cash flow to Equity (FCFE) $[\delta = \text{Debt Ratio}]$</p>	<p><i>Cashflows to Firm</i></p> <p>EBIT $(1 - \text{tax rate})$ - $(\text{Capital Exp.} - \text{Deprec'n})$ - Change in Work. Capital = Free Cash flow to Firm (FCFF)</p>
& A Discount Rate	<p><i>Cost of Equity</i></p> <ul style="list-style-type: none"> <i>Basis:</i> The riskier the investment, the greater is the cost of equity. <i>Models:</i> CAPM: Riskfree Rate + Beta (Risk Premium) APM: Riskfree Rate + $\sum \text{Beta}_j (\text{Risk Premium}_j)$; $n \text{ factors}$ 		<p><i>Cost of Capital</i></p> <p>WACC = $k_e (E / (D+E))$ + $k_d (D / (D+E))$ $k_d = \text{Current Borrowing Rate } (1-t)$ E,D: Mkt Val of Equity and Debt</p>
& a growth pattern	<p>Stable Growth</p> 	<p>Two-Stage Growth</p>  <p>High Growth Stable</p>	<p>Three-Stage Growth</p>  <p>High Growth Transition Stable</p>



TYING UP LOOSE ENDS

The trouble starts after you tell me you are done..

But what comes next?

215

Value of Operating Assets	Since this is a discounted cashflow valuation, should there be a real option premium?
+ Cash and Marketable Securities	Operating versus Non-operating cash Should cash be discounted for earning a low return?
+ Value of Cross Holdings	How do you value cross holdings in other companies? What if the cross holdings are in private businesses?
+ Value of Other Assets	What about other valuable assets? How do you consider under utilized assets?
Value of Firm	Should you discount this value for opacity or complexity? How about a premium for synergy? What about a premium for intangibles (brand name)?
- Value of Debt	What should be counted in debt? Should you subtract book or market value of debt? What about other obligations (pension fund and health care)? What about contingent liabilities? What about minority interests?
= Value of Equity	Should there be a premium/discount for control? Should there be a discount for distress
- Value of Equity Options	What equity options should be valued here (vested versus non-vested)? How do you value equity options?
= Value of Common Stock	Should you divide by primary or diluted shares?
/ Number of shares	
= Value per share	Should there be a discount for illiquidity/ marketability? Should there be a discount for minority interests?