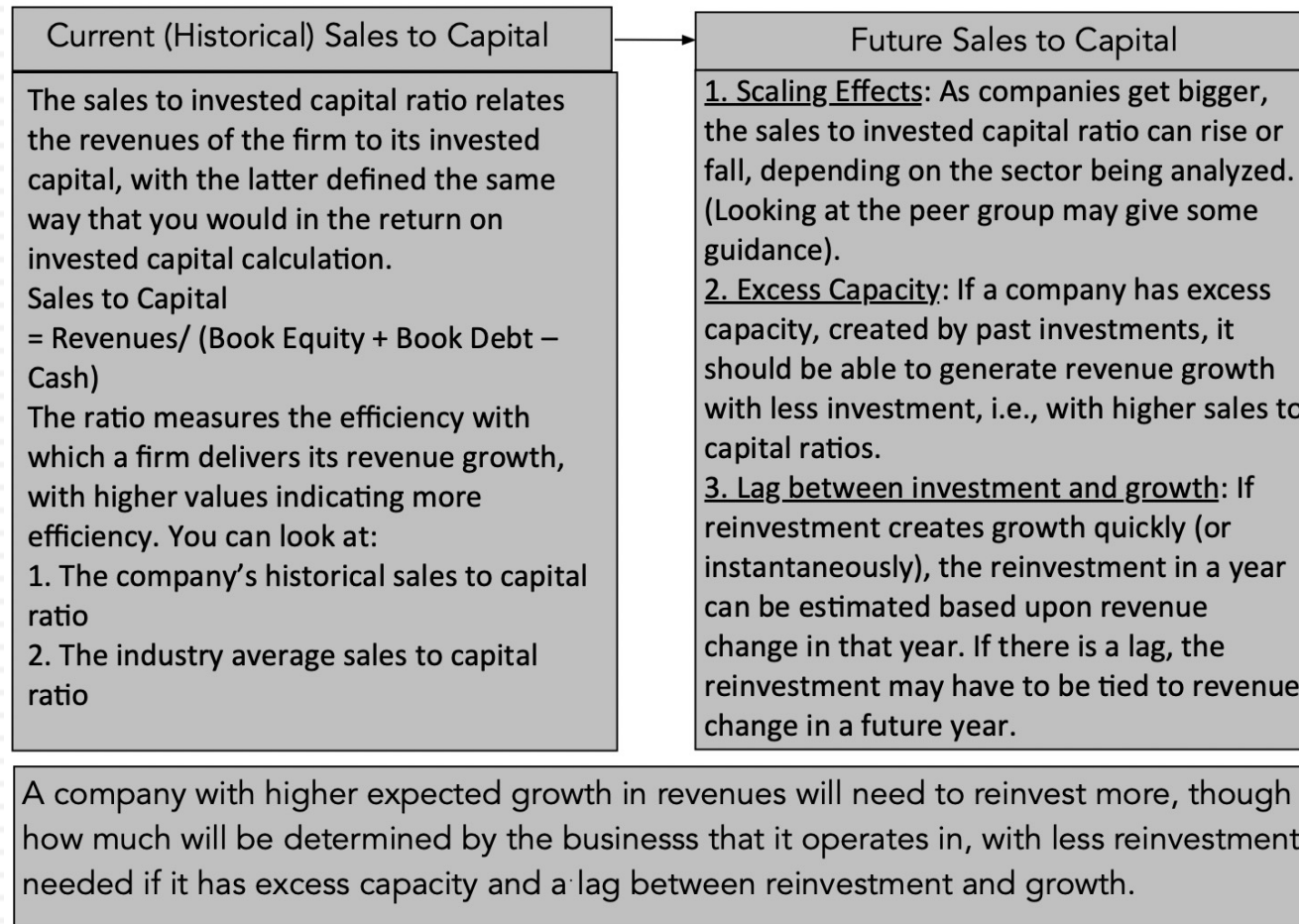


3. Sales to Invested Capital: A Pathway to estimating Reinvestment

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Sales to Invested Capital: Reinvestment



Airbnb: Reinvestment and Profitability

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Taxes
 Note that losses are carried forward and the company starts paying taxes only in year 5. Target tax rate is 25%.

Reinvestment
 $Reinvestment = Net\ Cap\ Ex + Acquisitions + Capitalized\ R\&D + Chg\ in\ Working\ Capital$
 To estimate the reinvestment, I divide the change in sales in that year by the sales to invested capital ratio.

Year	Revenues	Operating Margin	EBIT	EBIT (1-t)	Change in Sales	Sales to Capital	Reinvestment	FCFF	Invested Capital	ROIC
	\$ 3,625,731	-13.69%	\$ (496,542)	\$ (496,542)		1.92			\$ 1,370,158	-36.24%
1	\$ 4,691,698	-10.00%	\$ (469,170)	\$ (469,170)	\$ 1,065,967	2.00	\$ 532,984	\$ (1,002,153)	\$ 1,903,142	-24.65%
2	\$ 5,989,797	-3.00%	\$ (179,694)	\$ (179,694)	\$ 1,298,098	2.00	\$ 649,049	\$ (828,743)	\$ 2,552,191	-7.04%
3	\$ 7,565,479	0.50%	\$ 37,827	\$ 37,827	\$ 1,575,683	2.00	\$ 787,841	\$ (750,014)	\$ 3,340,033	1.13%
4	\$ 9,554,641	4.00%	\$ 382,186	\$ 382,186	\$ 1,989,162	2.00	\$ 994,581	\$ (612,395)	\$ 4,334,613	8.82%
5	\$ 12,065,542	7.50%	\$ 904,916	\$ 777,799	\$ 2,510,900	2.00	\$ 1,255,450	\$ (477,651)	\$ 5,590,064	13.91%
6	\$ 14,674,089	9.52%	\$1,397,269	\$1,047,952	\$ 2,608,547	2.00	\$ 1,304,274	\$ (256,322)	\$ 6,894,337	15.20%
7	\$ 17,163,026	13.39%	\$2,298,389	\$1,723,792	\$ 2,488,937	2.00	\$ 1,244,469	\$ 479,323	\$ 8,138,806	21.18%
8	\$ 19,274,804	17.26%	\$3,327,026	\$2,495,269	\$ 2,111,778	2.00	\$ 1,055,889	\$ 1,439,380	\$ 9,194,695	27.14%
9	\$ 20,748,969	21.13%	\$4,384,362	\$3,288,271	\$ 1,474,165	2.00	\$ 737,082	\$ 2,551,189	\$ 9,931,777	33.11%
10	\$ 21,370,016	25.00%	\$5,342,504	\$4,006,878	\$ 621,047	2.00	\$ 310,524	\$ 3,696,354	\$10,242,301	39.12%

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

Investment Returns
 $ROIC = EBIT\ (1-t) / Invested\ Capital\ in\ year\ t$

Aggregate versus Marginal Values

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- While sustainable growth equations are stated in terms of returns on capital (equity) or sales to capital the numbers that drive growth are returns on new investments, i.e., marginal returns on capital (equity) or marginal sales to capital ratios.
- The marginal returns and sales to capital ratios can be computed by looking at changes from year to year:
 - $$\text{Marginal ROC} = \frac{(\text{Operating Income}_t - \text{Operating Income}_{t-1})}{(\text{Invested Capital}_{t-1} - \text{Invested Capital}_{t-2})}$$
 - $$\text{Marginal ROC} = \frac{(\text{Sales}_t - \text{Sales}_{t-1})}{(\text{Invested Capital}_{t-1} - \text{Invested Capital}_{t-2})}$$
- As companies scale up, the marginal values for these variables can diverge from the aggregate values.
 - For companies where there are investing economies to scale, the marginal values can be significantly higher than the aggregate values.
 - For companies that are facing changing competitor or are entering new businesses, the marginal values can be lower than the aggregate values.

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Closure in Valuation

The Big Enchilada

Getting Closure in Valuation

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- 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

200

Approach	Inputs and Value	Types of business
Liquidation Value	Liquidation value of assets held by the firm in the terminal year.	Businesses built around a key person or a time-limited competitive advantage (license or patent)
Going Concern (Perpetuity)	TV in year $n = CF_{n+1} / (r - g)$, where $g =$ growth rate forever	Going concerns with long lives (>40 years)
Going Concern (Finite)	TV in year $n =$ PV of CF in years $n+1$ to $n+k$, where k is finite	Going concerns with shorter lives
Pricing	Terminal Year Operating Metric * Estimated Multiple of Metric	Never appropriate in an intrinsic valuation.

1. With perpetual growth, obey the growth cap

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- 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)
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 lower.
 - If the economy is composed of **high growth and stable growth firms**, the growth rate of the latter will be lower than the growth rate of the economy.
 - **The stable growth rate can be negative**, for companies in declining businesses.
 - If you use **nominal cashflows and discount rates**, the growth rate should be nominal in the currency in which the valuation is denominated.

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.

Time Period	Ten-year T.Bond rate	Inflation rate	Real GDP growth	Nominal GDP Growth Rate
1954-2021	5.59%	3.55%	2.94%	6.50%
1954-1980	5.83%	4.49%	3.50%	7.98%
1981-2008	6.88%	3.26%	3.04%	6.30%
2011-2021	2.25%	1.76%	1.70%	3.46%

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

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- 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.

Heineken: September 2019 (in Euros)

Cash flows from existing assets

	LTM	2013-2018
Revenues	€ 23,119	Growth rate = 3.22%
Operating Margin	14.86%	14.44%
Sales/Invested Capital	0.71	0.79
ROIC	7.46%	8.32%
Effective Tax Rate	29.70%	27.00%

The Payoff from growth

Revenues will grow 3.22% a year for next 5 years, tapering down to -0.5% growth in year 10

Operating margin (per-tax) will drop to 14.00%

Sales/Invested Capital will stay at five-year average of 0.79.

Maturity and Closure

Stable Growth
 $g = -0.5\%$;
 Cost of capital = 5%
 $ROC = 5\%$;
 Reinvestment Rate = $-0.5\%/5\% = -10\%$

Euro Cashflows

Terminal Value = $2972 / (0.05 - (-0.005)) = 54,034$

	1	2	3	4	5	6	7	8	9	10	Terminal year
Revenue growth rate	3.22%	3.22%	3.22%	3.22%	3.22%	2.48%	1.73%	0.99%	0.24%	-0.50%	-0.50%
Revenues	€ 23,863	€ 24,632	€ 25,425	€ 26,244	€ 27,089	€ 27,759	€ 28,240	€ 28,519	€ 28,589	€ 28,446	€ 28,304
EBIT (Operating) margin	14.38%	14.34%	14.30%	14.26%	14.21%	14.17%	14.13%	14.09%	14.04%	14.00%	14.00%
EBIT (Operating income)	€ 3,432	€ 3,532	€ 3,635	€ 3,741	€ 3,850	€ 3,934	€ 3,990	€ 4,017	€ 4,015	€ 3,982	\$ 3,963
Tax rate	29.70%	29.70%	29.70%	29.70%	29.70%	28.76%	27.82%	26.88%	25.94%	25.00%	0
EBIT(1-t)	€ 2,413	€ 2,483	€ 2,556	€ 2,630	€ 2,707	€ 2,802	€ 2,880	€ 2,937	€ 2,973	€ 2,987	\$ 2,972
- Reinvestment	€ 942	€ 973	€ 1,004	€ 1,036	€ 1,070	€ 849	€ 609	€ 353	€ 88	€ (181)	\$ (297)
FCFF	€ 1,471	€ 1,511	€ 1,552	€ 1,594	€ 1,637	€ 1,953	€ 2,271	€ 2,584	€ 2,885	€ 3,168	\$ 3,269

Discount at Euro Cost of Capital (WACC) = $7.66\% (.599) + 1.13\% (0.401) = 5.04\%$

The Risk in the Cash flows

On September 1, 2019, Heineken was trading at 93.25 Euros/share

Cost of Equity
7.66%

Cost of Debt
 $(-0.5\% + 2\%)(1 - 0.25) = 1.13\%$

Weights
E = 59.9% D = 40.1%

Riskfree Rate:
Euro Risk free rate = -0.50%

+

Beta = 1.20

x

Unlevered beta of alcoholic beverage business = 0.80

Firm's D/E Ratio: 66.98%

ERP = 6.83%

Region	Revenues	Weight	ERP
Europe	10348	50.24%	6.90%
North America	5920	28.74%	5.75%
Asia	2919	14.17%	7.22%
Latin America & Caribbean	781	3.79%	10.53%
Africa & Mid East	631	3.06%	9.30%
Total	20599	100.00%	6.83%

2. Don't wait too long...

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- Most growth firms have difficulty sustaining their growth for long periods, especially while earning excess returns. Assuming long growth periods for all firms is ignoring this reality.
- 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..

- The reinvestment rate in stable growth will be a function of the stable growth rate and return on capital in perpetuity
 - ▣ Reinvestment Rate = Stable growth rate/ Stable period ROC = g/ ROC
 - ▣ Terminal Value in year n =
$$\frac{\text{EBIT}_{n+1} (1-t)(1-\frac{g}{\text{ROC}})}{(\text{Cost of Capital}-g)}$$

		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

Excess Returns to Zero?

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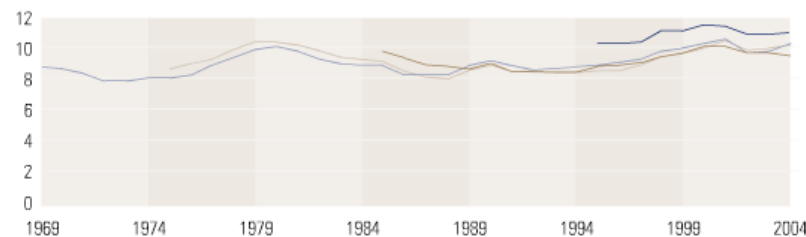
- There are some (McKinsey, for instance) who argue that the return on capital should always be equal to cost of capital in stable growth.
- But excess returns seem to persist for very long time periods.

A more sustainable measure

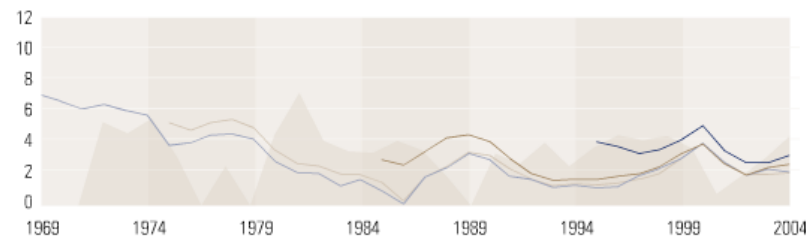
Median for top 500 publicly listed US companies by revenues in 1965, 1975, 1985, and 1995

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

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

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- 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.
 - a. If you make this assumption, what expected growth rate can you use in your terminal value computation?

 - b. What if the stable growth rate = inflation rate? Is it okay to make this assumption then?

4. Be internally consistent

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- 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 → Cost of capital and ROE → Cost of equity
- The reinvestment needs and dividend payout ratios should reflect the lower growth and excess returns:
 - ▣ Stable period payout ratio = $1 - g / \text{ROE}$
 - ▣ Stable period reinvestment rate = g / ROC

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Beyond Inputs: Choosing and Using the Right Model

Choosing the right model

Summarizing the Inputs

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- 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?

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□ 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?

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- 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?

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- 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?

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- 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)

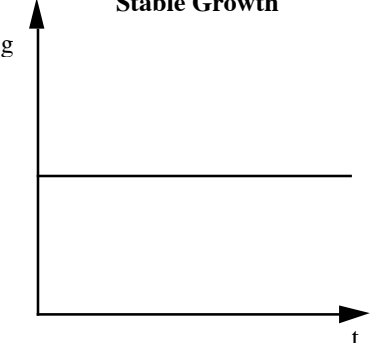
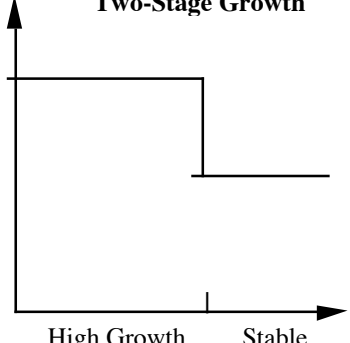
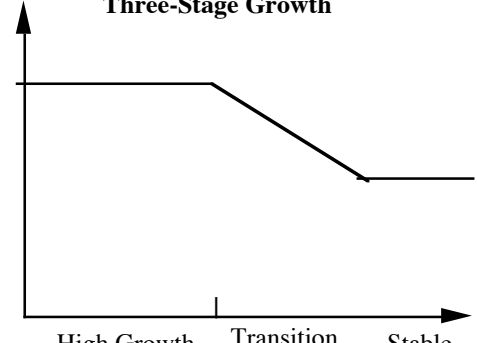
Use a 2-Stage Growth Model

- 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

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Choose a			
Cash Flow	<p style="text-align: center;"><i>Dividends</i></p> <p>Expected Dividends to Stockholders</p>	<p style="text-align: center;"><i>Cashflows to Equity</i></p> <p>Net Income - (1- δ) (Capital Exp. - Deprec'n) - (1- δ) Change in Work. Capital = Free Cash flow to Equity (FCFE) [δ = Debt Ratio]</p>	<p style="text-align: center;"><i>Cashflows to Firm</i></p> <p>EBIT (1- tax rate) - (Capital Exp. - Deprec'n) - Change in Work. Capital = Free Cash flow to Firm (FCFF)</p>
& A Discount Rate	<p style="text-align: center;"><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 + Σ Beta_j (Risk Premium_j): <i>n factors</i> 		<p style="text-align: center;"><i>Cost of Capital</i></p> <p>WACC = $k_e (E / (D+E))$ + $k_d (D / (D+E))$ k_d = Current Borrowing Rate (1-t) E, D: Mkt Val of Equity and Debt</p>
& a growth pattern	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Stable Growth</p>  </div> <div style="text-align: center;"> <p>Two-Stage Growth</p>  </div> <div style="text-align: center;"> <p>Three-Stage Growth</p>  </div> </div>		

Tying up Loose Ends

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

But what comes next?

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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?