

The Dark Side of Valuation

Valuing difficult-to-value companies

Aswath Damodaran

Website: www.damodaran.com

Blog: <http://aswathdamodaran.blogspot.com/>

Twitter feed: @AswathDamodaran

Valuation App: **uValue** on iTunes store

Email: adamodar@stern.nyu.edu

The essence of intrinsic value

- In intrinsic valuation, you value an asset based upon its intrinsic characteristics.
- For cash flow generating assets, the intrinsic value will be a function of the magnitude of the expected cash flows on the asset over its lifetime and the uncertainty about receiving those cash flows.
- Discounted cash flow valuation is a tool for estimating intrinsic value, where the expected value of an asset is written as the present value of the expected cash flows on the asset, with either the cash flows or the discount rate adjusted to reflect the risk.

Risk Adjusted Value: Three Basic Propositions

The value of an asset is the present value of the expected cash flows on that asset, over its expected life:

$$\text{Value of asset} = \frac{E(\text{CF}_1)}{(1+r)} + \frac{E(\text{CF}_2)}{(1+r)^2} + \frac{E(\text{CF}_3)}{(1+r)^3} \dots + \frac{E(\text{CF}_n)}{(1+r)^n}$$

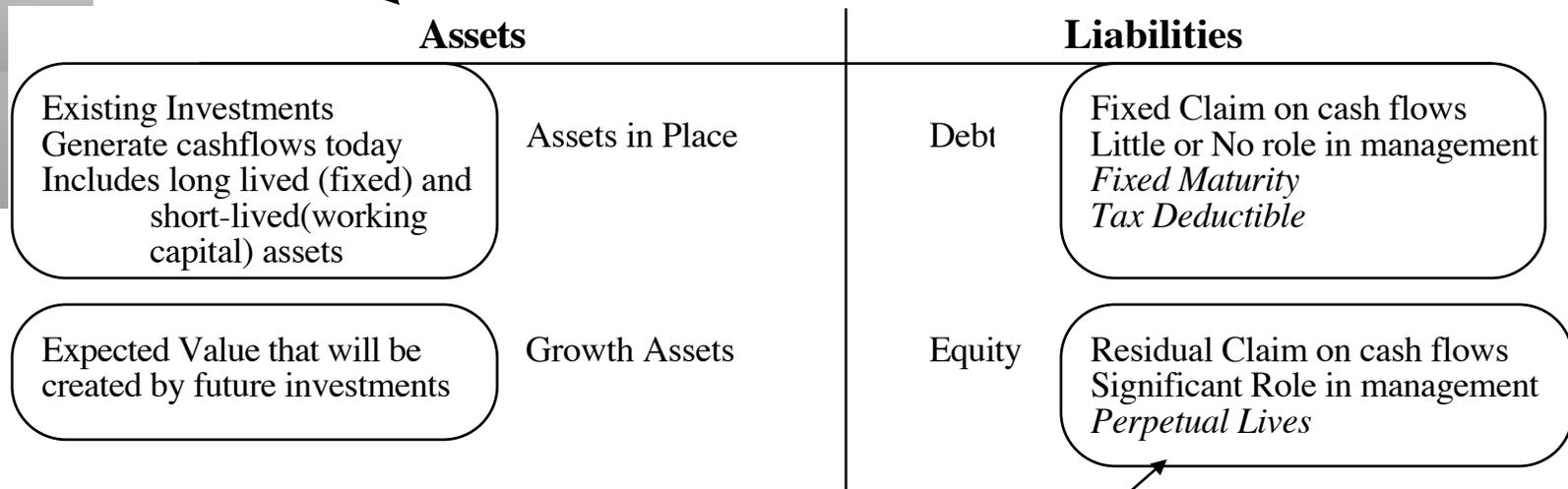
Proposition 1: If “it” does not affect the cash flows or alter risk (thus changing discount rates), “it” cannot affect value.

Proposition 2: For an asset to have value, the expected cash flows have to be positive some time over the life of the asset.

Proposition 3: Assets that generate cash flows early in their life will be worth more than assets that generate cash flows later; the latter may however have greater growth and higher cash flows to compensate.

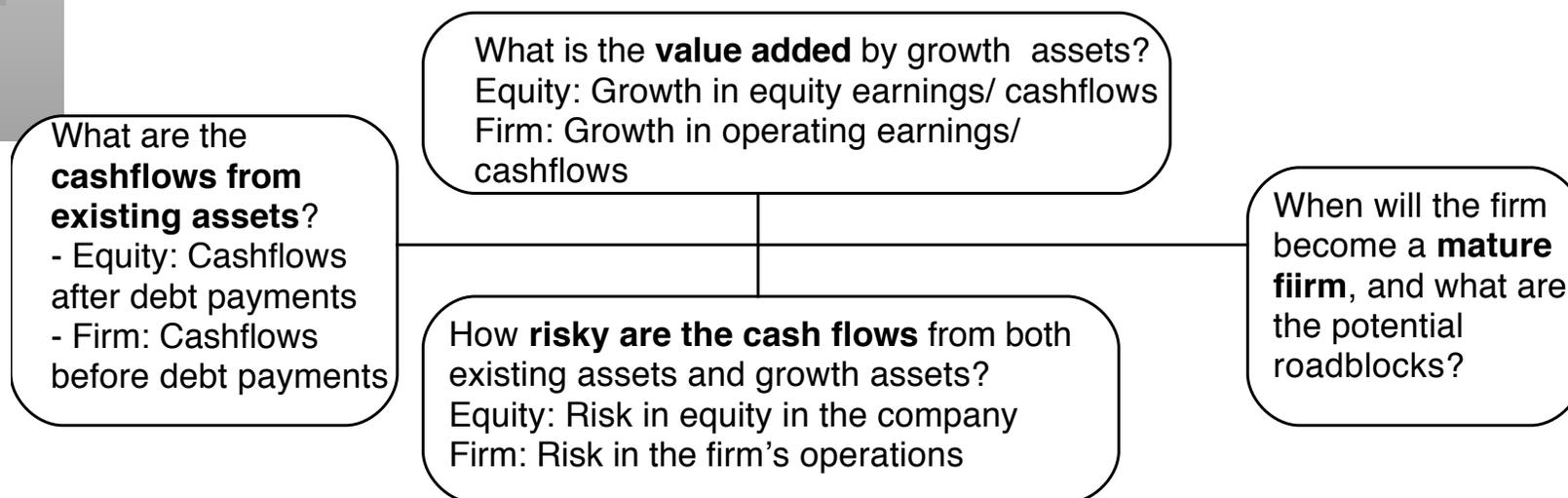
DCF Choices: Equity Valuation versus Firm Valuation

Firm Valuation: Value the entire business



Equity valuation: Value just the equity claim in the business

The fundamental determinants of value...



The Dark Side of Valuation...

- Valuing stable, money making companies with consistent and clear accounting statements, a long and stable history and lots of comparable firms is easy to do.
- The true test of your valuation skills is when you have to value “difficult” companies. In particular, the challenges are greatest when valuing:
 - Young companies, early in the life cycle, in young businesses
 - Companies that don’t fit the accounting mold
 - Companies that face substantial truncation risk (default or nationalization risk)

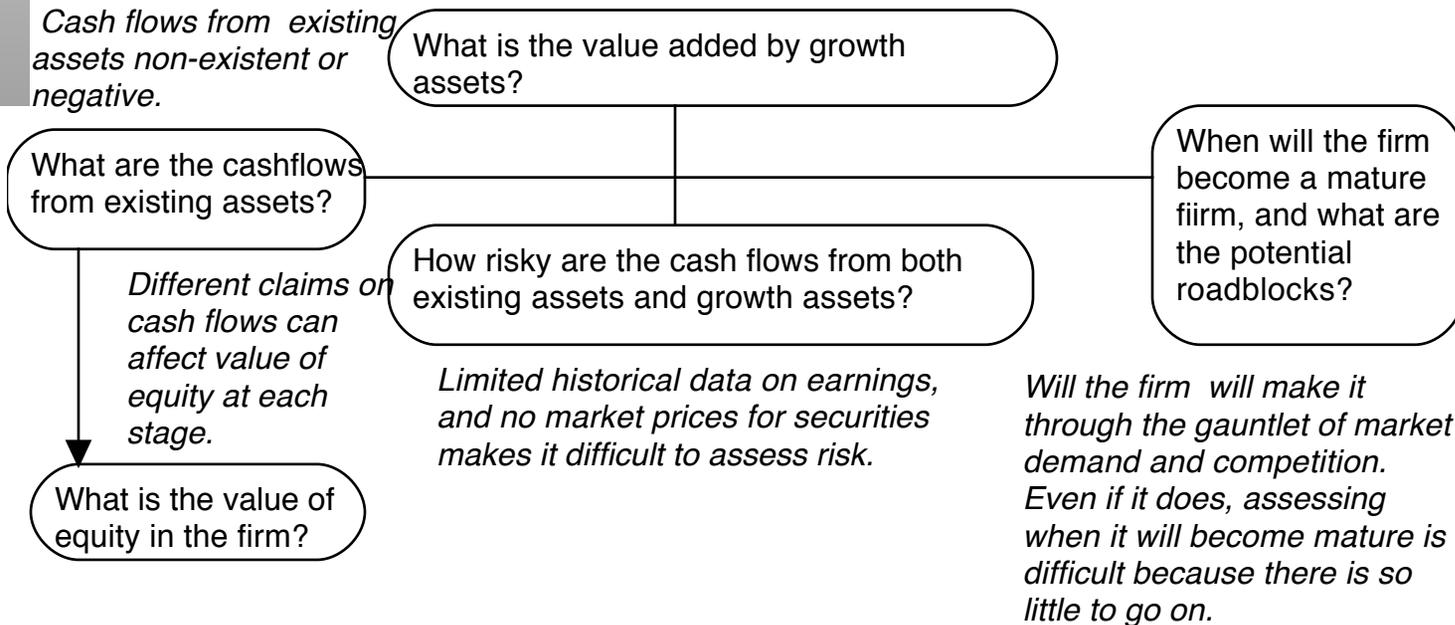
Difficult to value companies...

- Across the life cycle:
 - Young, growth firms: Limited history, small revenues in conjunction with big operating losses and a propensity for failure make these companies tough to value.
 - Mature companies in transition: When mature companies change or are forced to change, history may have to be abandoned and parameters have to be reestimated.
 - Declining and Distressed firms: A long but no longer relevant history, declining markets, high debt loads and the likelihood of distress make these companies equally difficult to value.
- Across sectors
 - Financial service firms: Opacity of financial statements and difficulties in estimating basic inputs leave us trusting managers to tell us what's going on.
 - Commodity and cyclical firms: Dependence of the underlying commodity prices or overall economic growth make these valuations susceptible to macro factors.
 - Firms with intangible assets: Violation of first principles by accountants requires us to restate all of the financial statements before we can make sense of value.

I. The challenge with young companies...

Making judgments on revenues/ profits difficult because you cannot draw on history. If you have no product/ service, it is difficult to gauge market potential or profitability. The company;s entire value lies in future growth but you have little to base your estimate on.

Cash flows from existing assets non-existent or negative.



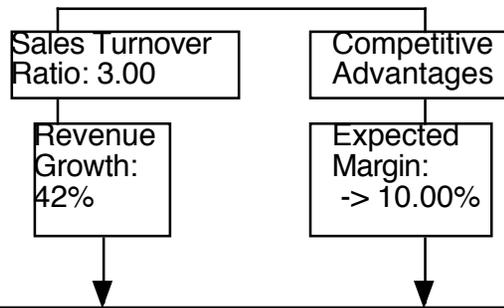
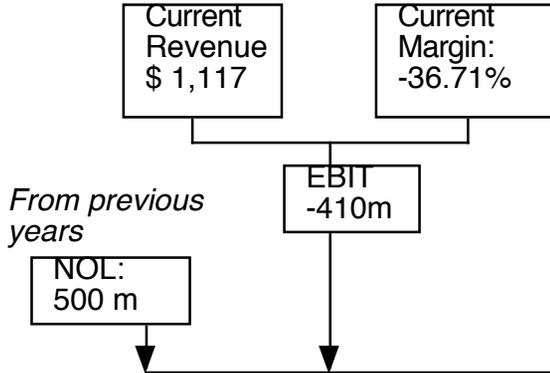
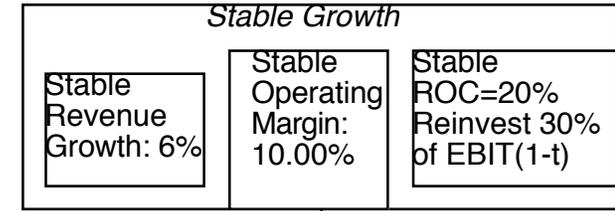
Upping the ante.. Young companies in young businesses...

- When valuing a business, we generally draw on three sources of information
 - The firm's current financial statement
 - How much did the firm sell?
 - How much did it earn?
 - The firm's financial history, usually summarized in its financial statements.
 - How fast have the firm's revenues and earnings grown over time?
 - What can we learn about cost structure and profitability from these trends?
 - Susceptibility to macro-economic factors (recessions and cyclical firms)
 - The industry and comparable firm data
 - What happens to firms as they mature? (Margins.. Revenue growth... Reinvestment needs... Risk)

- It is when valuing these companies that analysts find themselves tempted by the dark side, where
 - “Paradigm shifts” happen...
 - New metrics are invented ...
 - The story dominates and the numbers lag...

9a. Amazon in January 2000

Sales to capital ratio and expected margin are retail industry average numbers



Terminal Value = $1881 / (.0961 - .06) = 52,148$

Value of Op Assets	\$ 14,910
+ Cash	\$ 26
= Value of Firm	\$14,936
- Value of Debt	\$ 349
= Value of Equity	\$14,587
- Equity Options	\$ 2,892
Value per share	\$ 34.32

Revenues	\$2,793	5,585	9,774	14,661	19,059	23,862	28,729	33,211	36,798	39,006
EBIT	-\$373	-\$94	\$407	\$1,038	\$1,628	\$2,212	\$2,768	\$3,261	\$3,646	\$3,883
EBIT (1-t)	-\$373	-\$94	\$407	\$871	\$1,058	\$1,438	\$1,799	\$2,119	\$2,370	\$2,524
- Reinvestment	\$559	\$931	\$1,396	\$1,629	\$1,466	\$1,601	\$1,623	\$1,494	\$1,196	\$736
FCFF	-\$931	-\$1,024	-\$989	-\$758	-\$408	-\$163	\$177	\$625	\$1,174	\$1,788

Term. Year

\$41,346
10.00%
35.00%
\$2,688
\$ 807
\$1,881

All existing options valued as options, using current stock price of \$84.

Cost of Equity	12.90%	12.90%	12.90%	12.90%	12.90%	12.42%	12.30%	12.10%	11.70%	10.50%
Cost of Debt	8.00%	8.00%	8.00%	8.00%	8.00%	7.80%	7.75%	7.67%	7.50%	7.00%
AT cost of debt	8.00%	8.00%	8.00%	6.71%	5.20%	5.07%	5.04%	4.98%	4.88%	4.55%
Cost of Capital	12.84%	12.84%	12.84%	12.83%	12.81%	12.13%	11.96%	11.69%	11.15%	9.61%

Cost of Equity 12.90%

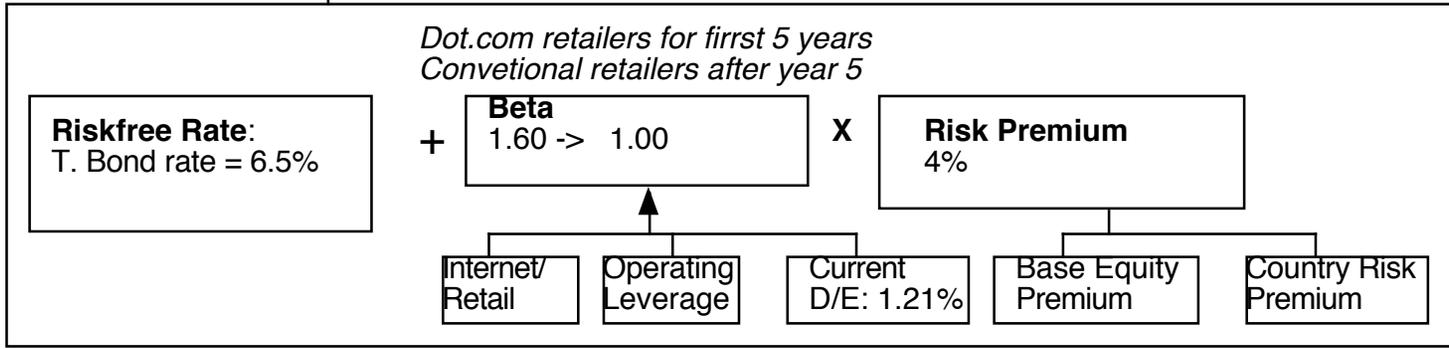
Used average interest coverage ratio over next 5 years to get BBB rating.

Cost of Debt 6.5%+1.5%=8.0%
Tax rate = 0% -> 35%

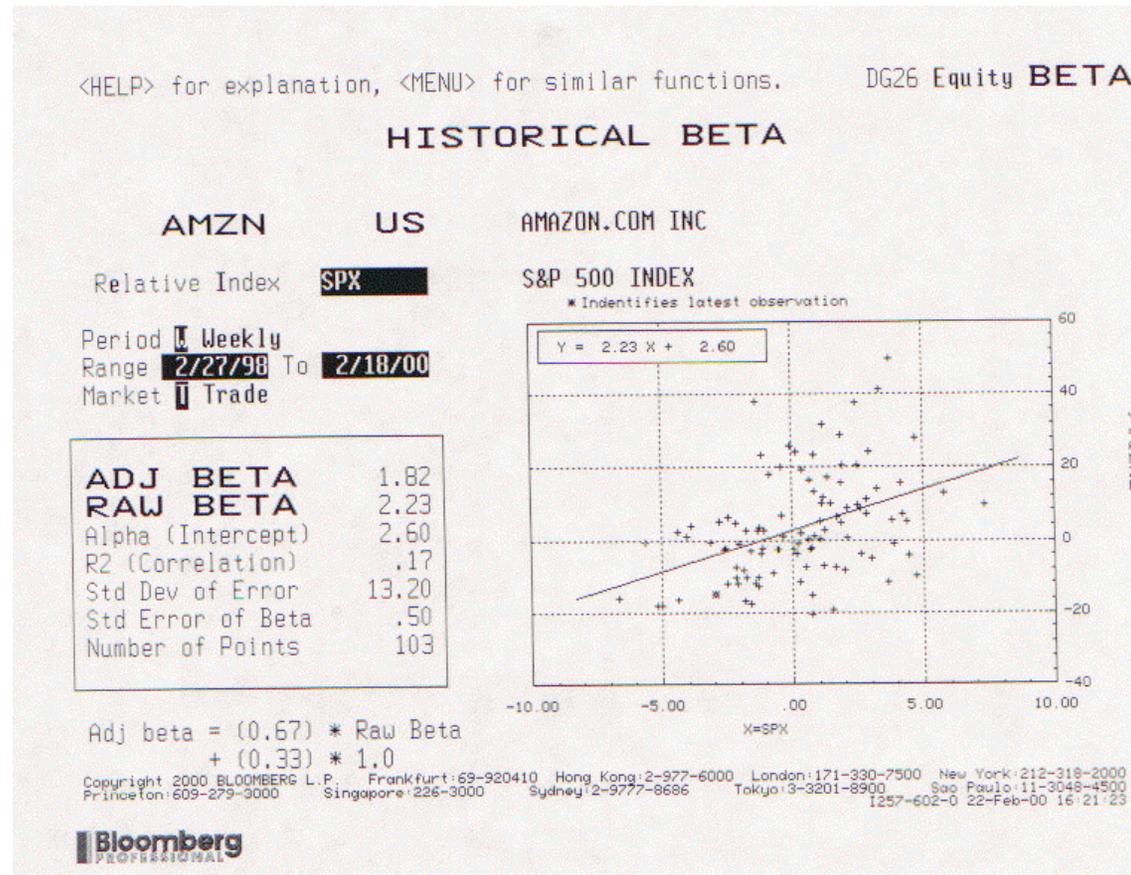
Weights Debt= 1.2% -> 15%

Amazon was trading at \$84 in January 2000.

Pushed debt ratio to retail industry average of 15%.



Lesson 1: Don't trust regression betas....



Lesson 2: The cost of capital will change over time...

Year	1	2	3	4	5
EBIT	-\$373	-\$94	\$407	\$1,038	\$1,628
Taxes	\$0	\$0	\$0	\$167	\$570
EBIT(1-t)-\$373	-\$94	\$407	\$871	\$1,058	
Tax rate	0%	0%	0%	16.13%	35%
NOL	\$500	\$873	\$967	\$560	\$0

	Yrs 1-3	4	5	6	7	8	9	10	Terminal year
Tax Rate	0.00%	16.13%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%
Debt Ratio	1.20%	1.20%	1.20%	3.96%	4.65%	5.80%	8.10%	15.00%	15.00%
Beta	1.60	1.60	1.60	1.48	1.36	1.24	1.12	1.00	1.00
Cost of Equity	12.90%	12.90%	12.90%	12.42%	11.94%	11.46%	10.98%	10.50%	10.50%
Cost of Debt	8.00%	8.00%	8.00%	7.80%	7.75%	7.67%	7.50%	7.00%	7.00%
After-tax cost of debt	8.00%	6.71%	5.20%	5.07%	5.04%	4.98%	4.88%	4.55%	4.55%
Cost of Capital	12.84%	12.83%	12.81%	12.13%	11.62%	11.08%	10.49%	9.61%	9.61%

Lesson 3: Work backwards and keep it simple...

Year	Revenues	Operating Margin	EBIT	
Tr12m	\$1,117	-36.71%	-\$410	
1	\$2,793	-13.35%	-\$373	
2	\$5,585	-1.68%	-\$94	
3	\$9,774	4.16%	\$407	
4	\$14,661	7.08%	\$1,038	
5	\$19,059	8.54%	\$1,628	
6	\$23,862	9.27%	\$2,212	
7	\$28,729	9.64%	\$2,768	
8	\$33,211	9.82%	\$3,261	
9	\$36,798	9.91%	\$3,646	
10	\$39,006	9.95%	\$3,883	
TY(11)	\$41,346	10.00%	\$4,135	Industry Average

Lesson 4: Don't forget to pay for growth...

Year	Revenue Growth	Chg in Revenue	Reinvestment	Chg Rev/ Chg Reinvestment	ROC
1	150.00%	\$1,676	\$559	3.00	-76.62%
2	100.00%	\$2,793	\$931	3.00	-8.96%
3	75.00%	\$4,189	\$1,396	3.00	20.59%
4	50.00%	\$4,887	\$1,629	3.00	25.82%
5	30.00%	\$4,398	\$1,466	3.00	21.16%
6	25.20%	\$4,803	\$1,601	3.00	22.23%
7	20.40%	\$4,868	\$1,623	3.00	22.30%
8	15.60%	\$4,482	\$1,494	3.00	21.87%
9	10.80%	\$3,587	\$1,196	3.00	21.19%
10	6.00%	\$2,208	\$736	3.00	20.39%

Lesson 5: There are always scenarios where the market price can be justified...

	6%	8%	10%	12%	14%
30%	\$ (1.94)	\$ 2.95	\$ 7.84	\$ 12.71	\$ 17.57
35%	\$ 1.41	\$ 8.37	\$ 15.33	\$ 22.27	\$ 29.21
40%	\$ 6.10	\$ 15.93	\$ 25.74	\$ 35.54	\$ 45.34
45%	\$ 12.59	\$ 26.34	\$ 40.05	\$ 53.77	\$ 67.48
50%	\$ 21.47	\$ 40.50	\$ 59.52	\$ 78.53	\$ 97.54
55%	\$ 33.47	\$ 59.60	\$ 85.72	\$ 111.84	\$ 137.95
60%	\$ 49.53	\$ 85.10	\$ 120.66	\$ 156.22	\$ 191.77

Lesson 6: You will be wrong 100% of the time... and it really is not (always) your fault...

- No matter how careful you are in getting your inputs and how well structured your model is, your estimate of value will change both as new information comes out about the company, the business and the economy.
- As information comes out, you will have to adjust and adapt your model to reflect the information. Rather than be defensive about the resulting changes in value, recognize that this is the essence of risk.
- *A test: If your valuations are unbiased, you should find yourself increasing estimated values as often as you are decreasing values. In other words, there should be equal doses of good and bad news affecting valuations (at least over time).*

9b. Amazon in January 2001

Reinvestment:
Cap ex includes acquisitions
Working capital is 3% of revenues

Stable Growth

Stable Revenue Growth: 5%	Stable Operating Margin: 9.32%	Stable ROC=16.94% Reinvest 29.5% of EBIT(1-t)
---------------------------	--------------------------------	--

Current Revenue \$ 2,465
Current Margin: -34.60%

EBIT -853m

NOL: 1,289 m

Sales Turnover Ratio: 3.02

Revenue Growth: 25.41%

Competitive

Expected Margin: -> 9.32%

Terminal Value = $1064 / (.0876 - .05)$
= \$ 28,310

Term. Year

\$24,912
\$2,302
\$1,509
\$ 445
\$1,064

	1	2	3	4	5	6	7	8	9	10
Revenues	\$4,314	\$6,471	\$9,059	\$11,777	\$14,132	\$16,534	\$18,849	\$20,922	\$22,596	\$23,726
EBIT	-\$545	-\$107	\$347	\$774	\$1,123	\$1,428	\$1,692	\$1,914	\$2,087	\$2,201
EBIT(1-t)	-\$545	-\$107	\$347	\$774	\$1,017	\$928	\$1,100	\$1,244	\$1,356	\$1,431
- Reinvestment	\$612	\$714	\$857	\$900	\$780	\$796	\$766	\$687	\$554	\$374
FCFF	-\$1,157	-\$822	-\$510	-\$126	\$237	\$132	\$333	\$558	\$802	\$1,057

Value of Op Assets \$ 8,789
+ Cash & Non-op \$ 1,263
= Value of Firm \$10,052
· Value of Debt \$ 1,879
= Value of Equity \$ 8,173
· Equity Options \$ 845
Value per share \$ 20.83

	1	2	3	4	5	6	7	8	9	10
Debt Ratio	27.27%	27.27%	27.27%	27.27%	27.27%	24.81%	24.20%	23.18%	21.13%	15.00%
Beta	2.18	2.18	2.18	2.18	2.18	1.96	1.75	1.53	1.32	1.10
Cost of Equity	13.81%	13.81%	13.81%	13.81%	13.81%	12.95%	12.09%	11.22%	10.36%	9.50%
AT cost of debt	10.00%	10.00%	10.00%	10.00%	9.06%	6.11%	6.01%	5.85%	5.53%	4.55%
Cost of Capital	12.77%	12.77%	12.77%	12.77%	12.52%	11.25%	10.62%	9.98%	9.34%	8.76%

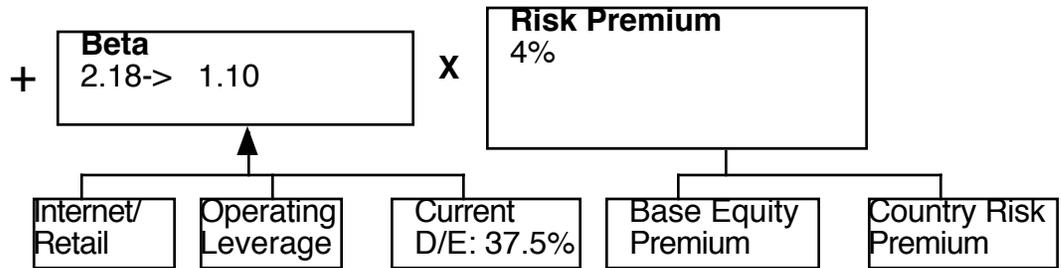
Forever

Cost of Equity 13.81%

Cost of Debt 6.5%+3.5%=10.0%
Tax rate = 0% -> 35%

Weights Debt= 27.3% -> 15%

Riskfree Rate:
T. Bond rate = 5.1%



Amazon.com
January 2001
Stock price = \$14

And the market is often “more wrong”....

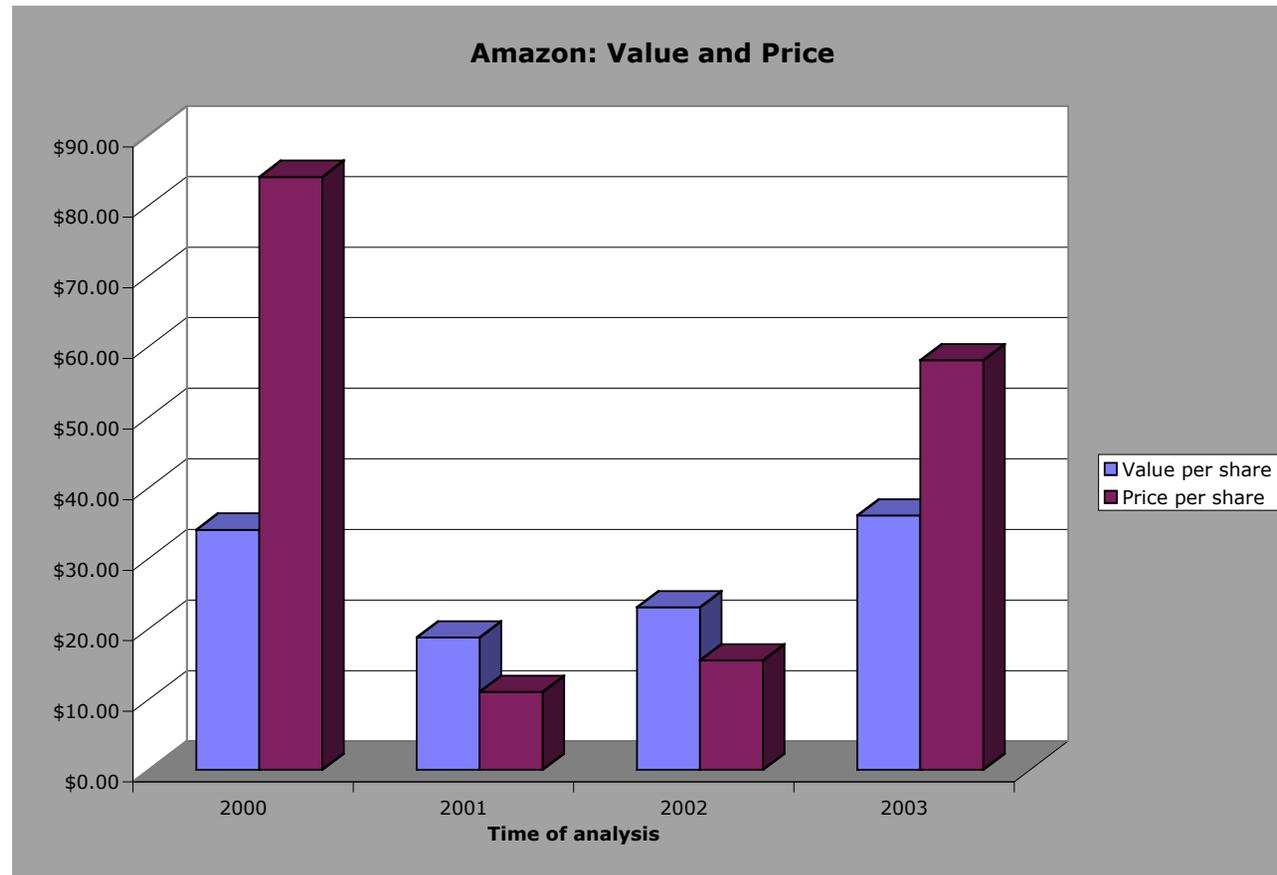
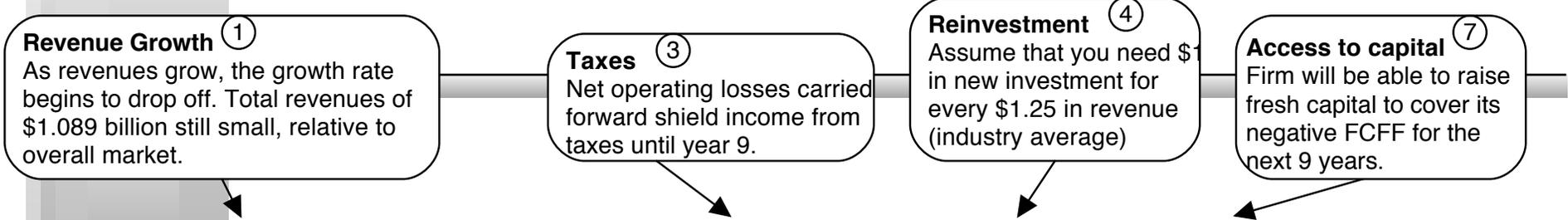
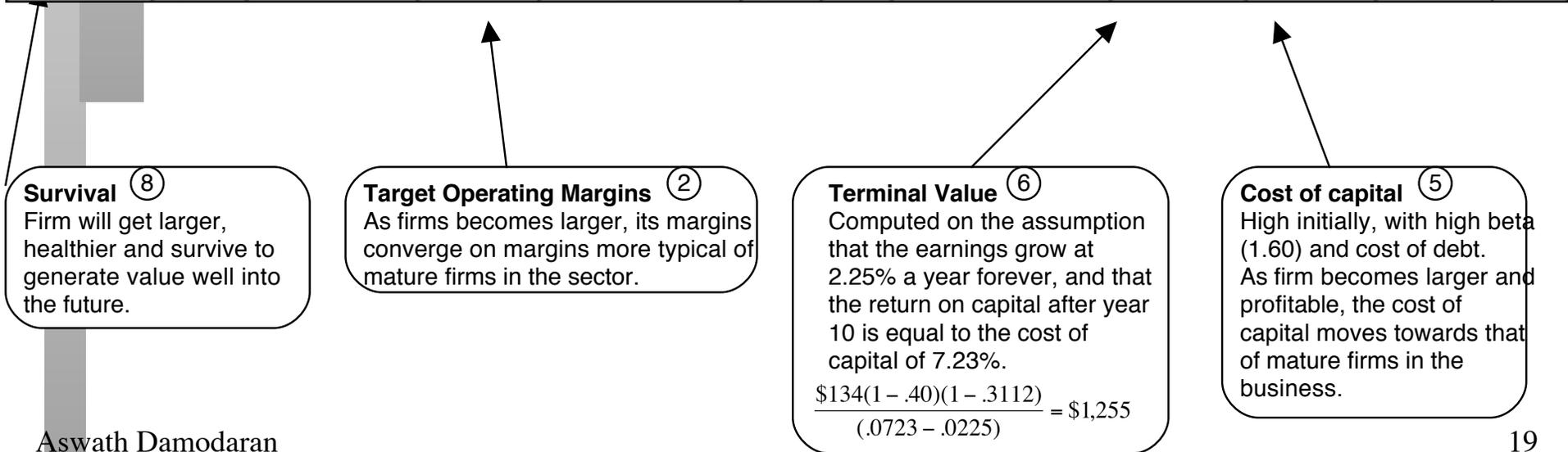


Exhibit 5.1: Value Drivers for a Young Growth Company - Evergreen Solar in Early 2009

The setting: Evergreen Solar, a manufacturer of solar power cells was founded in 2003 and is a Massachusetts-based company. Revenues at the firm increased from \$24 million in 2004 to \$70 million in 2007, yielding a compounded growth rate of 43% a year. In the trailing 12 months leading into this valuation, the company generated a pre-tax operating loss of \$ 50 million on revenues of \$ 90 million.



Year	Revenues	Revenue growth rate	Pre-tax Margin	Pre-tax operating income	NOL	Taxes	After-tax Operating Income	Revenue change	Sales to Capital	Reinvestment	FCFF
Trailing 12 month	\$89.89		-55.31%	-\$49.72	\$98.00	\$0.00	-\$49.72				
1	\$125.85	40.00%	-31.87%	-\$40.11	\$138.11	\$0.00	-\$40.11	\$35.96	2.50	\$14.38	-\$54.50
2	\$176.18	40.00%	-16.25%	-\$28.63	\$166.74	\$0.00	-\$28.63	\$50.34	2.50	\$20.14	-\$48.76
3	\$246.66	40.00%	-5.83%	-\$14.39	\$181.13	\$0.00	-\$14.39	\$70.47	2.50	\$28.19	-\$42.58
4	\$345.32	40.00%	1.11%	\$3.84	\$177.29	\$0.00	\$3.84	\$98.66	2.50	\$39.47	-\$35.63
5	\$483.45	40.00%	5.74%	\$27.75	\$149.54	\$0.00	\$27.75	\$138.13	2.50	\$55.25	-\$27.50
6	\$628.48	30.00%	8.83%	\$55.48	\$94.06	\$0.00	\$55.48	\$145.03	2.50	\$58.01	-\$2.54
7	\$785.61	25.00%	10.88%	\$85.51	\$8.55	\$0.00	\$85.51	\$157.12	2.50	\$62.85	\$22.66
8	\$942.73	20.00%	12.26%	\$115.55	\$0.00	\$42.80	\$72.75	\$157.12	2.50	\$62.85	\$9.90
9	\$1,084.14	15.00%	13.17%	\$142.79	\$0.00	\$57.12	\$85.68	\$141.41	2.50	\$56.56	\$29.11
10	\$1,192.55	10.00%	13.78%	\$164.34	\$0.00	\$65.74	\$98.60	\$108.41	2.50	\$43.37	\$55.24



II. Mature Companies in transition..

- Mature companies are generally the easiest group to value. They have long, established histories that can be mined for inputs. They have investment policies that are set and capital structures that are stable, thus making valuation more grounded in past data.
- However, this stability in the numbers can mask real problems at the company. The company may be set in a process, where it invests more or less than it should and does not have the right financing mix. In effect, the policies are consistent, stable and bad.
- If you expect these companies to change or as is more often the case to have change thrust upon them,

The perils of valuing mature companies...

Figure 7.1: Estimation Issues - Mature Companies

Lots of historical data on earnings and cashflows. Key questions remain if these numbers are volatile over time or if the existing assets are not being efficiently utilized.

Growth is usually not very high, but firms may still be generating healthy returns on investments, relative to cost of funding. Questions include how long they can generate these excess returns and with what growth rate in operations. Restructuring can change both inputs dramatically and some firms maintain high growth through acquisitions.

What are the cashflows from existing assets?

Equity claims can vary in voting rights and dividends.

What is the value of equity in the firm?

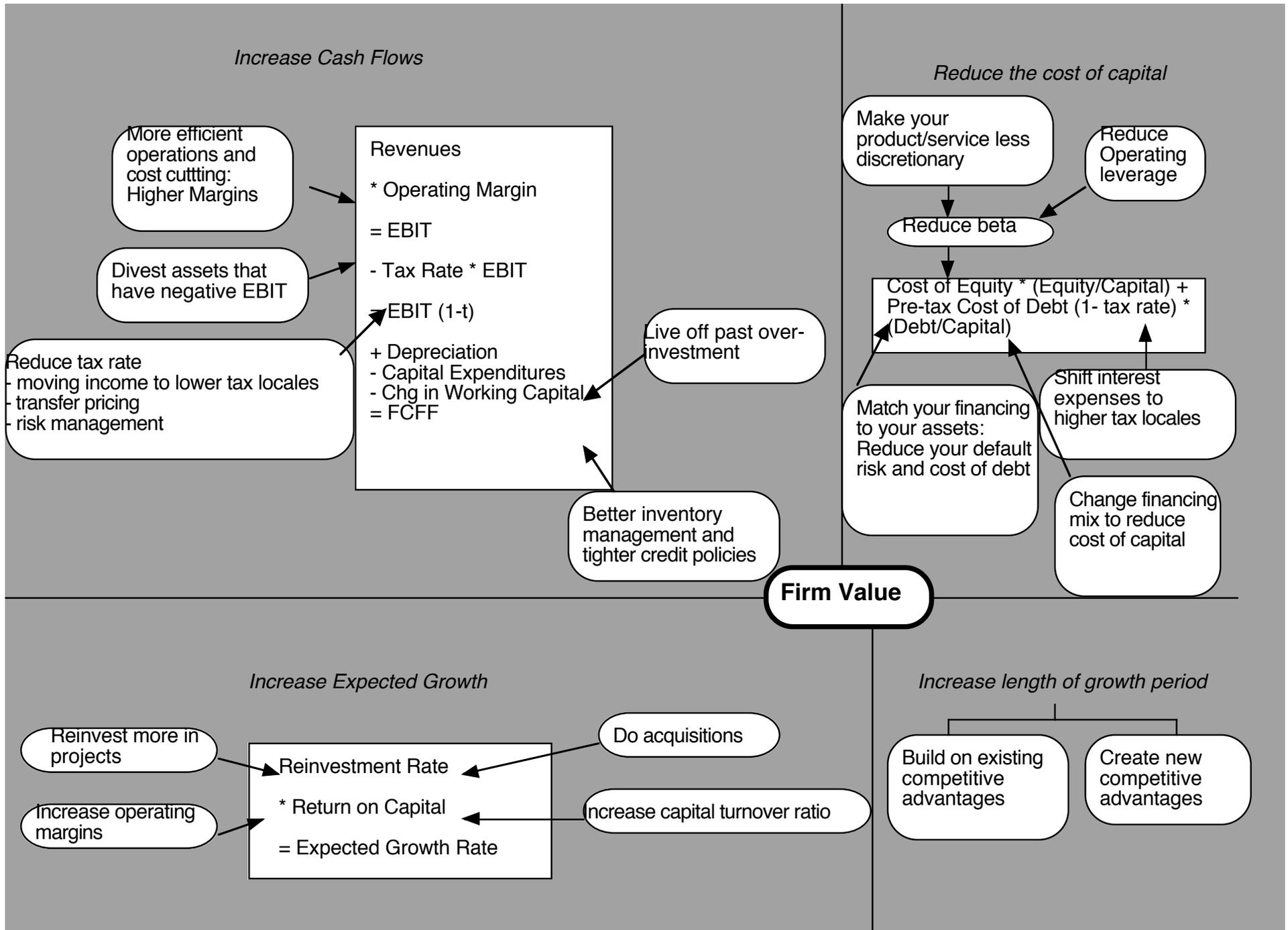
What is the value added by growth assets?

How risky are the cash flows from both existing assets and growth assets?

Operating risk should be stable, but the firm can change its financial leverage. This can affect both the cost of equity and capital.

When will the firm become a mature firm, and what are the potential roadblocks?

Maintaining excess returns or high growth for any length of time is difficult to do for a mature firm.



Hormel Foods: The Value of Control Changing

Hormel Foods sells packaged meat and other food products and has been in existence as a publicly traded company for almost 80 years. In 2008, the firm reported after-tax operating income of \$315 million, reflecting a compounded growth of 5% over the previous 5 years.

The Status Quo

Run by existing management, with conservative reinvestment policies (reinvestment rate = 14.34% and debt ratio = 10.4%.

Anemic growth rate and short growth period, due to reinvestment policy

Low debt ratio affects cost of capital

Year	Operating income after taxes	Expected growth rate	ROC	Reinvestment Rate	Reinvestment	FCFF	Cost of capital	Present Value
Trailing 12 months	\$315							
1	\$324	2.75%	14.34%	19.14%	\$62	\$262	6.79%	\$245
2	\$333	2.75%	14.34%	19.14%	\$64	\$269	6.79%	\$236
3	\$342	2.75%	14.34%	19.14%	\$65	\$276	6.79%	\$227
Beyond	\$350	2.35%	7.23%	32.52%	\$114	\$4,840	7.23%	\$3,974
Value of operating assets								\$4,682
(Add) Cash								\$155
(Subtract) Debt								\$491
(Subtract) Management Options								\$53
Value of equity in common stock								\$4,293
Value per share								\$31.91

New and better management

More aggressive reinvestment which increases the reinvestment rate (to 40%) and length of growth (to 5 years), and higher debt ratio (20%).

Operating Restructuring ①

Expected growth rate = $ROC \times \text{Reinvestment Rate}$
 Expected growth rate (status quo) = $14.34\% \times 19.14\% = 2.75\%$
 Expected growth rate (optimal) = $14.00\% \times 40\% = 5.60\%$
 ROC drops, reinvestment rises and growth goes up.

Financial restructuring ②

Cost of capital = Cost of equity (1-Debt ratio) + Cost of debt (Debt ratio)
 Status quo = $7.33\% (1-.104) + 3.60\% (1-.40) (.104) = 6.79\%$
 Optimal = $7.75\% (1-.20) + 3.60\% (1-.40) (.20) = 6.63\%$
 Cost of equity rises but cost of capital drops.

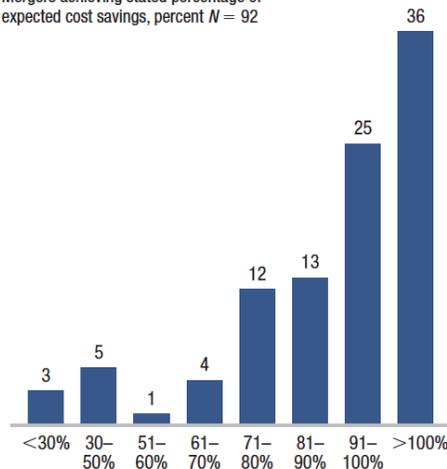
Year	Operating income after taxes	Expected growth rate	ROC	Reinvestment Rate	Reinvestment	FCFF	Cost of capital	Present Value
Trailing 12 months	\$315							
1	\$333	5.60%	14.00%	40.00%	\$133	\$200	6.63%	\$187
2	\$351	5.60%	14.00%	40.00%	\$141	\$211	6.63%	\$185
3	\$371	5.60%	14.00%	40.00%	\$148	\$223	6.63%	\$184
4	\$392	5.60%	14.00%	40.00%	\$260	\$235	6.63%	\$182
5	\$414	5.60%	14.00%	40.00%	\$223	\$248	6.63%	\$180
Beyond	\$423	2.35%	6.74%	34.87%	\$148	\$6,282	6.74%	\$4,557
Value of operating assets								\$5,475
(Add) Cash								\$155
(Subtract) Debt								\$491
(Subtract) Management Options								\$53
Value of equity in common stock								\$5,085
Value per share								\$37.80

Probability of management change = 10%
 Expected value = $\$31.91 (.90) + \$37.80 (.10) = \$32.50$

Lesson 1: Cost cutting and increased efficiency are easier accomplished on paper than in practice...

Cost-synergy estimation is better, but there are patterns emerging in the errors

Mergers achieving stated percentage of expected cost savings, percent $N = 92$



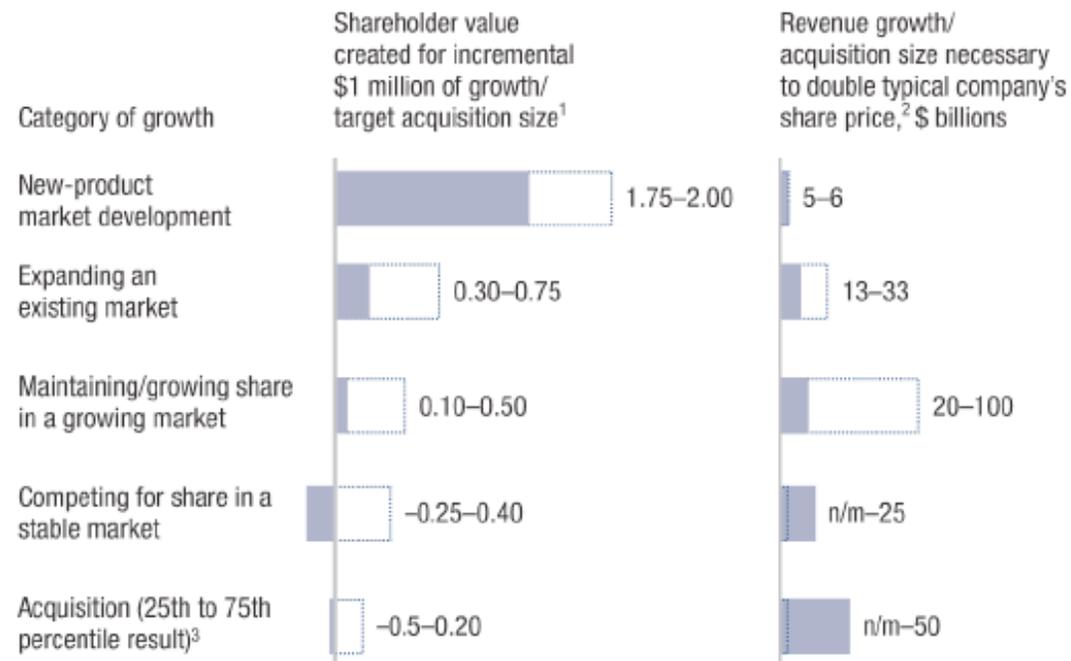
Typical sources of estimation error

- Underestimating one-time costs
- Using benchmarks from noncomparable situations
- Not sanity-checking management estimates against precedent transactions
- Failing to ground estimates in bottom-up analysis (e.g., location-by-location review of overlaps)

Source: McKinsey (2002) Postmerger Management Practice client survey; client case studies

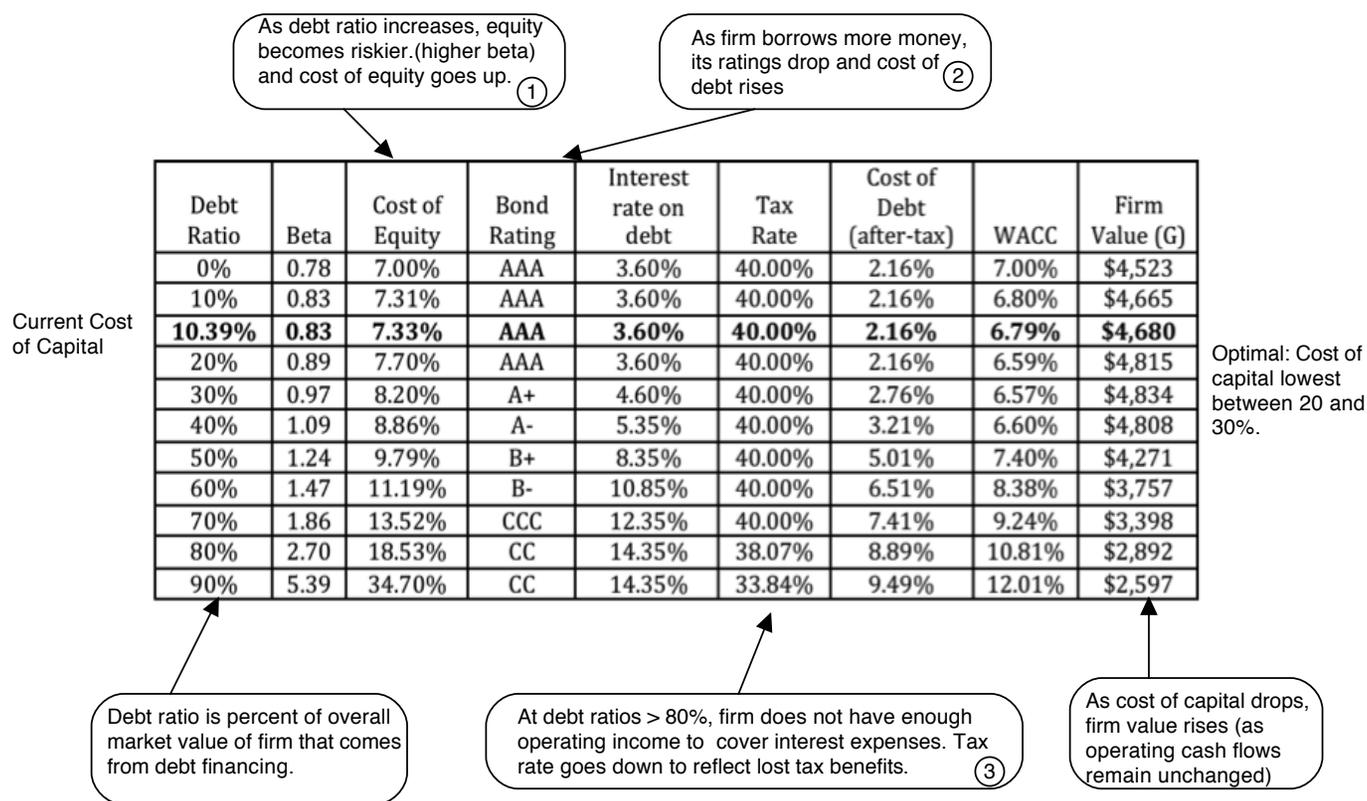
Lesson 2: Increasing growth is not always an option (or at least not a good option)

Modes of organic growth vary in value creation intensity— consumer goods industry



Lesson 3: Financial leverage is a double-edged sword..

Exhibit 7.1: Optimal Financing Mix: Hormel Foods in January 2009



III. Dealing with decline and distress...

Historical data often reflects flat or declining revenues and falling margins. Investments often earn less than the cost of capital.

Growth can be negative, as firm sheds assets and shrinks. As less profitable assets are shed, the firm's remaining assets may improve in quality.

What is the value added by growth assets?

What are the cashflows from existing assets?

Underfunded pension obligations and litigation claims can lower value of equity. Liquidation preferences can affect value of equity

What is the value of equity in the firm?

How risky are the cash flows from both existing assets and growth assets?

Depending upon the risk of the assets being divested and the use of the proceeds from the divestiture (to pay dividends or retire debt), the risk in both the firm and its equity can change.

When will the firm become a mature firm, and what are the potential roadblocks?

There is a real chance, especially with high financial leverage, that the firm will not make it. If it is expected to survive as a going concern, it will be as a much smaller entity.

a. Dealing with Decline

- In decline, firms often see declining revenues and lower margins, translating in negative expected growth over time.
- If these firms are run by good managers, they will not fight decline. Instead, they will adapt to it and shut down or sell investments that do not generate the cost of capital. This can translate into negative net capital expenditures (depreciation exceeds cap ex), declining working capital and an overall negative reinvestment rate. The best case scenario is that the firm can shed its bad assets, make itself a much smaller and healthier firm and then settle into long-term stable growth.
- As an investor, your worst case scenario is that these firms are run by managers in denial who continue to expand the firm by making bad investments (that generate lower returns than the cost of capital). These firms may be able to grow revenues and operating income but will destroy value along the way.

11. Sears Holdings: Status Quo

Current Cashflow to Firm
 EBIT(1-t) : 1,183
 - Nt CpX -18
 - Chg WC - 67
 = FCFF 1,268
 Reinvestment Rate = -75/1183
 = -7.19%
 Return on capital = 4.99%

Reinvestment Rate
 -30.00%

Expected Growth in EBIT (1-t)
 $-.30 * -.05 = -0.015$
 -1.5%

Return on Capital
 5%

Stable Growth
 $g = 2\%$; Beta = 1.00;
 Country Premium = 0%
 Cost of capital = 7.13%
 ROC = 7.13%; Tax rate = 38%
 Reinvestment Rate = 28.05%

Terminal Value₄ = $868 / (.0713 - .02) = 16,921$

Op. Assets 17,634
 + Cash: 1,622
 - Debt 7,726
 = Equity 11,528
 - Options 5
 Value/Share \$87.29

	1	2	3	4
EBIT (1-t)	\$1,165	\$1,147	\$1,130	\$1,113
- Reinvestment	(\$349)	(\$344)	(\$339)	(\$334)
FCFF	\$1,514	\$1,492	\$1,469	\$1,447

Term Yr
 \$1,206
 \$ 339
 \$ 868

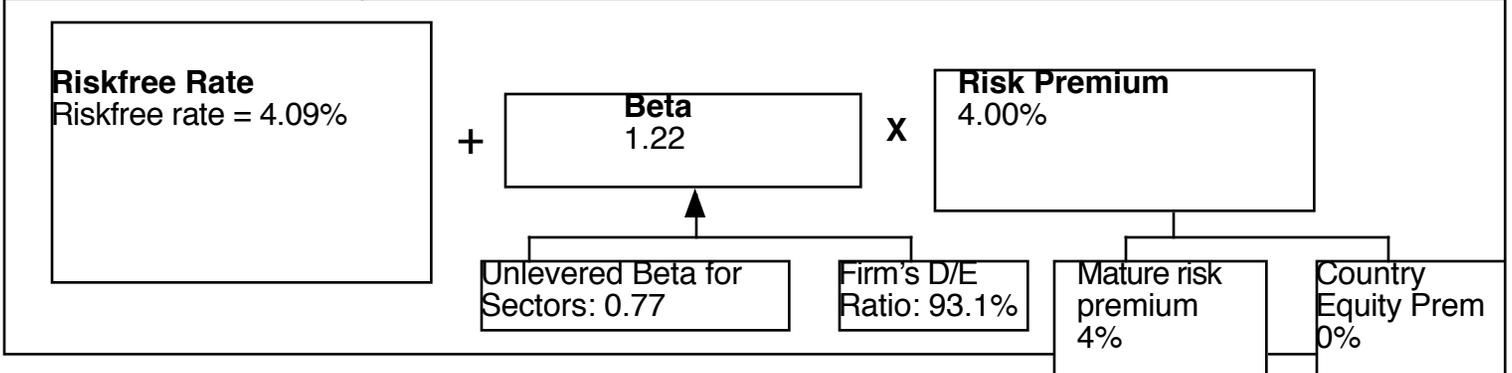
Discount at Cost of Capital (WACC) = 9.58% (.566) + 4.80% (0.434) = 7.50%

Cost of Equity
 9.58%

Cost of Debt
 $(4.09\% + 3.65\%)(1 - .38)$
 = 4.80%

Weights
 E = 56.6% D = 43.4%

On July 23, 2008,
 Sears was trading at
 \$76.25 a share.



b. Dealing with Distress

- A DCF valuation values a firm as a going concern. If there is a significant likelihood of the firm failing before it reaches stable growth and if the assets will then be sold for a value less than the present value of the expected cashflows (a distress sale value), DCF valuations will understate the value of the firm.
- Value of Equity = DCF value of equity (1 - Probability of distress) + Distress sale value of equity (Probability of distress)
- There are three ways in which we can estimate the probability of distress:
 - Use the bond rating to estimate the cumulative probability of distress over 10 years
 - Estimate the probability of distress with a probit
 - Estimate the probability of distress by looking at market value of bonds..
- The distress sale value of equity is usually best estimated as a percent of book value (and this value will be lower if the economy is doing badly and there are other firms in the same business also in distress).

Current Revenue
\$ 4,390

Current Margin:
4.76%

EBIT
\$ 209m

Reinvestment:
Capital expenditures include cost of new casinos and working capital

Extended reinvestment break, due to investment in past

Industry average

Expected Margin:
-> 17%

Stable Growth
Stable Revenue Growth: 3%
Stable Operating Margin: 17%
Stable ROC=10%
Reinvest 30% of EBIT(1-t)

Terminal Value = $758 \cdot (0.0743 - 0.03)$
= \$ 17,129

Value of Op Assets \$ 9,793
+ Cash & Non-op \$ 3,040
= Value of Firm \$ 12,833
- Value of Debt \$ 7,565
= Value of Equity \$ 5,268

Value per share \$ 8.12

Revenues	\$4,434	\$4,523	\$5,427	\$6,513	\$7,815	\$8,206	\$8,616	\$9,047	\$9,499	\$9,974	
Oper margin	5.81%	6.86%	7.90%	8.95%	10%	11.40%	12.80%	14.20%	15.60%	17%	
EBIT	\$258	\$310	\$429	\$583	\$782	\$935	\$1,103	\$1,285	\$1,482	\$1,696	
Tax rate	26.0%	26.0%	26.0%	26.0%	26.0%	28.4%	30.8%	33.2%	35.6%	38.00%	
EBIT * (1 - t)	\$191	\$229	\$317	\$431	\$578	\$670	\$763	\$858	\$954	\$1,051	
- Reinvestment	-\$19	-\$11	\$0	\$22	\$58	\$67	\$153	\$215	\$286	\$350	
FCFF	\$210	\$241	\$317	\$410	\$520	\$603	\$611	\$644	\$668	\$701	
		1	2	3	4	5	6	7	8	9	10
Beta	3.14	3.14	3.14	3.14	3.14	2.75	2.36	1.97	1.59	1.20	
Cost of equity	21.82%	21.82%	21.82%	21.82%	21.82%	19.50%	17.17%	14.85%	12.52%	10.20%	
Cost of debt	9%	9%	9%	9%	9%	8.70%	8.40%	8.10%	7.80%	7.50%	
Debt ratio	73.50%	73.50%	73.50%	73.50%	73.50%	68.80%	64.10%	59.40%	54.70%	50.00%	
Cost of capital	9.88%	9.88%	9.88%	9.88%	9.88%	9.79%	9.50%	9.01%	8.32%	7.43%	

Term. Year
\$10,273
17%
\$ 1,746
38%
\$1,083
\$ 325
\$758

Forever

Cost of Equity
21.82%

Cost of Debt
3%+6%= 9%
9% (1-.38)=5.58%

Weights
Debt= 73.5% ->50%

Riskfree Rate:
T. Bond rate = 3%

+ Beta
3.14-> 1.20

X Risk Premium
6%

Casino
1.15

Current
D/E: 277%

Base Equity
Premium

Country Risk
Premium

Las Vegas Sands
February 2009
Trading @ \$4.25

Adjusting the value of LVS for distress..

- In February 2009, LVS was rated B+ by S&P. Historically, 28.25% of B+ rated bonds default within 10 years. LVS has a 6.375% bond, maturing in February 2015 (7 years), trading at \$529. If we discount the expected cash flows on the bond at the riskfree rate, we can back out the probability of distress from the bond price:

$$529 = \sum_{t=1}^{t=7} \frac{63.75(1 - \pi_{\text{Distress}})^t}{(1.03)^t} + \frac{1000(1 - \pi_{\text{Distress}})^7}{(1.03)^7}$$

- Solving for the probability of bankruptcy, we get:

$$\pi_{\text{Distress}} = \text{Annual probability of default} = 13.54\%$$

- Cumulative probability of surviving 10 years = $(1 - .1354)^{10} = 23.34\%$
- Cumulative probability of distress over 10 years = $1 - .2334 = .7666$ or 76.66%
- If LVS is becomes distressed:
 - Expected distress sale proceeds = \$2,769 million < Face value of debt
 - Expected equity value/share = \$0.00
- Expected value per share = $\$8.12 (1 - .7666) + \$0.00 (.7666) = \$1.92$

Exhibit 8.2: Valuing a Distressed firm: Las Vegas Sands in early 2009

Las Vegas Sands owns and operates the Venetian Casino and Sands Convention Center in Las Vegas and the Sands Macau Casino in Macau, China. While the revenues increased from \$1.75 billion in 2005 to \$4.39 billion in 2008 and it had two other casinos in development - it ran into significant financial trouble in the last quarter of 2008. Fears about whether the firm would be able to meet its debt obligations pushed down both stock prices (almost 90%) and bond prices (about 40%) in 2008.

Limited revenue growth ①

Distress makes it difficult to build new casinos. So growth has to come from existing casinos.

Tax rate ③

As tax benefits from investments fade and profits come back, tax rate rises to marginal tax rate.

Curtailed reinvestment ④

Difficulty in raising new capital and debt repayment needs reduce cash available for reinvestment, at least for near term.

Return to financial health ⑤

High debt ratio pushed up cost of equity and capital. As debt is repaid, debt ratio decreases and cost of capital drops.

Year	Revenue growth	Revenues	Operating Margin	Operating Income	Tax rate	After-tax Operating Income	Reinvestment Rate	Reinvestment	FCFF	Debt Ratio	Cost of capital	Present Value
Current		\$4,390	4.76%	\$209	26.00%	\$155				73.50%		
1	1%	\$4,434	5.81%	\$258	26.00%	\$191	-10.00%	-\$19	\$210	73.50%	9.88%	\$191
2	2%	\$4,523	6.86%	\$310	26.00%	\$229	-5.00%	-\$11	\$241	73.50%	9.88%	\$200
3	20%	\$5,427	7.90%	\$429	26.00%	\$317	0.00%	\$0	\$317	73.50%	9.88%	\$239
4	20%	\$6,513	8.95%	\$583	26.00%	\$431	5.00%	\$22	\$410	73.50%	9.88%	\$281
5	20%	\$7,815	10.00%	\$782	26.00%	\$578	10.00%	\$58	\$520	73.50%	9.88%	\$325
6	5%	\$8,206	11.40%	\$935	28.40%	\$670	10.00%	\$67	\$603	68.80%	9.79%	\$343
7	5%	\$8,616	12.80%	\$1,103	30.80%	\$763	20.00%	\$153	\$611	64.10%	9.50%	\$317
8	5%	\$9,047	14.20%	\$1,285	33.20%	\$858	25.00%	\$215	\$644	59.40%	9.01%	\$307
9	5%	\$9,499	15.60%	\$1,482	35.60%	\$954	30.00%	\$286	\$668	54.70%	8.32%	\$294
10	5%	\$9,974	17.00%	\$1,696	38.00%	\$1,051	33.30%	\$350	\$701	50.00%	7.43%	\$7,298
Beyond	3%	\$10,273	17%	\$1,746	38.00%	1082.81468	33.30%	\$325	\$17,129	50.00%	7.43%	\$9,793
Value of operating assets												\$19,587
(Add) Cash												\$3,040
(Subtract) Debt												\$7,565
Value of equity												\$5,268.01
Value per share (going concern)												\$8.21
Probability of going concern												71.75%
Value per share (distress)												\$0.00
Probability of distress												28.25%
Distress adjusted Value per share												\$5.89

Terminal value ⑥

With return to health, back to growth $\frac{1051(1.03)(1-.30)}{(.0743-.03)} = \$17,129$

Return to operating health ②

Current margins are low. Operating margins improve as distress wanes and firm returns to health. The margin in year 11 is based on industry averages and the company's historical margins.

Distress sale value ⑧

If the firm is unable to make debt payments, there will be no value to equity.

Risk of default ⑦

The high debt ratio makes default a very real probability. Given the company's rating (BB), history suggests a 28.25% probability of default within 10 years.

Default adjusted value

Weighted average of going concern value and distress sale value: $\$8.25(.7175) + \$0(.2125)$

Lesson 1: Truncation risk is hard to assess and impossible to build into discount rates...

- When investing in a business, you are exposed to all types of risks. Some risks are continuous, i.e., interest rates changing or labor costs shifting, but others are discrete. The most extreme discrete risks such as distress and nationalization can shut a business down.
- Analysts, when valuing businesses facing discrete risks, often torture themselves trying to figure out how to adjust discount rates for these risks. But discount rates are really designed to carry that burden: they are more attuned to measuring exposure to continuous risk.
- Put simply, if you are concerned that your cash flows in year 3 could be wrong (because of macro or micro events), you can adjust discount rates to reflect that worry. If you are concerned that there might be no year 3, because the firm could cease to exist in years 1 or 2, you cannot adjust discount rates/

Lesson 2: There is information in “other” markets...

- When valuing an asset, we often develop tunnel vision and focus in only on the market for that asset to obtain information. Thus, to value real estate we look at the real estate market and to value stocks, we use information in the stock market.
- You can improve your valuation in any market by incorporating information in other markets. Thus, to value the equity in Las Vegas Sands, we utilized the information the pricing of the bonds issues by the company.

IV. Valuing Financial Service Companies

Existing assets are usually financial assets or loans, often marked to market. Earnings do not provide much information on underlying risk.

What are the cashflows from existing assets?

Preferred stock is a significant source of capital.

What is the value of equity in the firm?

Defining capital expenditures and working capital is a challenge. Growth can be strongly influenced by regulatory limits and constraints. Both the amount of new investments and the returns on these investments can change with regulatory changes.

What is the value added by growth assets?

How risky are the cash flows from both existing assets and growth assets?

For financial service firms, debt is raw material rather than a source of capital. It is not only tough to define but if defined broadly can result in high financial leverage, magnifying the impact of small operating risk changes on equity risk.

When will the firm become a mature firm, and what are the potential roadblocks?

In addition to all the normal constraints, financial service firms also have to worry about maintaining capital ratios that are acceptable to regulators. If they do not, they can be taken over and shut down.

Figure 9.1: A Dividend Discount Model Value of Wells Fargo in October 2008

Current dividends ①
 in the most recent 12 months the firm paid out dividends of \$1.18 on earnings per share of \$2.16.

Expected Growth ②
 A product of the retention ratio and the ROE.
 $(1 - .5463) (.1351) = 6.13\%$

Quality of growth ③
 ROE in the future is expected to be lower than in trailing 12 months, to reflect an expected 30% increase in capital requirements, as a result of the crisis.

Year	Earnings per share	Expected growth	Payout Ratio	Return on equity	Dividends per share	Cost of Equity	Present Value
Trailing 12 months	\$2.16		54.63%	17.56%	\$1.18		
1	\$2.29	6.13%	54.63%	13.51%	\$1.25	9.60%	\$1.14
2	\$2.43	6.13%	54.63%	13.51%	\$1.33	9.60%	\$1.14
3	\$2.58	6.13%	54.63%	13.51%	\$1.41	9.60%	\$1.14
4	\$2.74	6.13%	54.63%	13.51%	\$1.50	9.60%	\$1.14
5	\$2.91	6.13%	54.63%	13.51%	\$1.59	9.60%	\$1.14
Terminal year	\$3.00	3.00%	65.12%	8.60%	\$34.83	8.60%	\$22.03
Value per share today =							\$27.74

Terminal Value ⑤
 In stable growth, we assume that the ROE = Cost of equity (8.60%) and compute the payout ratio accordingly:
 $\text{Payout ratio} = 1 - 3/8.6 = 65.12\%$
 The terminal value is computed as follows:

Risk ④
 The cost of equity is estimated using a beta of 1.20, reflecting the increased risk in banking. In stable growth, the beta drops to 1.00 and the cost of equity reflects that.
 (Riskfree rate = 3.6%; Equity risk premium = 5%)

Lesson 1: Financial service companies are opaque...

- With financial service firms, we enter into a Faustian bargain. They tell us very little about the quality of their assets (loans, for a bank, for instance are not broken down by default risk status) but we accept that in return for assets being marked to market (by accountants who presumably have access to the information that we don't have).
- In addition, estimating cash flows for a financial service firm is difficult to do. So, we trust financial service firms to pay out their cash flows as dividends. Hence, the use of the dividend discount model.

Lesson 2: For financial service companies, book value matters...

- The book value of assets and equity is mostly irrelevant when valuing non-financial service companies. After all, the book value of equity is a historical figure and can be nonsensical. (The book value of equity can be negative and is so for more than a 1000 publicly traded US companies)
- With financial service firms, book value of equity is relevant for two reasons:
 - Since financial service firms mark to market, the book value is more likely to reflect what the firms own right now (rather than a historical value)
 - The regulatory capital ratios are based on book equity. Thus, a bank with negative or even low book equity will be shut down by the regulators.
- From a valuation perspective, it therefore makes sense to pay heed to book value. In fact, you can argue that reinvestment for a bank is the amount that it needs to add to book equity to sustain its growth ambitions and safety requirements:
 - $FCFE = \text{Net Income} - \text{Reinvestment in regulatory capital (book equity)}$

2d. Deutsche Bank: March 2009

Last 2 years

	2007	2008
Net Income	3,954 m	-3,855m
Dividends	2,146 m	285 m
Risk adjusted assets =	312,882m	
Book Equity =	31,914 m	
Regulatory Capital =		

Normalized
Net Income
for base year
3,000 m
Normalized
ROE = 9.4%

Expected
growth in
asset base
4%

Target capital
ratio 10%

Target ROE
10.2%

Stable Growth
g = 3%; Beta = 1.00
Cost of equity = 10.20%
Return on equity = 10.20%;
Reinvestment Rate = g/ROE
= $3/10.20\% = 29.41\%$

Cashflows

	1	2	3	4	5
Asset Base	325,398 €	338,414 €	351,950 €	366,028 €	380,669 €
Capital ratio	10.16%	10.12%	10.08%	10.04%	10.00%
Regulatory Capital	33,060 €	34,247 €	35,477 €	36,749 €	38,067 €
Change in capital	1,146 €	1,187 €	1,229 €	1,273 €	1,318 €
ROE	9.56%	9.72%	9.88%	10.04%	10.20%
Net Income	3,161 €	3,329 €	3,505 €	3,690 €	3,883 €
-Reinvestment	1,146 €	1,187 €	1,229 €	1,273 €	1,318 €
FCFE	2,014 €	2,142 €	2,276 €	2,417 €	2,565 €

Terminal Value₅ = $2,823 / (.102 - .03) = 39,209$ m

3,999
1,176
2,823

PV of CF = 31,383 m
/ # shares 581.85
Value/Share 53.94 €

Discount at Cost of equity = $3.60\% + 1.162 \times 6\% + -0.60\% = 11.172\%$

In March 2009
Deutsche Bank price = 48
Euros/share (down from 89
Euros in early 2008)

Riskfree Rate:
Euro Riskfree Rate =
3.6%

+

Beta
1.162

X

Mature market
premium
6%

+

Beta for commercial &
investment banking

Region	Lambda	CRP
Western Europe	0.68	0.00%
United States	0.42	0.00%
Latin America	0.01	4.50%
Africa & Middle East	0.01	7.00%
Asia	0.11	3.50%
Eastern Europe	0.04	3.00%
Deutsche Bank		0.60%

V. Valuing Companies with “intangible” assets

If capital expenditures are miscategorized as operating expenses, it becomes very difficult to assess how much a firm is reinvesting for future growth and how well its investments are doing.

What is the value added by growth assets?

What are the cashflows from existing assets?

The capital expenditures associated with acquiring intangible assets (technology, human capital) are mis-categorized as operating expenses, leading to incorrect accounting earnings and measures of capital invested.

How risky are the cash flows from both existing assets and growth assets?

It can be more difficult to borrow against intangible assets than it is against tangible assets. The risk in operations can change depending upon how stable the intangible asset is.

When will the firm become a mature firm, and what are the potential roadblocks?

Intangible assets such as brand name and customer loyalty can last for very long periods or dissipate overnight.

Lesson 1: Accounting rules are cluttered with inconsistencies...

- If we start with accounting first principles, capital expenditures are expenditures designed to create benefits over many periods. They should not be used to reduce operating income in the period that they are made, but should be depreciated/amortized over their life. They should show up as assets on the balance sheet.
- Accounting is consistent in its treatment of cap ex with manufacturing firms, but is inconsistent with firms that do not fit the mold.
 - With pharmaceutical and technology firms, R&D is the ultimate cap ex but is treated as an operating expense.
 - With consulting firms and other firms dependent on human capital, recruiting and training expenses are your long term investments that are treated as operating expenses.
 - With brand name consumer product companies, a portion of the advertising expense is to build up brand name and is the real capital expenditure. It is treated as an operating expense.

Exhibit 11.1: Converting R&D expenses to R&D assets - Amgen

Step 1: Determining an amortizable life for R & D expenses. ①

How long will it take, on an expected basis, for research to pay off at Amgen? Given the length of the approval process for new drugs by the Food and Drugs Administration, we will assume that this amortizable life is 10 years.

Step 2: Capitalize historical R&D expense

② ③

Year	R&D Expense	Unamortized portion	Amortization this year	
Current	3030.00	1.00	3030.00	
-1	3266.00	0.90	2939.40	\$326.60
-2	3366.00	0.80	2692.80	\$336.60
-3	2314.00	0.70	1619.80	\$231.40
-4	2028.00	0.60	1216.80	\$202.80
-5	1655.00	0.50	827.50	\$165.50
-6	1117.00	0.40	446.80	\$111.70
-7	864.00	0.30	259.20	\$86.40
-8	845.00	0.20	169.00	\$84.50
-9	823.00	0.10	82.30	\$82.30
-10	663.00	0.00	0.00	\$66.30
			\$13283.60	\$1,694.10

④

Current year's R&D expense = Cap ex = \$3,030 million
 R&D amortization = Depreciation = \$ 1,694 million
 Unamortized R&D = Capital invested (R&D) = \$13,284 million

Step 3: Restate earnings, book value and return numbers

⑤

	Unadjusted	Adjusted for R&D	Comments
Net Income	\$4,196	$4,196 + 3030 - 1694 = \$ 5,532$	Add current year's R&D and subtract R&D amortization
Book value of equity	\$17,869	$17,869 + 13,284 = \$ 31,153$	Add unamortized R&D from prior years
Return on Equity	$\frac{4196}{17869} = 23.48\%$	$\frac{5532}{31153} = 17.75\%$	Return on equity drops when book equity is augmented by R&D, even though net income rises.
Pre-tax Operating Income	\$5,594	$5,594 + 3030 - 1694 = \$ 6,930$	Add current year's R&D and subtract R&D amortization
Book value of invested capital	\$21,985	$21,985 + 13,284 = \$ 35,269$	Add unamortized R&D from prior years
Pre-tax Return on Capital	$\frac{5594}{21985} = 25.44\%$	$\frac{6930}{35269} = 19.65\%$	Return on capital drops when capital is augmented by R&D, even though operating income rises.

10. Amgen: Status Quo

Cap Ex = Acc net Cap Ex(255) + Acquisitions (3975) + R&D (2216)

Current Cashflow to Firm

EBIT(1-t) = :7336(1-.28) = 6058
 - Nt CpX = 6443
 - Chg WC 37
 = FCFF - 423
 Reinvestment Rate = 6480/6058 = 106.98%
 Return on capital = 16.71%

Reinvestment Rate 60%

Expected Growth in EBIT (1-t)
 $.60 \times .16 = .096$
9.6%

Return on Capital 16%

Stable Growth

g = 4%; Beta = 1.10;
 Debt Ratio = 20%; Tax rate = 35%
 Cost of capital = 8.08%
 ROC = 10.00%;
 Reinvestment Rate = 4/10 = 40%

Terminal Value₁₀ = 7300 / (.0808 - .04) = 179,099

First 5 years

Growth decreases gradually to 4%

Op. Assets 94214
 + Cash: 1283
 - Debt 8272
 = Equity 87226
 - Options 479
 Value/Share \$ 74.33

Year	1	2	3	4	5	6	7	8	9	10	Term Yr
EBIT	\$9,221	\$10,106	\$11,076	\$12,140	\$13,305	\$14,433	\$15,496	\$16,463	\$17,306	\$17,998	18718
EBIT (1-t)	\$6,639	\$7,276	\$7,975	\$8,741	\$9,580	\$10,392	\$11,157	\$11,853	\$12,460	\$12,958	12167
- Reinvestment	\$3,983	\$4,366	\$4,785	\$5,244	\$5,748	\$5,820	\$5,802	\$5,690	\$5,482	\$5,183	4867
= FCFF	\$2,656	\$2,911	\$3,190	\$3,496	\$3,832	\$4,573	\$5,355	\$6,164	\$6,978	\$7,775	7300

Cost of Capital (WACC) = 11.7% (0.90) + 3.66% (0.10) = 10.90%

Debt ratio increases to 20%
 Beta decreases to 1.10

On May 1, 2007, Amgen was trading at \$ 55/share

Cost of Equity 11.70%

Cost of Debt (4.78% + .85%)(1-.35) = 3.66%

Weights E = 90% D = 10%

Riskfree Rate: Riskfree rate = 4.78%

+

Beta 1.73

x

Risk Premium 4%

Unlevered Beta for Sectors: 1.59

D/E = 11.06%

Lesson 2: And fixing those inconsistencies can alter your view of a company and affect its value

	No R&D adjustment	R&D adjustment
EBIT	\$5,071	\$7,336
Invested Capital	\$25,277	\$33,173
ROIC	14.58%	18.26%
Reinvestment Rate	115.68%	106.98%
Value of firm	\$58,617	\$95,497
Value of equity	\$50,346	\$87,226
Value/share	\$42.73	\$74.33

VI. Valuing cyclical and commodity companies

Company growth often comes from movements in the economic cycle, for cyclical firms, or commodity prices, for commodity companies.

What are the cashflows from existing assets?

Historical revenue and earnings data are volatile, as the economic cycle and commodity prices change.

What is the value added by growth assets?

How risky are the cash flows from both existing assets and growth assets?

Primary risk is from the economy for cyclical firms and from commodity price movements for commodity companies. These risks can stay dormant for long periods of apparent prosperity.

When will the firm become a mature firm, and what are the potential roadblocks?

For commodity companies, the fact that there are only finite amounts of the commodity may put a limit on growth forever. For cyclical firms, there is the peril that the next recession may put an end to the firm.

Valuing a Cyclical Company - Toyota in Early 2009

In early 2009, Toyota Motors had the highest market share in the sector. However, the global economic recession in 2008-09 had pulled earnings down.

Year	Revenues	Operating Income	EBITDA	Operating Margin
FY1 1992	¥10,163,380	¥218,511	¥218,511	2.15%
FY1 1993	¥10,210,750	¥181,897	¥181,897	1.78%
FY1 1994	¥9,362,732	¥136,226	¥136,226	1.45%
FY1 1995	¥8,120,975	¥255,719	¥255,719	3.15%
FY1 1996	¥10,718,740	¥348,069	¥348,069	3.25%
FY1 1997	¥12,243,830	¥665,110	¥665,110	5.43%
FY1 1998	¥11,678,400	¥779,800	¥1,382,950	6.68%
FY1 1999	¥12,749,010	¥774,947	¥1,415,997	6.08%
FY1 2000	¥12,879,560	¥775,982	¥1,430,982	6.02%
FY1 2001	¥13,424,420	¥870,131	¥1,542,631	6.48%
FY1 2002	¥15,106,300	¥1,123,475	¥1,822,975	7.44%
FY1 2003	¥16,054,290	¥1,363,680	¥2,101,780	8.49%
FY1 2004	¥17,294,760	¥1,666,894	¥2,454,994	9.64%
FY1 2005	¥18,551,530	¥1,672,187	¥2,447,987	9.01%
FY1 2006	¥21,036,910	¥1,878,342	¥2,769,742	8.93%
FY1 2007	¥23,948,090	¥2,238,683	¥3,185,683	9.35%
FY1 2008	¥26,289,240	¥2,270,375	¥3,312,775	8.64%
FY 2009 (Estin)	¥22,661,325	¥267,904	¥1,310,304	1.18%
		¥1,306,867		7.33%

Normalized Earnings ①

As a cyclical company, Toyota's earnings have been volatile and 2009 earnings reflect the troubled global economy. We will assume that when economic growth returns, the operating margin for Toyota will revert back to the historical average.

Normalized Operating Income = Revenues in 2009 * Average Operating Margin (98--09)
 = 22661 * .0733 = 1660.7 billion yen

Normalized Return on capital and Reinvestment ②

Once earnings bounce back to normal, we assume that Toyota will be able to earn a return on capital equal to its cost of capital (5.09%). This is a sector, where earning excess returns has proved to be difficult even for the best of firms.

To sustain a 1.5% growth rate, the reinvestment rate has to be:
 Reinvestment rate = 1.5%/5.09%
 = 29.46%

Operating Assets	19,640
+ Cash	2,288
+ Non-operating assets	6,845
- Debt	11,862
- Minority Interests	583
Value of Equity	
/ No of shares	/3,448
Value per share	¥4735

$$\text{Value of operating assets} = \frac{1660.7 (1.015) (1 - .407) (1 - .2946)}{(.0509 - .015)} = 19,640 \text{ billion}$$

Normalized Cost of capital ③

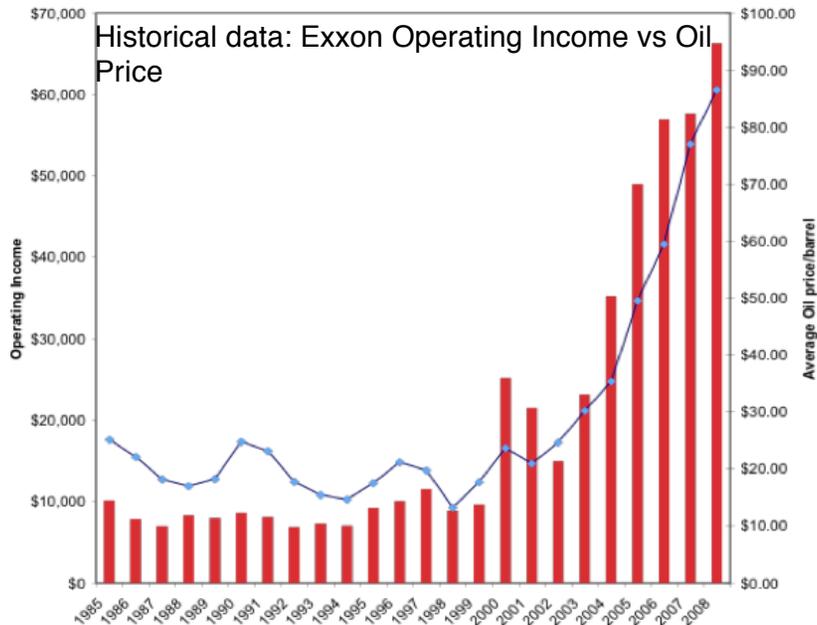
The cost of capital is computed using the average beta of automobile companies (1.10), and Toyota's cost of debt (3.25%) and debt ratio (52.9% debt ratio). We use the Japanese marginal tax rate of 40.7% for computing both the after-tax cost of debt and the after-tax operating income

Cost of capital = 8.65% (.471) + 3.25% (1-.407) (.529) = 5.09%

Stable Growth ④

Once earnings are normalized, we assume that Toyota, as the largest market-share company, will be able to maintain only stable growth (1.5% in Yen terms)

Valuing a commodity company - Exxon in Early 2009



Regressing Exxon's operating income against the oil price per barrel from 1985-2008:

$$\text{Operating Income} = -6,395 + 911.32 (\text{Average Oil Price}) \quad R^2 = 90.2\%$$

(2.95) (14.59)

Exxon Mobil's operating income increases about \$9.11 billion for every \$ 10 increase in the price per barrel of oil and 90% of the variation in Exxon's earnings over time comes from movements in oil prices.

Estimate normalized income based on current oil price ①

At the time of the valuation, the oil price was \$ 45 a barrel. Exxon's operating income based on this price is

$$\text{Normalized Operating Income} = -6,395 + 911.32 (\$45) = \$34,614$$

Estimate return on capital and reinvestment rate based on normalized income ②

This operating income translates into a return on capital of approximately 21% and a reinvestment rate of 9.52%, based upon a 2% growth rate.

$$\text{Reinvestment Rate} = g / \text{ROC} = 2 / 21\% = 9.52\%$$

$$\text{Value of operating assets} = \frac{34,614(1 - .38)(1 - .0952)}{(.0818 - .02)} = \$320,472 \text{ million}$$

Exxon's cost of capital ④

Exxon has been a predominantly equity funded company, and is expected to remain so, with a debt ratio of only 2.85%. Its cost of equity is 8.35% (based on a beta of 0.90) and its pre-tax cost of debt is 3.75% (given AAA rating). The marginal tax rate is 38%.

$$\text{Cost of capital} = 8.35\% (.9715) + 3.75\% (1 - .38) (.0285) = 8.18\%$$

Expected growth in operating income ③

Since Exxon Mobile is the largest oil company in the world, we will assume an expected growth of only 2% in perpetuity.

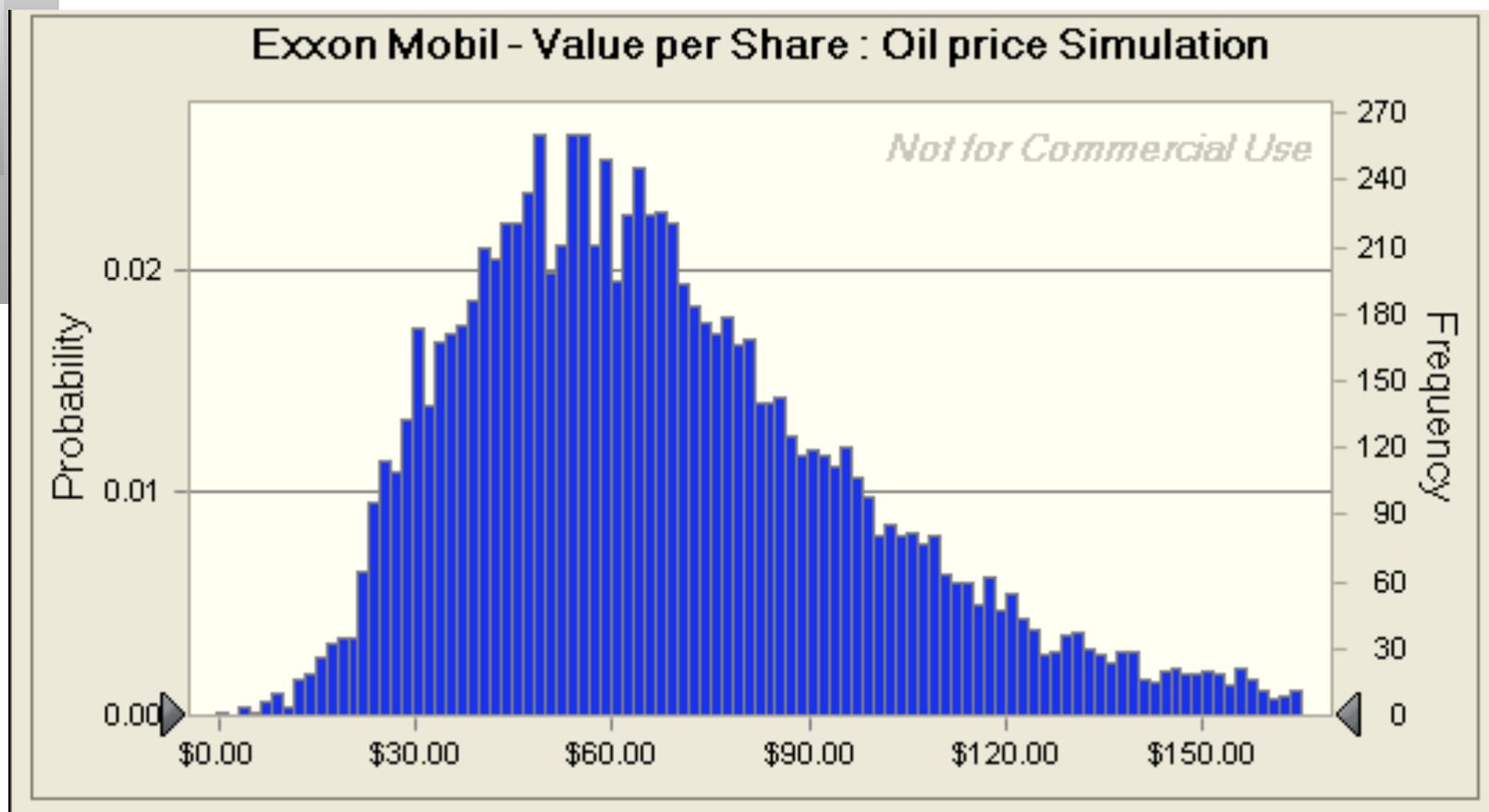
Lesson 1: With “macro” companies, it is easy to get lost in “macro” assumptions...

- With cyclical and commodity companies, it is undeniable that the value you arrive at will be affected by your views on the economy or the price of the commodity.
- Consequently, you will feel the urge to take a stand on these macro variables and build them into your valuation. Doing so, though, will create valuations that are jointly impacted by your views on macro variables and your views on the company, and it is difficult to separate the two.
- The best (though not easiest) thing to do is to separate your macro views from your micro views. Use current market based numbers for your valuation, but then provide a separate assessment of what you think about those market numbers.

Lesson 2: Use probabilistic tools to assess value as a function of macro variables...

- If there is a key macro variable affecting the value of your company that you are uncertain about (and who is not), why not quantify the uncertainty in a distribution (rather than a single price) and use that distribution in your valuation.
- That is exactly what you do in a Monte Carlo simulation, where you allow one or more variables to be distributions and compute a distribution of values for the company.
- With a simulation, you get not only everything you would get in a standard valuation (an estimated value for your company) but you will get additional output (on the variation in that value and the likelihood that your firm is under or over valued)

Exxon Mobil Valuation: Simulation



Closing Thoughts...

- Valuation becomes more difficult as we move away from the standard script: money making manufacturing companies with long histories.
- When valuation becomes more difficult, you will be tempted to abandon first principles in valuation and told that discounted cash flow (and intrinsic) valuation don't work for "these" companies. Instead, you will be asked to look at alternate metrics and models to price these companies.
- The architecture of conventional valuation is strong enough to allow us to value any company, but it does require us to be flexible (in our approaches and use of models) and creative (in making estimates and dealing with uncertainty).
- The payoff to doing intrinsic valuation is greatest with these "difficult to value" companies, because most people give up.