TERMINAL VALUE
THE TAIL THE WAGS THE DOG?

FOREVER OR BUST? THE MANY PATHS TO TERMINAL VALUE (MYTH 5.1)

Aswath Damodaran

The Closure Factor

- The DCF Equation for an asset with a life of n years

$$\text{Value of an asset with n-year life} = \frac{E(CF_1)}{(1+r)} + \frac{E(CF_2)}{(1+r)^2} + \frac{E(CF_3)}{(1+r)^3} \ldots + \frac{E(CF_n)}{(1+r)^n}$$

- If you have an asset that has a life that is longer than your forecast horizon:

$$\text{Value of an asset with life longer than t years} = \frac{E(CF_1)}{(1+r)} + \frac{E(CF_2)}{(1+r)^2} + \frac{E(CF_3)}{(1+r)^3} \ldots + \frac{Terminal\ Value_t}{(1+r)^t}$$

The Textbook Approach

- In presenting terminal value in textbooks and classrooms, the standard approach that is presented is the perpetual growth model, where you assume that cash flows grow at a constant rate forever.

$$Terminal\ Value_n = \frac{Expected\ Free\ Cash\ Flow_{n+1}}{(Discount\ Rate - Expected\ Growth\ Rate)}$$

- The cash flows and discount rate can be estimated from the perspective of equity investors or from the perspective of the entire business.

One acceptable alternative: Growing Annuities

- You can use an annuity or growing annuity formula to compute the terminal value. For instance, consider a 40-year asset with the following cash flows:

Year	1	2	3	4	5	Beyond year 5
Cash flow	$100	$125	$150	$175	$200	Grows at 2% a year

- The value is as follows:

$$\text{Value of 40-year asset} = \frac{100}{(1.08)} + \frac{125}{(1.08)^2} + \frac{150}{(1.08)^3} + \frac{175}{(1.08)^4} + \frac{200}{(1.08)^5} + \frac{200(1.02)\left(1-\frac{1.02^{35}}{1.08^{35}}\right)}{(.08-.02)(1.08^5)}$$

A Simple Rationale for Forever

Here's another alternative: Liquidation Value

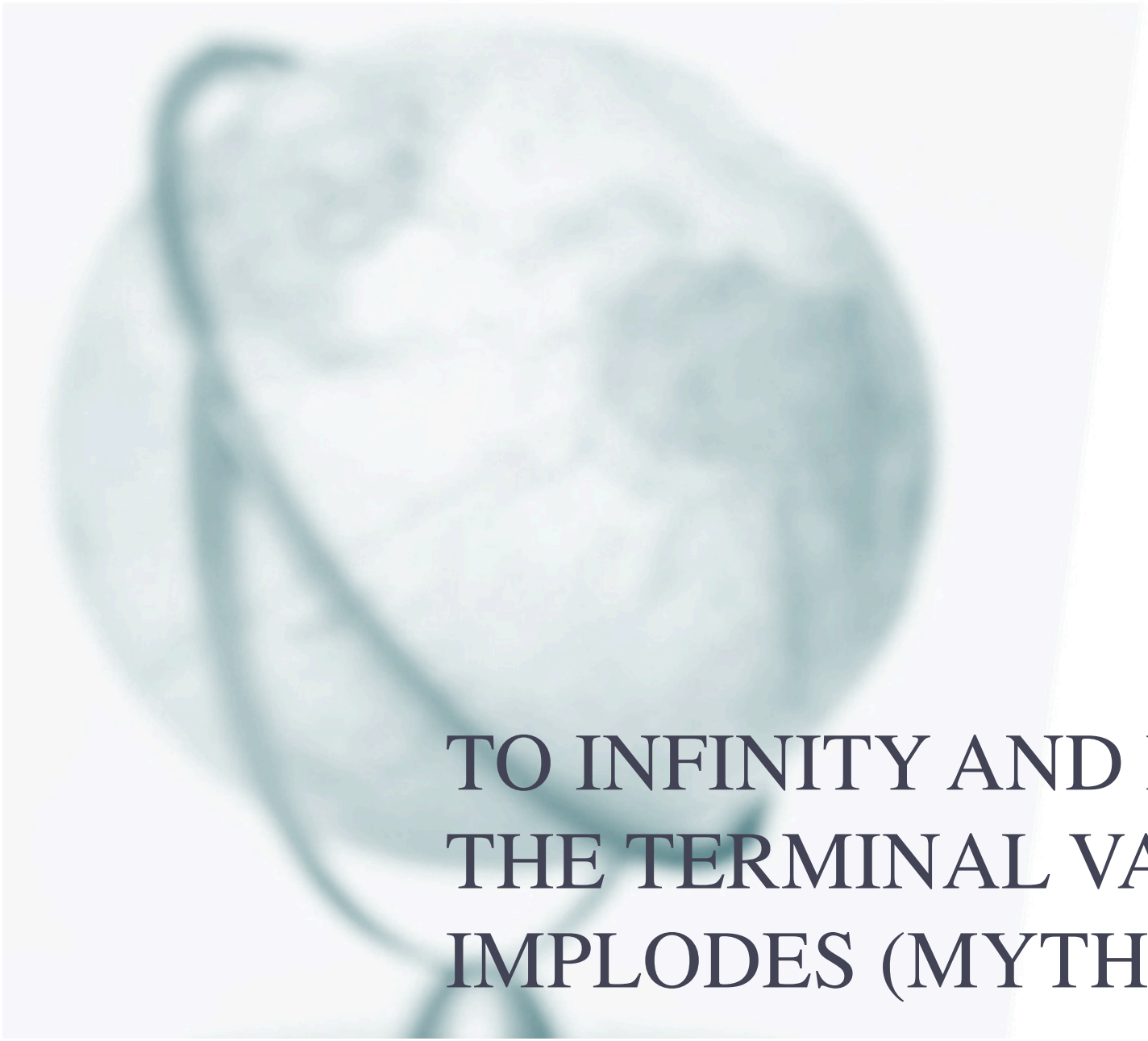
- There is one other legitimate way of estimating the terminal value in a discounted cash flow valuation and that is to assume that at the end of your forecast period, you will be shutting it down as a going concern and liquidating or salvaging its assets individually.
- This assumptions makes sense if you are valuing a business that derives all of its value from a finite lived asset or where operations are bounded by a time constraint (a restaurant in a leased building).

How about a multiple?

- In many DCF valuations, analysts use exit multiples to estimate terminal value.
- If that exit multiple is based upon what other companies are trading at today in the peer group, you have made your most important cash flow in your valuation into a pricing. These are Trojan Horse DCFs.
- You can always take intrinsic value inputs and convert them into an intrinsic multiple. If that is the process you use, you are staying within the constructs of intrinsic value.

The Bottom Line

- The perpetual growth model is a neat and flexible way to tie up loose ends and value an asset that has a very long life.
- That said, if you find yourself balking at the "forever", use an annuity or a growing annuity model, and if you find that daunting, use a liquidation value.



TO INFINITY AND BEYOND: THE TERMINAL VALUE IMPLODES (MYTH 5.2)

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The Mathematical Trap

- The perpetual growth model is borrowed from mathematics and reflects the sum of an infinite series.

$$Terminal\ Value_n = \frac{Expected\ Free\ Cash\ Flow_{n+1}}{(Discount\ Rate - Expected\ Growth\ Rate)}$$

As g moves towards r, the terminal value will approach infinity.

If g>r, the terminal value will become negative.

The Growth Cap

- If you want to draw on the perpetual growth equation, either because you believe your business will last forever or for convenience, the growth rate that you can use in it is constrained to be less than equal to the growth rate of the economy in which you operate.
- This is not a debatable assumption, since it is mathematical, not one that owes its presence to economic theory.

The Sub Questions

- Domestic versus Global: Depends on your company's operating reach and ambitions. Even emerging markets that are currently in high growth, though, will converge on global growth.
- Real versus Nominal: If your valuation is in real terms, the cap on your growth rate will be the real growth rate in the economy, and if in nominal terms, it will be the nominal growth rate.
- Currency: If you are valuing your company in a high-inflation currency, your nominal growth rate forever can be much higher than if you value it in a low-inflation currency.

My Simple Proxy: The Risk free Rate

- I use a simpler and more easily observable number as a cap on stable growth: the risk free rate that I have used in the valuation.
- This take into account the currency automatically (since higher inflation currencies have higher risk free rates) and it is not unreasonable to argue that it is a good proxy for the nominal growth rate in the economy.

Reason 1: The Data is supportive

Risk free rate = Expected Inflation + Expected real interest rate

Nominal economic growth = Expected Inflation + Expected real growth rate

Period	10-Year T.Bond Rate	Inflation Rate	Real GDP Growth	Nominal GDP growth rate	Nominal GDP - T.Bond Rate
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%

Reason 2: It preserves consistency

- When you use a riskfree rate in a valuation, you are implicitly making assumptions about economic growth and inflation in the future and you should make similar assumptions in estimating your cash flows.
- If you believe, the risk free rate today is too low or even negative (because the central banks have kept it so), you have to keep your growth rate in perpetuity very low or negative to keep your valuation from imploding.
- If you use growth rates that reflect the past (where inflation might have been higher) with today's low risk free rates, your valuation is inconsistent.

Reason 3: Self Control (or Lack of it)

- I know that I fight my preconceptions and the urges I feel to tweak the numbers to deliver the result that I want to see.
- There is no number that can have more consequence for value than the growth rate in the terminal value and having a cap on that number will not only make me look elsewhere but also make me more aware of my biases.

The Bottom Line

- The growth rate in terminal value comes with constraints, since it has to last forever.
- If you don't obey these constraints, your valuations will be unbounded and useless.

THE FREE GROWTH MYTH: THE EXCESS RETURN LINK (MYTH 5.3)

Aswath Damodaran

Playing with Growth

- In the terminal value equation, the growth seems to be the magic input, the key driver of value.

$$Terminal\ Value_n = \frac{Free\ Cash\ Flow_{n+1}}{(r-g)}$$

If you hold all else constant, the value is always an increasing function of growth. Growth is a gift that keeps on giving..

The Drivers of Growth

- Growth is determined by how much you reinvest and how well you reinvest:

$$\text{Reinvestment Rate} = \frac{(\text{Cap Ex-Deprec'n-Change in Noncash Working Capital})}{\text{EBIT}\,(1-t)}$$

$$\text{Return on Invested Capital} = \frac{\text{EBIT}\,(1-t)}{(\text{BV of Equity} + \text{BV of Debt-Cash})}$$

- In stable growth, expected growth rate has to be a product of these numbers:
  - Growth rate = Reinvestment Rate (RR) * Return on Invested Capital (ROIC)
  - The terminal value equation can be restated:

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

- Or as an intrinsic value multiple of $EBIT_n$

$$\text{Terminal Value Multiple of } EBIT_n = \frac{(1+g)(1-t)(1-\frac{g}{ROC})}{(Cost\ of\ Capital - g)}$$

An Expanded Version of Terminal Value

- For a firm that expects to generate $100 million in after-tax operating income next year, with a cost of capital of 10%, the terminal value can be estimated as a function of the ROIC it earns on its marginal investments in perpetuity.
- With a growth rate of 3% and a return on capital is 12%, for instance, the terminal value is:

$$\text{Terminal Value in year n} = \frac{\$100\ million\ (1 - \frac{.03}{.12})}{(.10 - .03)} = \$1{,}071\ million$$

Terminal Value and Growth

		Return on capital in perpetuity				
		6%	8%	10%	12%	14%
Growth rate forever	0.00%	$1,000	$1,000	$1,000	$1,000	$1,000
	0.50%	$965	$987	$1,000	$1,009	$1,015
	1.00%	$926	$972	$1,000	$1,019	$1,032
	1.50%	$882	$956	$1,000	$1,029	$1,050
	2.00%	$833	$938	$1,000	$1,042	$1,071
	2.50%	$778	$917	$1,000	$1,056	$1,095
	3.00%	$714	$893	$1,000	$1,071	$1,122

The Zero Excess Return World

- There are a few valuation purists who argue that the only assumption that is consistent with a mature, stable growth company is that you assume zero excess returns, since no company can have competitive advantages that last forever.
- If you make that assumption, you might as well dispense with estimating a stable growth rate and estimate a terminal value with a zero growth rate. While I see a basis for the argument, it runs into a reality check, i.e., that excess returns seem to last far longer than high growth rates do.

Dangerous Practice 1: Just grow the FCFF another year!

Valuation of a firm with expected growth in earnings of 10% for next 5 yeras and 3% thereafter; Cost of capital is 10% abd Return on capital is 15%

Terminal Value = FCFF in year 6/ (.10-.03)

		Just Grow FCFF		Recompute FCFF	
Year	EBIT(1-t)	FCFF	Term Value	FCFF	Term Value
1	$ 108.00	$ 36.00		$ 36.00	
2	$ 116.64	$ 38.88		$ 38.88	
3	$ 125.97	$ 41.99		$ 41.99	
4	$ 136.05	$ 45.35		$ 45.35	
5	$ 146.93	$ 48.98	$ 720.67	$ 48.98	$ 1,729.61
6	$ 151.34	$ 50.45		$ 121.07	
Value today	$ 605.27			$ 1,073.95	

Reinvestment Rate in first 5 years = g/ ROC = 10%/15% = 66.67%

FCFF in year 6 = $29.39 (1.03)

Reinvestment Rate in year 6 = g/ ROC = 3%/15% = 20%
FCFF in year 6 = 149.87 (1-.20) = $119.90

Dangerous Practice 2: No reinvestment needed!

- Approximately half of all the DCFs assume that when you get to stable growth, you can set capital expenditures = depreciation, ignore working capital changes and effectively make the reinvestment rate zero, while allowing the firm to continue growing at a stable growth rate.
- That argument fails at two levels.
  - If you reinvest nothing, your invested capital stays constant during your stable growth period, and as operating income rises, your return on invested capital will approach infinity.
  - Even if you assume a growth rate = inflation rate, you will have to replace your existing productive assets as they age and the same inflation that aids you on your revenues will cause the capital expenditures to exceed depreciation.

The Bottom Line

- It is conventional wisdom that it is the growth rate in the perpetual growth equation that is the most significant driver of the resulting value.
- That may be true if you hold all else constant and change only the growth rate, but it is not if you recognize that growth is never free and that changing the growth rate has consequences for your cash flows.
- Specifically, it is not the growth rate per se that determines value but how efficiently you generate that growth, and that efficiency is captured in the excess returns earned by your firm.

GROWTH CANNOT BE NEGATIVE FOREVER! OR CAN IT? (MYTH 5.4)

Aswath Damodaran

Negative Growth Rates in Valuation

- It is striking how infrequently you see projections of negative growth into the future, even for companies where the trend lines in revenues and earnings have been anything but positive.
- You almost never see a terminal value calculation, where the analyst assumes a negative growth rate in perpetuity. In fact, there are many who seem to view this as mathematical faux pas.

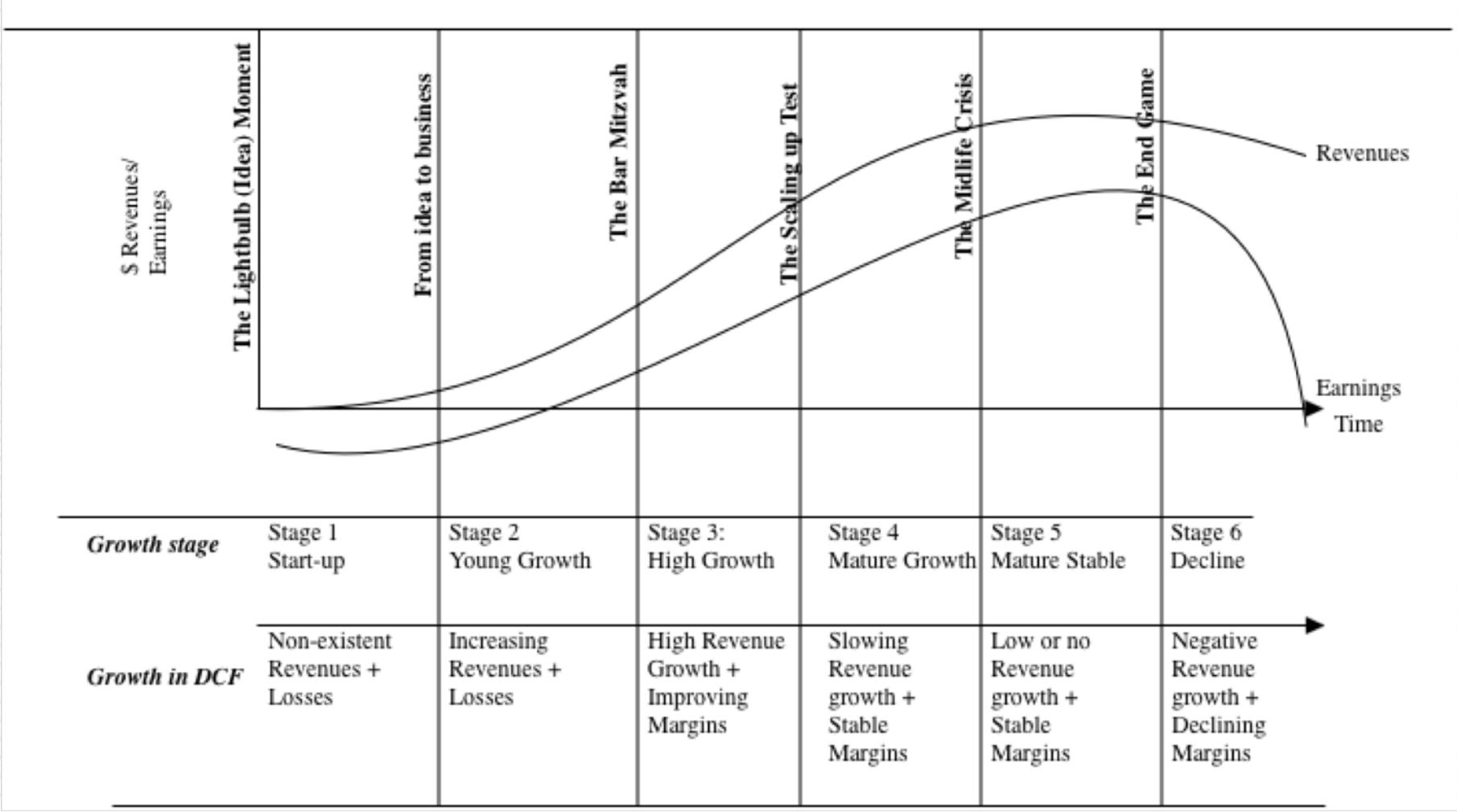
Negative Growth Rates: More common than you think!

Region	Number of firms	% with negative revenue growth in 2015	% with negative CAGR in revenues: 2011-2015	% with negative CAGR in revenues: 2006-2015
Australia, NZ and Canada	5014	41.44%	36.73%	28.20%
Developed Europe	7082	33.42%	30.03%	24.25%
Emerging Markets	21196	43.06%	29.35%	21.50%
Japan	3698	33.41%	20.76%	31.80%
United States	9823	39.69%	26.76%	28.10%
Grand Total	46814	39.86%	28.64%	24.69%

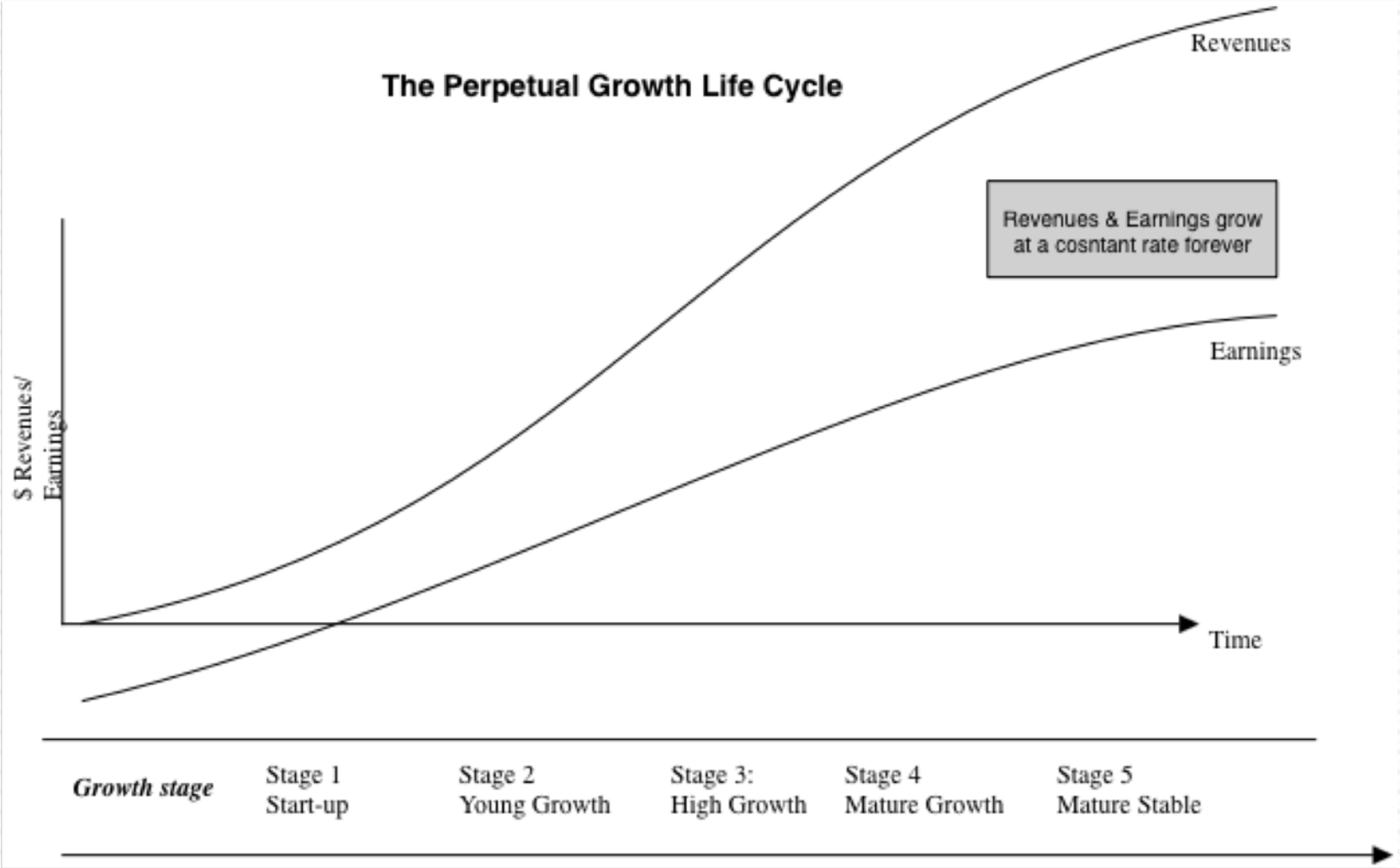
And more widespread in some sectors than others…

Industry Grouping	*Number of firms*	*In 2015*	*CAGR from 2011-2015*	*CAGR from 20106-2015*
Publshing & Newspapers	346	53.77%	48.44%	45.69%
Computers/Peripherals	327	43.30%	42.12%	45.65%
Electronics (Consumer & Office)	152	43.70%	47.11%	44.44%
Homebuilding	164	31.51%	22.69%	35.87%
Oil/Gas (Production and Exploration)	959	79.22%	43.75%	35.40%
Food Wholesalers	126	37.00%	30.59%	33.33%
Office Equipment & Services	160	40.58%	32.54%	33.33%
Real Estate (General/Diversified)	418	41.33%	32.72%	32.52%
Telecom. Equipment	473	43.00%	37.36%	32.43%
Financial Svcs. (Non-bank & Insurance)	983	28.17%	26.96%	32.26%
Steel	757	73.23%	50.65%	32.08%

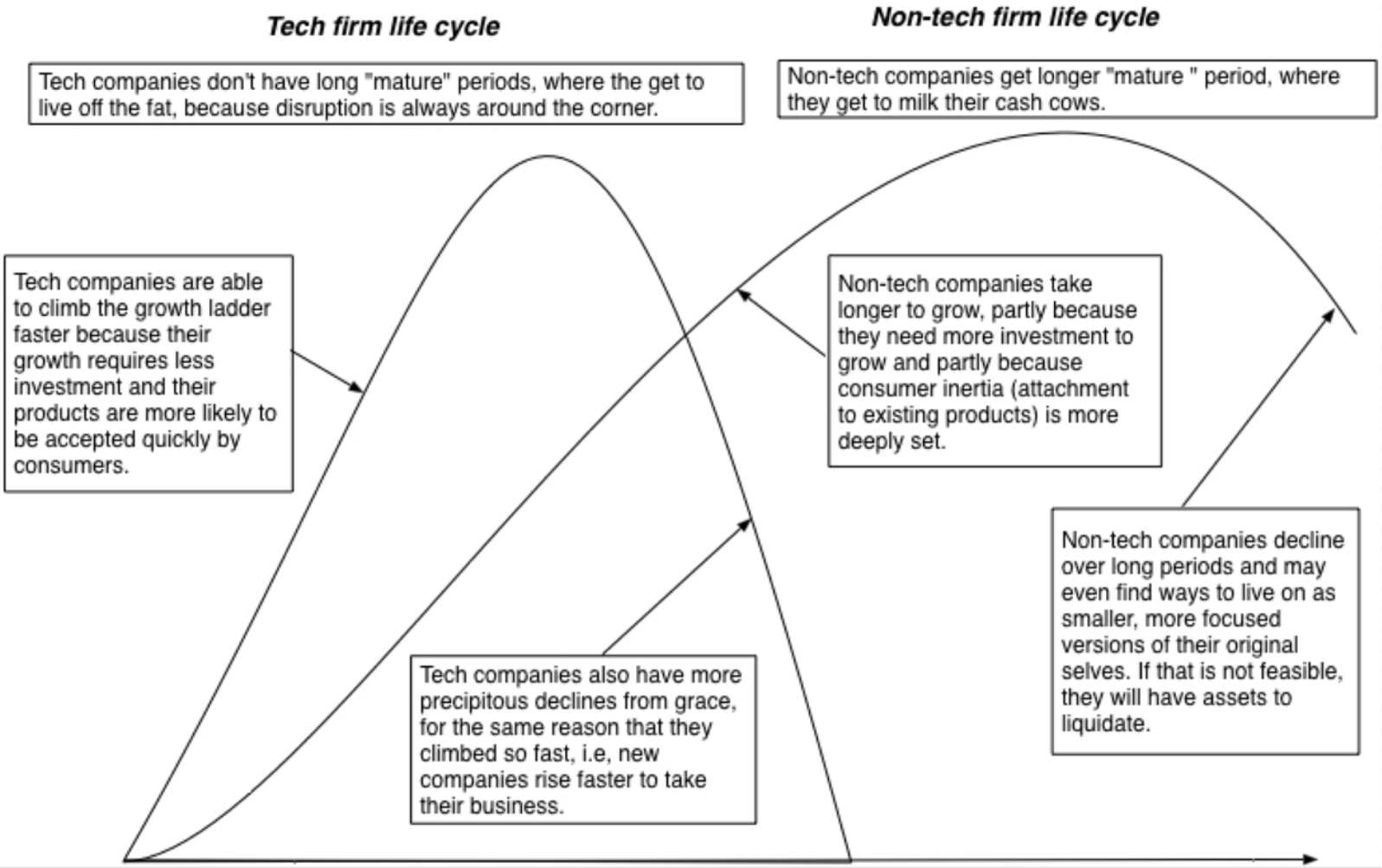
Negative Growth: A Life Cycle Perspective



The Conventional DCF World Life Cycle



And perhaps we need to rethink DCF with tech companies



Negative Growth: The Mechanics

- Consider the example of the firm with $100 million in expected after-tax operating income next year, that is in perpetual growth and let's assume a perpetual growth rate of -5% a year forever. If you assume that as the firm shrinks, there will be no cash flows from selling or liquidating assets, the terminal value with a 10% cost of capital is:

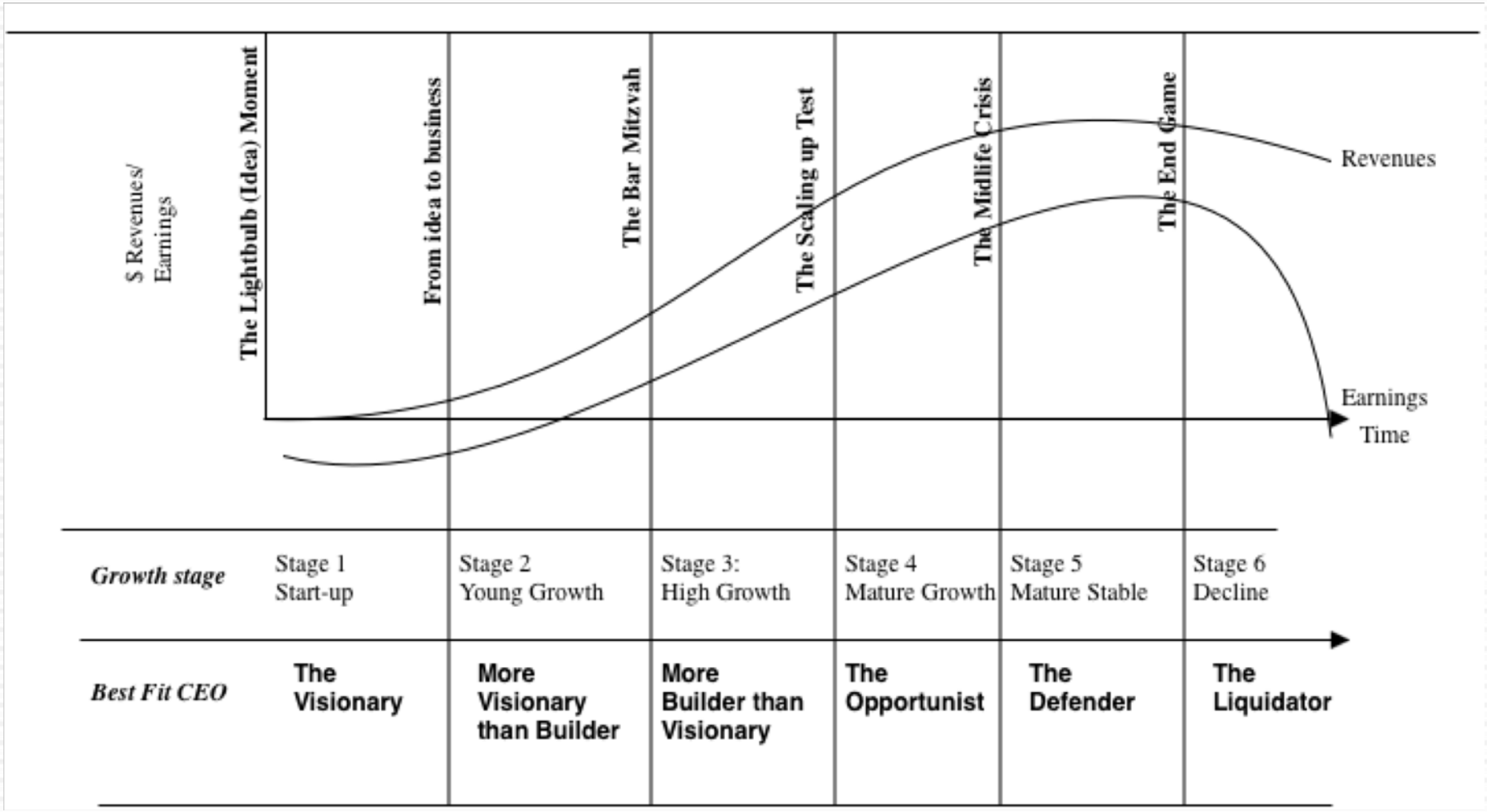
  Terminal value = $100/ (.10-(-.05)) = $666.67

- If you assume that there are assets that are being liquidated as the firm shrinks, you have to estimate the return on capital on these assets and compute a reinvestment rate. If the assets that you are liquidating, for instance, have a 7.5% return on invested capital, the reinvestment rate will be -66.67%.

  Reinvestment rate = -5%/7.5% = 66.67%

- If you are puzzled by a negative reinvestment rate, think of it as an additional cash flow that you are generating from asset sales, and your terminal value will then be:
  - Terminal value = $100 (1-(-0.6667))/ (.10 – (-.05)) = $1,111.33

The Managerial Implications



The Bottom Line

- So, be bold. Assume negative growth rates in revenues for firms where you think it is appropriate and work out the value.
- It is advice that I plan to take myself because I don't use negative growth rates often enough in valuation.

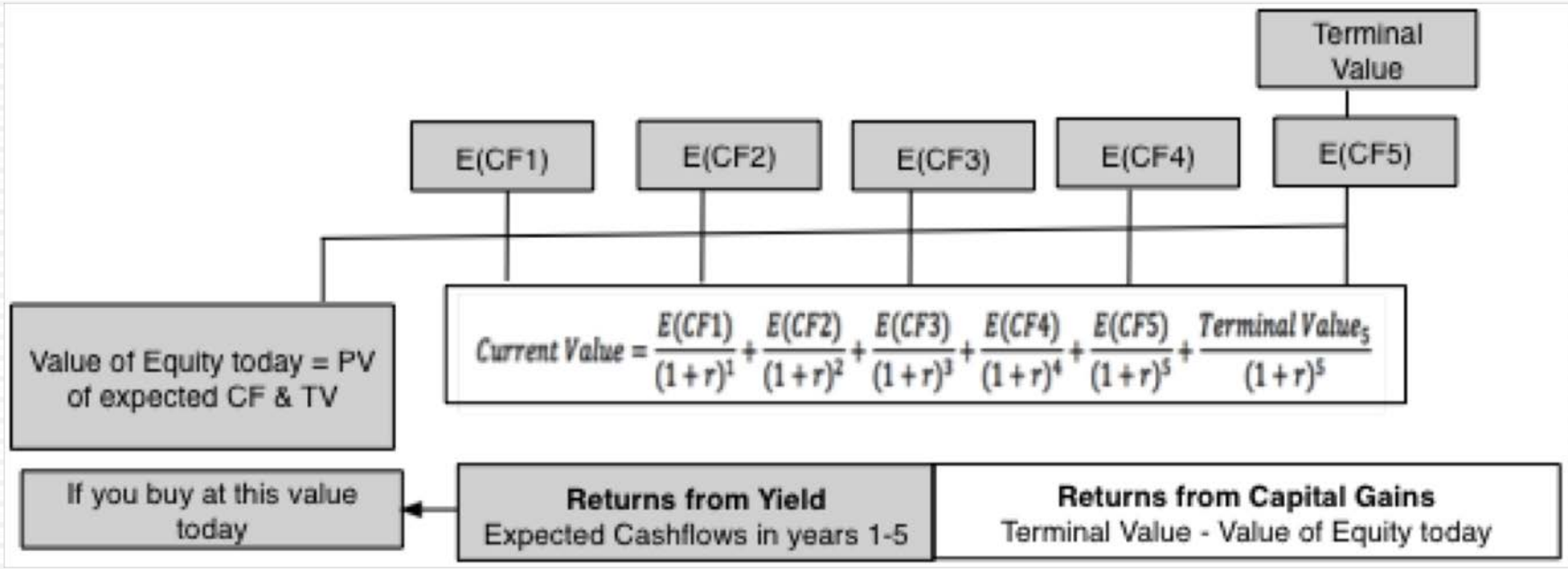
THE TERMINAL VALUE ATE MY DCF: TERMINAL VALUE MYTH 5.5

Aswath Damodaran

The Large Terminal Value: Myths

- A large portion of your current value in a DCF comes from your terminal value.
- It is easy to interpret this number incorrectly.
  - There is a perception that if the terminal value is a high proportion of your value today, the DCF is inherently unreliable, perhaps a reflection of its old value investing roots.
  - Following up on the realization that a high percentage of your current value comes from your terminal value is a leap to arguing that the assumptions that you make about high growth therefore don't matter as much as the assumptions you make in your terminal valuation.

Framing the Terminal Value in terms of Returns



And that reflects how investors make money on stocks..

	1 Year Horizon	5-Year Horizon	10-year Horizon
1928-2015	67.09%	67.57%	70.09%
1966-2015	72.43%	73.42%	75.10%
1996-2015	81.51%	84.11%	85.28%

Terminal Value as Proportion of Value: The Drivers

Excess Growth Rate (next 5 years)	ROE = COE -2%	ROE = COE	ROE = COE +2%
0%	75.14%	75.14%	75.14%
2%	86.30%	82.53%	80.86%
4%	100.00%	90.76%	86.75%
6%	117.24%	100.00%	93.15%
8%	139.59%	110.44%	100.00%
10%	169.71%	122.33%	107.35%

Though your terminal value is a high proportion of value, your high growth assumptions matter..

Excess Growth Rate (next 5 years)	ROE = COE -2%	ROE = COE	ROE = COE +2%
0%	$1,227.00	$1,380.00	$1,472.00
2%	$1,326.00	$1,491.00	$1,591.00
4%	$1,431.00	$1,610.00	$1,717.00
6%	$1,542.00	$1,734.00	$1,850.00
8%	$1,659.00	$1,864.00	$1,991.00
10%	$1,783.00	$2,006.00	$2,140.00

The Bottom Line

- If you are valuing equity in a going concern with a long life, you should not be surprised to see the terminal value in your DCF account for a high percentage of value.
- Contrary to what some may tell you, this is not a flaw in your valuation but a reflection of reality. You make money on equity investments primarily through price appreciation and the DCF is a reflection of that fact.
- Even though the terminal value will be a high proportion of current value, my suggestion is that you still pay attention to your assumptions about cash flows and growth during your high growth period, since your terminal value will be determined largely by them.