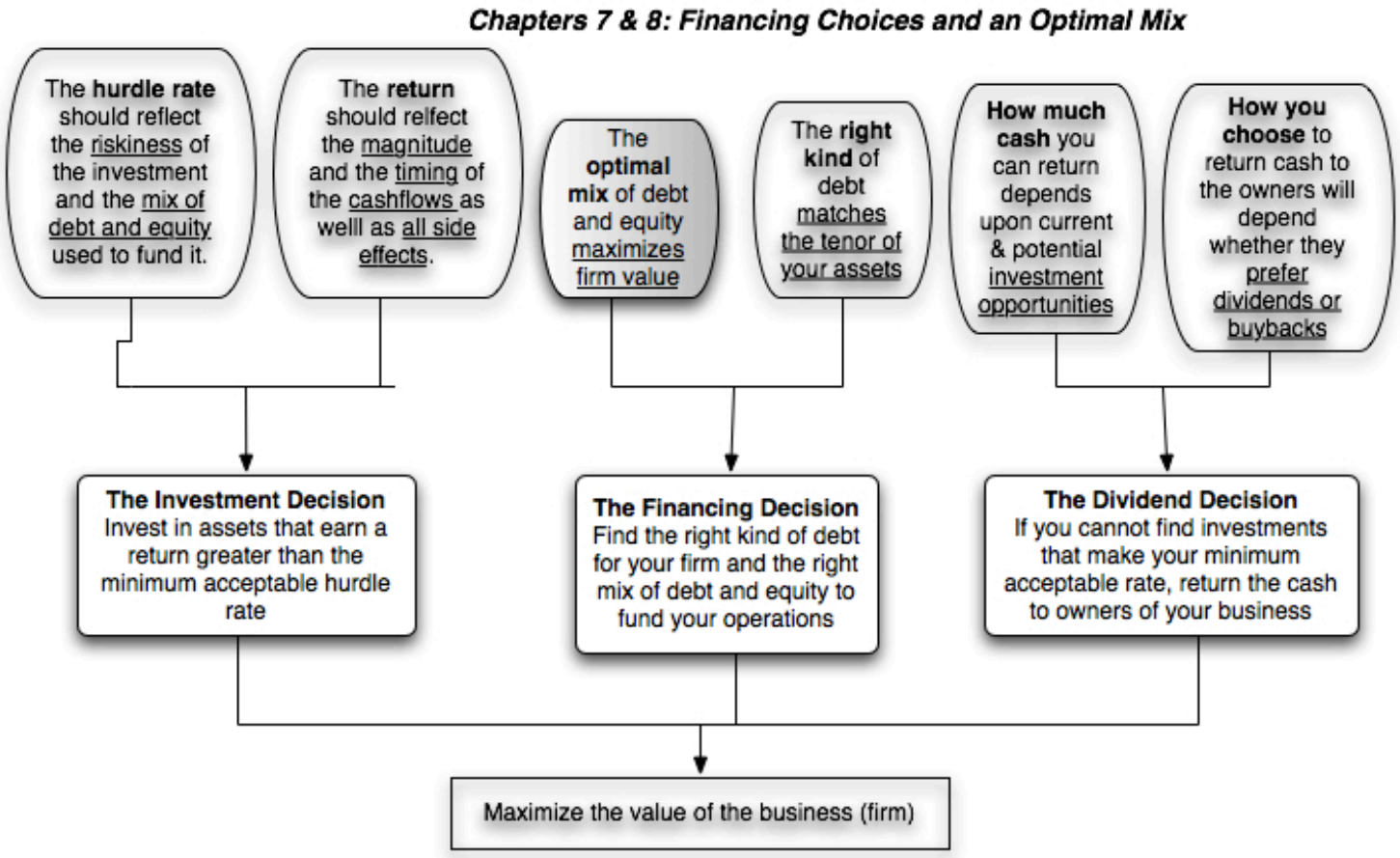
CAPITAL STRUCTURE: FINDING THE RIGHT FINANCING MIX

You can have too much debt… or too little..

The Big Picture..



Pathways to the Optimal

- The Cost of Capital Approach: The optimal debt ratio is the one that minimizes the cost of capital for a firm.
- The Enhanced Cost of Capital approach: The optimal debt ratio is the one that generates the best combination of (low) cost of capital and (high) operating income.
- The Adjusted Present Value Approach: The optimal debt ratio is the one that maximizes the overall value of the firm.
- The Sector Approach: The optimal debt ratio is the one that brings the firm closes to its peer group in terms of financing mix.
- The Life Cycle Approach: The optimal debt ratio is the one that best suits where the firm is in its life cycle.

I. The Cost of Capital Approach

- Value of a Firm = Present Value of Cash Flows to the Firm, discounted back at the cost of capital.
- If the cash flows to the firm are held constant, and the cost of capital is minimized, the value of the firm will be maximized.

Measuring Cost of Capital

- Recapping our discussion of cost of capital:
- The cost of debt is the market interest rate that the firm has to pay on its long term borrowing today, net of tax benefits. It will be a function of:
  (a) The long-term riskfree rate
  (b) The default spread for the company, reflecting its credit risk
  (c) The firm's marginal tax rate
- The cost of equity reflects the expected return demanded by marginal equity investors. If they are diversified, only the portion of the equity risk that cannot be diversified away (beta or betas) will be priced into the cost of equity.
- The cost of capital is the cost of each component weighted by its relative market value.
- Cost of capital = Cost of equity (E/(D+E)) + After-tax cost of debt (D/(D+E))

Costs of Debt & Equity

- An article in an Asian business magazine argued that equity was cheaper than debt, because dividend yields are much lower than interest rates on debt. Do you agree with this statement?
  a. Yes
  b. No
- Can equity ever be cheaper than debt?
  a. Yes
  b. No

Applying Cost of Capital Approach: The Textbook Example

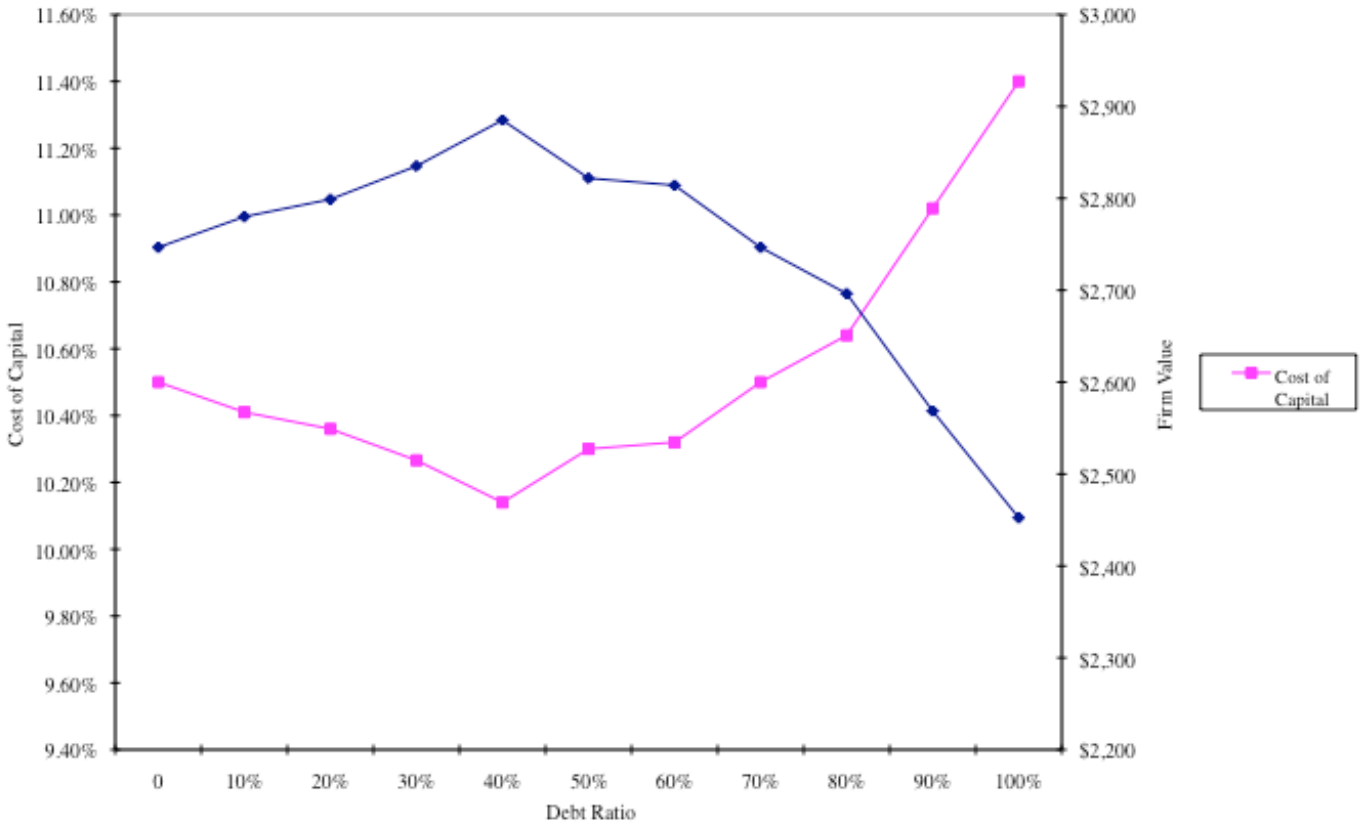
Assume the firm has $200 million in cash flows, expected to grow 3% a year forever.

D/(D+E)	Cost of Equity	After-tax Cost of Debt	Cost of Capital	Firm Value
0	10.50%	4.80%	10.50%	$2,747
10%	11.00%	5.10%	10.41%	$2,780
20%	11.60%	5.40%	10.36%	$2,799
30%	12.30%	5.52%	10.27%	$2,835
40%	13.10%	5.70%	10.14%	$2,885
50%	14.50%	6.10%	10.30%	$2,822
60%	15.00%	7.20%	10.32%	$2,814
70%	16.10%	8.10%	10.50%	$2,747
80%	17.20%	9.00%	10.64%	$2,696
90%	18.40%	10.20%	11.02%	$2,569
100%	19.70%	11.40%	11.40%	$2,452

$$\text{Value} = \frac{\text{Expected Cash flow to firm next year}}{(\text{Cost of capital} - g)} = \frac{200(1.03)}{(\text{Cost of capital} - g)}$$

The U-shaped Cost of Capital Graph…

Figure 8.2: Cost of Capital and Firm Value



Current Cost of Capital: Disney

- The beta for Disney's stock in May 2009 was 0.9011. The T. bond rate at that time was 3.5%. Using an estimated equity risk premium of 6%, we estimated the cost of equity for Disney to be 8.91%:

  Cost of Equity = 3.5% + 0.9011(6%) = 8.91%

- Disney's bond rating in May 2009 was A, and based on this rating, the estimated pretax cost of debt for Disney is 6%. Using a marginal tax rate of 38%, the after-tax cost of debt for Disney is 3.72%.

  After-Tax Cost of Debt = 6.00% (1 – 0.38) = 3.72%

- The cost of capital was calculated using these costs and the weights based on market values of equity (45,193) and debt (16,682):

  Cost of capital = $8.91\% \frac{45,193}{(16,682+45,193)} + 3.72\% \frac{16,682}{(16,682+45,193)} = 7.51\%$

Mechanics of Cost of Capital Estimation

- 1. Estimate the Cost of Equity at different levels of debt:
  - Equity will become riskier -> Beta will increase -> Cost of Equity will increase.
  - Estimation will use levered beta calculation
- 2. Estimate the Cost of Debt at different levels of debt:
  - Default risk will go up and bond ratings will go down as debt goes up -> Cost of Debt will increase.
  - To estimating bond ratings, we will use the interest coverage ratio (EBIT/Interest expense)
- 3. Estimate the Cost of Capital at different levels of debt
- 4. Calculate the effect on Firm Value and Stock Price.

Laying the groundwork:
1. Estimate the unlevered beta for the firm

- To get to the unlevered beta, we can start with the levered beta (0.9011) and work back to an unlevered beta:

$$\text{Unlevered beta} = \frac{\text{Levered Beta}}{\left(1+(1-t)\frac{\text{Debt}}{\text{Equity}}\right)} = \frac{0.9011}{\left(1+(1-.38)\frac{16,682}{45,193}\right)} = 0.7333$$

- Alternatively, we can back to the source and estimate it from the betas of the businesses.

Business	Revenues in 2008	EV/Sales	Estimated Value	Firm Value Proportion	Unlevered beta
Media Networks	$16,116	2.13	$34,327.78	58.92%	0.7056
Parks and Resorts	$11,504	1.51	$17,408.14	29.88%	0.5849
Studio Entertainment	$7,348	0.78	$5,754.86	9.88%	1.3027
Consumer Products	$2,875	0.27	$768.20	1.32%	1.0690
Disney	$37,843		$58,258.99	100.00%	0.7333

2. Get Disney's current financials…

	Last fiscal year	Trailing 12 months
Revenues	$37,843	$36,990
EBITDA	$8,986	$8,319
Depreciation & Amortization	$1,582	$1,593
EBIT	$7,404	$6,726
Interest Expenses	$712	$728
EBITDA (adjusted for leases)	$9,989	$8,422
EBIT(adjusted for leases)	$7,708	$6,829
Interest Expenses (adjusted for leases)	$815	$831

I. Cost of Equity

Debt to Capital Ratio	D/E Ratio	Levered Beta	Cost of Equity
0%	0.00%	0.7333	7.90%
10%	11.11%	0.7838	8.20%
20%	25.00%	0.8470	8.58%
30%	42.86%	0.9281	9.07%
40%	66.67%	1.0364	9.72%
50%	100.00%	1.1879	10.63%
60%	150.00%	1.4153	11.99%
70%	233.33%	1.7941	14.26%
80%	400.00%	2.5519	18.81%
90%	900.00%	4.8251	32.45%

Levered Beta = 0.7333 (1 + (1-.38) (D/E))
Cost of equity = 3.5% + Levered Beta * 6%

Estimating Cost of Debt

Start with the current market value of the firm = 45,193 + $16,682 = $61,875 million

D/(D+E)	0.00%	10.00%	Debt to capital
D/E	0.00%	11.11%	D/E = 10/90 = .1111
$ Debt	$0	$6,188	10% of $61,875
EBITDA	$8,422	$8,422	Same as 0% debt
Depreciation	$1,593	$1,593	Same as 0% debt
EBIT	$6,829	$6,829	Same as 0% debt
Interest	$0	$294	Pre-tax cost of debt * $ Debt
Pre-tax Int. cov	∞	23.24	EBIT/ Interest Expenses
Likely Rating	AAA	AAA	From Ratings table
Pre-tax cost of debt	4.75%	4.75%	Riskless Rate + Spread

The Ratings Table

Interest Coverage Ratio	Rating	Typical Default Spread	Pre-tax cost of debt
>8.5	AAA	1.25%	4.75%
6.5-8.5	AA	1.75%	5.25%
5.5-6.5	A+	2.25%	5.75%
4.25- 5.5	A	2.50%	6.00%
3- 4.25	A–	3.00%	6.50%
2.5-3.0	BBB	3.50%	7.00%
2.25-2.5	BB+	4.25%	7.75%
2.0-2.25	BB	5.00%	8.50%
1.75-2.0	B+	6.00%	9.50%
1.5-1.75	B	7.25%	10.75%
1.25-1.5	B–	8.50%	12.00%
0.8-1.25	CCC	10.00%	13.50%
0.65-0.8	CC	12.00%	15.50%
0.2-0.65	C	15.00%	18.50%
<0.2	D	20.00%	23.50%

T.Bond rate in early 2009 = 3.5%

A Test: Can you do the 30% level?

D/(D + E)	10.00%	20.00%	30%	
D/E	11.11%	25.00%		
$ Debt	$6,188	$12,375		
EBITDA	$8,422	$8,422		
Depreciation	$1,593	$1,593		
EBIT	$6,829	$6,829		
Interest expense	$294	$588		
Pretax int. cov	23.24	11.62		
Likely rating	AAA	AAA		
Pretax cost of debt	4.75%	4.75%		

Bond Ratings, Cost of Debt and Debt Ratios

Debt Ratio	$ Debt	Interest Expense	Interest coverage ratio	Bond Rating	Interest rate on debt	Tax Rate	After-tax cost of debt
0%	$0	$0	∞	AAA	4.75%	38.00%	2.95%
10%	$6,188	$294	23.24	AAA	4.75%	38.00%	2.95%
20%	$12,375	$588	11.62	AAA	4.75%	38.00%	2.95%
30%	$18,563	$975	7.01	AA	5.25%	38.00%	3.26%
40%	$24,750	$1,485	4.60	A	6.00%	38.00%	3.72%
50%	$30,938	$2,011	3.40	A-	6.50%	38.00%	4.03%
60%	$37,125	$2,599	2.63	BBB	7.00%	38.00%	4.34%
70%	$43,313	$5,198	1.31	B-	12.00%	38.00%	7.44%
80%	$49,500	$6,683	1.02	CCC	13.50%	38.00%	8.37%
90%	$55,688	$7,518	0.91	CCC	13.50%	34.52%	8.84%

Marginal tax rates and Taxable Income…

- You need taxable income for interest to provide a tax savings. Note that the EBIT at Disney is $6,829 million. As long as interest expenses are less than $6,829 million, interest expenses remain fully tax-deductible and earn the 38% tax benefit. At an 80% debt ratio, the interest expenses are $6,683 million and the tax benefit is therefore 38% of this amount.
- At a 90% debt ratio, however, the interest expenses balloon to $7,518 million, which is greater than the EBIT of $6,829 million. We consider the tax benefit on the interest expenses up to this amount:

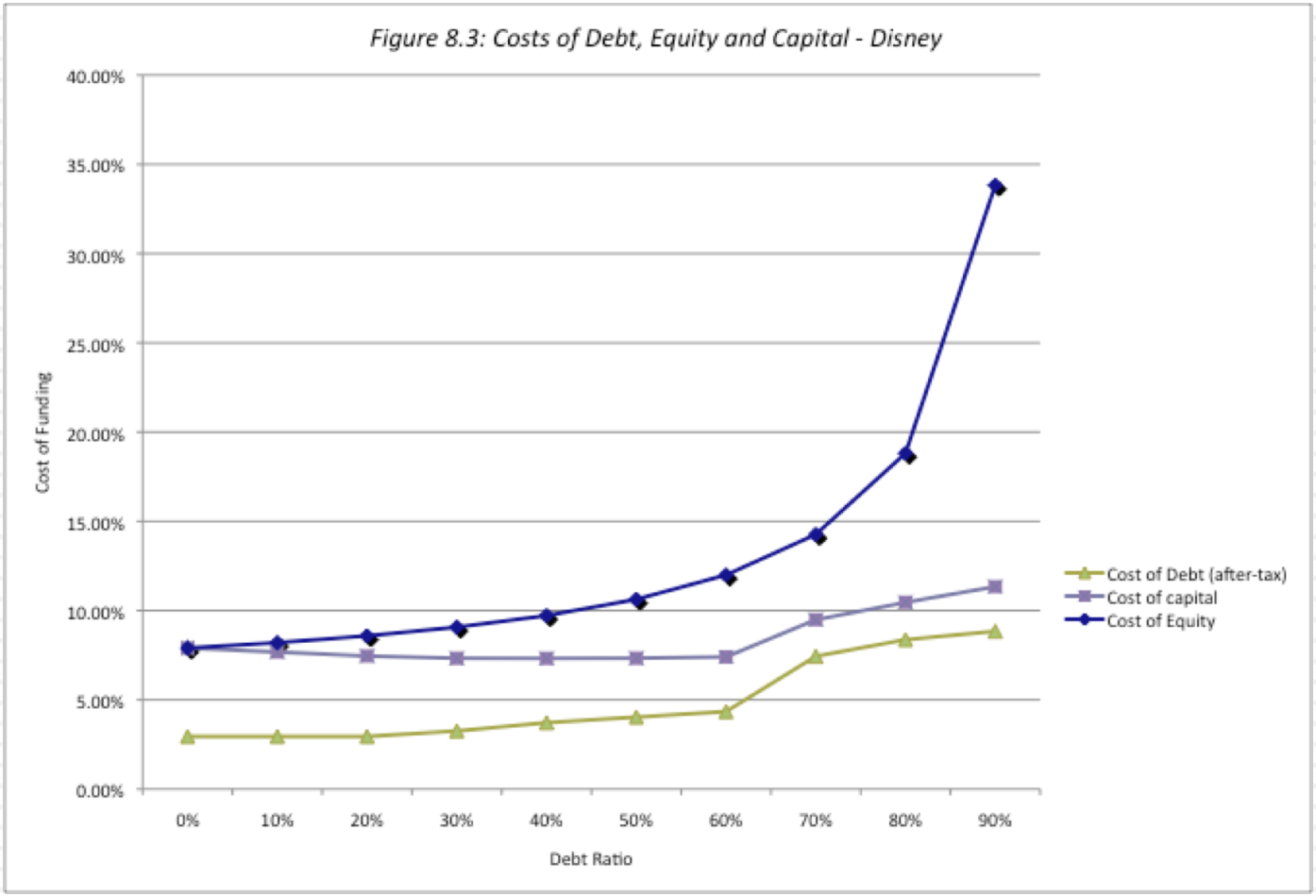
  Maximum Tax Benefit = EBIT * Marginal Tax Rate = $6,829 million * 0.38 = $2,595 million

  Adjusted Marginal Tax Rate = Maximum Tax Benefit/Interest Expenses = $2,595/$7,518 = 34.52%

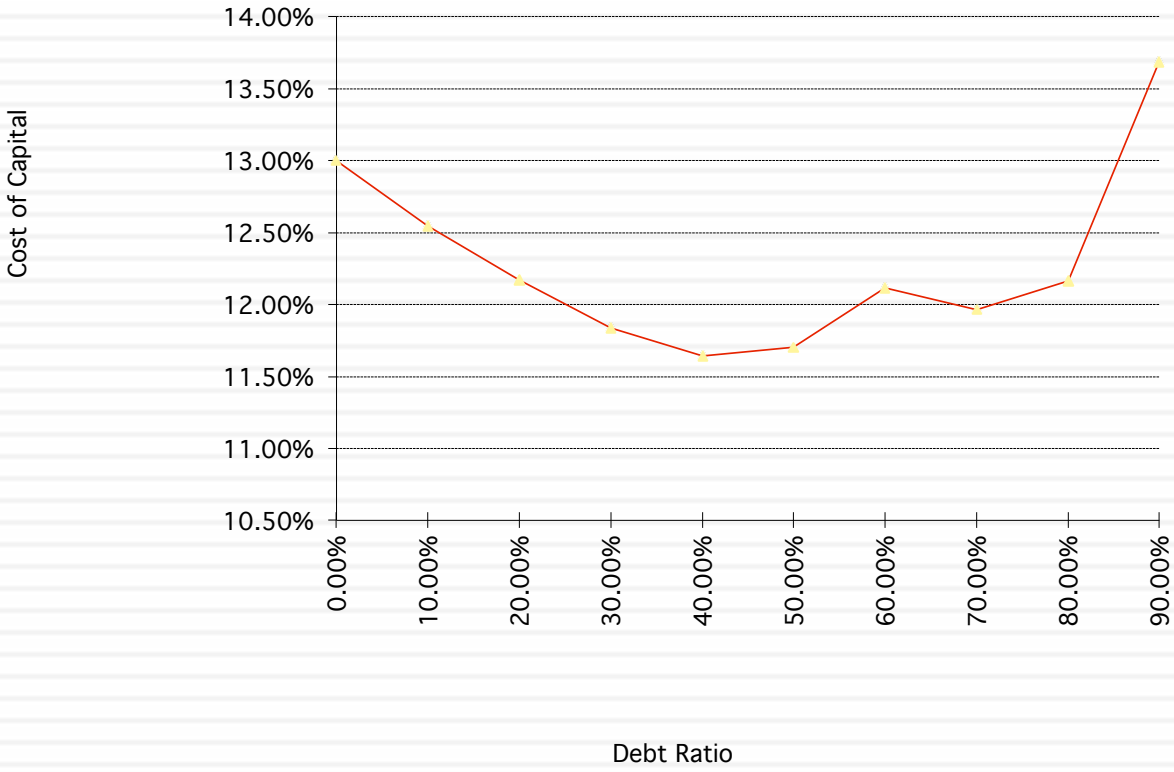
Disney's cost of capital schedule…

Debt Ratio	Beta	Cost of Equity	Cost of Debt (after-tax)	Cost of capital
0%	0.73	7.90%	2.95%	7.90%
10%	0.78	8.20%	2.95%	7.68%
20%	0.85	8.58%	2.95%	7.45%
30%	0.93	9.07%	3.26%	7.32%
40%	1.04	9.72%	3.72%	7.32%
50%	1.19	10.63%	4.03%	7.33%
60%	1.42	11.99%	4.34%	7.40%
70%	1.79	14.26%	7.44%	9.49%
80%	2.55	18.81%	8.37%	10.46%
90%	5.05	33.83%	8.84%	11.34%

Disney: Cost of Capital Chart



Disney: Cost of Capital Chart: 1997



Note the kink in the cost of capital graph at 60% debt. What is causing it?

The cost of capital approach suggests that Disney should do the following…

- Disney currently has $16.68 billion in debt. The optimal dollar debt (at 40%) is roughly $24.75 billion. Disney has excess debt capacity of $ 8.07 billion.
- To move to its optimal and gain the increase in value, Disney should borrow $ 8 billion and buy back stock.
- Given the magnitude of this decision, you should expect to answer three questions:
  1. Why should we do it?
  2. What if something goes wrong?
  3. What if we don't want (or cannot) buy back stock and want to make investments with the additional debt capacity?

Why should we do it?
Effect on Firm Value – Full Valuation Approach

Step 1: Estimate the cash flows to Disney as a firm

EBIT (1 – Tax Rate) = 6829 (1 – 0.38) =	$4,234
+ Depreciation and amortization =	$1,593
– Capital expenditures =	$1,628
– Change in noncash working capital	$0
Free cash flow to the firm =	$4,199

Step 2: Back out the implied growth rate in the current market value

Value of firm = $ 61,875 = $$\frac{FCFF_0(1+g)}{(\text{Cost of Capital} - g)} = \frac{4,199(1+g)}{(.0751 - g)}$$

Growth rate = (Firm Value * Cost of Capital – CF to Firm)/(Firm Value + CF to Firm)

= (61,875* 0.0751 – 4199)/(61,875 + 4,199) = 0.0068 or 0.68%

Step 3: Revalue the firm with the new cost of capital

Firm value = $$\frac{FCFF_0(1+g)}{(\text{Cost of Capital} - g)} = \frac{4,199(1.0068)}{(.0732 - 0.0068)} = \$63,665 \text{ million}$$

The firm value increases by $1,790 million (63,665 – 61,875 = 1,790)

An Alternate Approach
Effect on Value: Capital Structure Isolation…

- In this approach, we start with the current market value and isolate the effect of changing the capital structure on the cash flow and the resulting value.
- Firm Value before the change = 45,193 + $16,682 = $61,875 million

WACCb = 7.51%	Annual Cost = 61,875 * 0.0751 = $4,646.82 million
WACCa = 7.32%	Annual Cost = 61,875 * 0.0732 = $ 4,529.68 million
Δ WACC = 0.19%	Change in Annual Cost = $117.14 million

- If we assume a perpetual growth of 0.68% in firm value over time,
  - Increase in firm value = $\frac{\text{Annual Savings next year}}{(\text{Cost of Capital} - g)} = \frac{\$117.14}{(0.0732 - 0.0068)} = \$1{,}763 \text{ million}$
  - The total number of shares outstanding before the buyback is 1856.732 million.
  - Change in Stock Price = $1,763/1856.732 = $ 0.95 per share

A Test: The Repurchase Price

- Let us suppose that the CFO of Disney approached you about buying back stock. He wants to know the maximum price that he should be willing to pay on the stock buyback. (The current price is $ 24.34 and there are 1856.732 million shares outstanding).
- If we assume that investors are rational, i.e., that the investor who sell their shares back want the same share of firm value increase as those who remain:
  - Increase in Value per Share = $1,763/1856.732 = $ 0.95
  - New Stock Price = $24.34 + $0.95= $25.29
  - Buying shares back $25.29 will leave you as a stockholder indifferent between selling and not selling.
- What would happen to the stock price after the buyback if you were able to buy stock back at $ 24.34?

Buybacks and Stock Prices

- Assume that Disney does make a tender offer for it's shares but pays $27 per share. What will happen to the value per share for the shareholders who do not sell back?
  a. The share price will drop below the pre-announcement price of $24.34
  b. The share price will be between $24.34 and the estimated value (above) of $25.29
  c. The share price will be higher than $25.29

2. What if something goes wrong? The Downside Risk

- Sensitivity to Assumptions

  A. "What if" analysis

  The optimal debt ratio is a function of our inputs on operating income, tax rates and macro variables. We could focus on one or two key variables – operating income is an obvious choice – and look at history for guidance on volatility in that number and ask what if questions.

  B. "Economic Scenario" Approach

  We can develop possible scenarios, based upon macro variables, and examine the optimal debt ratio under each one. For instance, we could look at the optimal debt ratio for a cyclical firm under a boom economy, a regular economy and an economy in recession.

- Constraint on Bond Ratings/ Book Debt Ratios

  Alternatively, we can put constraints on the optimal debt ratio to reduce exposure to downside risk. Thus, we could require the firm to have a minimum rating, at the optimal debt ratio or to have a book debt ratio that is less than a "specified" value.

Explore the past: Disney's Operating Income History

Year	EBIT	% Change in EBIT
1987	756	
1988	848	12.17%
1989	1177	38.80%
1990	1368	16.23%
1991	1124	-17.84%
1992	1287	14.50%
1993	1560	21.21%
1994	1804	15.64%
1995	2262	25.39%
1996	3024	33.69%
1997	3945	30.46%
1998	3843	-2.59%
1999	3580	-6.84%
2000	2525	-29.47%
2001	2832	12.16%
2002	2384	-15.82%
2003	2713	13.80%
2004	$4,048	49.21%
2005	$4,107	1.46%
2006	$5,355	30.39%
2007	$6,829	27.53%
2008	$7,404	8.42%

Key questions:
What does a bad year look like for Disney?
How much volatility is there in operating income?

Recession	*Decline in Operating Income*
2008-09	Drop of about 10%
2002	Drop of 15.82%
1991	Drop of 22.00%
1981-82	Increased

What if?
Examining the sensitivity of the optimal debt ratio..

EBITDA drops by	EBITDA	Optimal Debt ratio
0%	$8,319	40%
5%	$7,903	40%
10%	$7,487	40%
15%	$7,071	40%
20%	$6,655	30%

Constraints on Ratings

- Management often specifies a 'desired Rating' below which they do not want to fall.
- The rating constraint is driven by three factors
  - it is one way of protecting against downside risk in operating income
  - a drop in ratings might affect operating income (indirect bankruptcy costs)
  - there is an ego factor associated with high ratings
- Caveat: Every Rating Constraint Has A Cost.
  - Every rating constraint, if binding, will create a cost.
  - Managers should be provided with an estimate of the cost of a specified ratings constraint so that they can decide whether the benefits exceed the costs.

Ratings Constraints for Disney

- At its optimal debt ratio of 40%, Disney has an estimated rating of A.
- If managers insisted on a AA rating, the optimal debt ratio for Disney is then 30% and the cost of the ratings constraint is fairly small:
  - Cost of AA Rating Constraint = Value at 40% Debt – Value at 30% Debt
    = $63,651 – $63,596 = $55 million
- If managers insisted on a AAA rating, the optimal debt ratio would drop to 20% and the cost of the ratings constraint would rise:
  - Cost of AAA rating constraint = Value at 40% Debt – Value at 20% Debt
    = $63,651 - $62,371 = $1,280 million

3. What if you do not buy back stock..

- The optimal debt ratio is ultimately a function of the underlying riskiness of the business in which you operate and your tax rate.
- Will the optimal be different if you invested in projects instead of buying back stock?
  - No. As long as the projects financed are in the same business mix that the company has always been in and your tax rate does not change significantly.
  - Yes, if the projects are in entirely different types of businesses or if the tax rate is significantly different.

Extension to a family group company: Tata Chemical's Optimal Capital Structure

Actual

Business	Cost of equity	Pre-tax cost of debt	After-tax cost of debt	D/(D+E)	Cost of capital
Fertilizers	14.14%	10.0%	6.60%	34.02%	11.58%
Chemicals	13.58%	10.0%	6.60%	34.02%	11.21%
Tata Chemicals	13.93%	10.0%	6.60%	34.02%	11.44%

Optimal

Debt Ratio	Beta	Cost of Equity	Bond Rating	Interest rate on debt	Tax Rate	Cost of Debt (after-tax)	WACC	Firm Value (G)
0%	0.70	11.39%	AAA	8.25%	33.99%	5.45%	11.39%	Rs 79,626
10%	0.75	11.93%	A+	9.25%	33.99%	6.11%	11.35%	Rs 80,084
20%	0.82	12.61%	BB	12.00%	33.99%	7.92%	11.67%	Rs 76,586
30%	0.90	13.48%	B-	15.50%	33.99%	10.23%	12.51%	Rs 68,768
40%	1.01	14.64%	CC	19.00%	33.99%	12.54%	13.80%	Rs 59,257
50%	1.23	16.98%	C	22.00%	24.43%	16.63%	16.80%	Rs 44,637
60%	1.58	20.64%	D	27.00%	16.59%	22.52%	21.77%	Rs 31,272
70%	2.11	26.19%	D	27.00%	14.22%	23.16%	24.07%	Rs 27,325
80%	3.17	37.28%	D	27.00%	12.44%	23.64%	26.37%	Rs 24,189
90%	6.33	70.56%	D	27.00%	11.06%	24.01%	28.67%	Rs 21,638

Tata Chemical looks like it is over levered (34% actual versus 10% optimal), but it is tough to tell without looking at the rest of the group.

Extension to a firm with volatile earnings: Aracruz's Optimal Debt Ratio

Cost of debt includes default spread for Brazil.

Debt Ratio	Beta	Cost of Equity	Bond Rating	Interest rate on debt	Tax Rate	Cost of Debt (after-tax)	WACC	Firm Value (G)
0%	1.01	13.52%	AAA	7.25%	34.00%	4.79%	13.52%	R$ 17,424
10%	1.08	14.26%	A-	9.00%	34.00%	5.94%	13.42%	R$ 17,600
20%	1.17	15.17%	B-	14.50%	34.00%	9.57%	14.05%	R$ 16,511
30%	1.29	16.36%	CC	18.00%	33.83%	11.91%	15.03%	R$ 15,062
40%	1.53	18.75%	C	21.00%	21.75%	16.43%	17.82%	R$ 11,994
50%	1.87	22.13%	D	26.00%	14.05%	22.35%	22.24%	R$ 9,012
60%	2.34	26.79%	D	26.00%	11.71%	22.95%	24.49%	R$ 7,975
70%	3.12	34.55%	D	26.00%	10.04%	23.39%	26.74%	R$ 7,140
80%	4.68	50.08%	D	26.00%	8.78%	23.72%	28.99%	R$ 6,452
90%	9.36	96.66%	D	26.00%	7.81%	23.97%	31.24%	R$ 5,875

Using Aracruz's actual operating income in 2008, an abysmal year, yields an optimal debt ratio of 0%. Applying Aracruz's average pretax operating margin between 2004 and 2008 of 27.24% to 2008 revenues of $R 3,697 million to get a normalized operating income of R$ 1,007 million. That is the number used in computing the optimal debt ratio in this table.

Extension to a private business
Optimal Debt Ratio for Bookscape

Debt Ratio	Beta	Cost of Equity	Bond Rating	Interest rate on debt	Tax Rate	Cost of Debt (after-tax)	Cost of capital	Firm Value (G)
0%	1.98	15.38%	AAA	4.75%	40.00%	2.85%	15.38%	$20,701.79
10%	2.11	16.18%	AAA	4.75%	40.00%	2.85%	14.84%	$21,728.94
20%	2.28	17.17%	AAA	4.75%	40.00%	2.85%	14.30%	$22,858.84
30%	2.49	18.44%	A	6.00%	40.00%	3.60%	13.99%	$23,572.02
40%	2.77	20.14%	A-	6.50%	40.00%	3.90%	13.64%	$24,403.93
50%	3.17	22.51%	BB	8.50%	40.00%	5.10%	13.81%	$24,000.23
60%	3.76	26.08%	B	10.75%	40.00%	6.45%	14.30%	$22,861.61
70%	4.75	32.02%	B-	12.00%	40.00%	7.20%	14.65%	$22,128.00
80%	6.73	43.90%	CC	15.50%	40.00%	9.30%	16.22%	$19,282.19
90%	13.20	82.73%	CC	15.50%	37.03%	9.76%	17.06%	$18,039.01

No market value because it is a private firm. Hence, we estimated value:
Estimated Market Value of Equity (in ‘000s) = Net Income for Bookscape *
Average PE for Publicly Traded Book Retailers = 1,500 * 10 = $15,000
Estimated Market Value of Debt = PV of leases= $9.6 milliion

Limitations of the Cost of Capital approach

- It is static: The most critical number in the entire analysis is the operating income. If that changes, the optimal debt ratio will change.
- It ignores indirect bankruptcy costs: The operating income is assumed to stay fixed as the debt ratio and the rating changes.
- Beta and Ratings: It is based upon rigid assumptions of how market risk and default risk get borne as the firm borrows more money and the resulting costs.

II. Enhanced Cost of Capital Approach

- Distress cost affected operating income: In the enhanced cost of capital approach, the indirect costs of bankruptcy are built into the expected operating income. As the rating of the firm declines, the operating income is adjusted to reflect the loss in operating income that will occur when customers, suppliers and investors react.
- Dynamic analysis: Rather than look at a single number for operating income, you can draw from a distribution of operating income (thus allowing for different outcomes).

Estimating the Distress Effect- Disney

Rating	Drop in EBITDA
A- or higher	No effect
A-	2.00%
BBB	10.00%
BB+	20.00%
B-	25.00%
CCC	40.00%
D	50.00%

Indirect bankruptcy costs manifest themselves, when the rating drops to A- and then start becoming larger as the rating drops below investment grade.

The Optimal Debt Ratio with Indirect Bankruptcy Costs

Debt Ratio	Bond Rating	Cost of Capital	Firm Value (G)
0%	AAA	7.90%	$58,522
10%	AAA	7.68%	$60,384
20%	AAA	7.45%	$62,368
30%	A+	7.42%	$62,707
40%	CCC	9.18%	$24,987
50%	C	12.77%	$17,569
60%	C	14.27%	$15,630
70%	C	15.77%	$14,077
80%	C	17.27%	$12,804
90%	C	18.77%	$11,743

The optimal debt ratio drops to 30% from the original computation of 40%.

Extending this approach to analyzing Financial Service Firms

- Interest coverage ratio spreads, which are critical in determining the bond ratings, have to be estimated separately for financial service firms; applying manufacturing company spreads will result in absurdly low ratings for even the safest banks and very low optimal debt ratios.
- It is difficult to estimate the debt on a financial service company's balance sheet. Given the mix of deposits, repurchase agreements, short-term financing, and other liabilities that may appear on a financial service firm's balance sheet, one solution is to focus only on long-term debt, defined tightly, and to use interest coverage ratios defined using only long-term interest expenses.
- Financial service firms are regulated and have to meet capital ratios that are defined in terms of book value. If, in the process of moving to an optimal market value debt ratio, these firms violate the book capital ratios, they could put themselves in jeopardy.

An alternative approach based on Regulatory Capital

- Rather than try to bend the cost of capital approach to breaking point, we will adopt a different approach for financial service firms where we estimate debt capacity based on regulatory capital.
- Consider a bank with $ 100 million in loans outstanding and a book value of equity of $ 6 million. Furthermore, assume that the regulatory requirement is that equity capital be maintained at 5% of loans outstanding. Finally, assume that this bank wants to increase its loan base by $ 50 million to $ 150 million and to augment its equity capital ratio to 7% of loans outstanding.

Loans outstanding after Expansion		= $ 150 million
* Equity/Capital ratio desired	= 7%	
= Equity after expansion		= $10.5 million
Existing Equity		= $ 6.0 million
New Equity needed	= $ 4.5 million	

  - This can come from retained earnings or from new equity issues.

Financing Strategies for a financial institution

- The Regulatory minimum strategy: In this strategy, financial service firms try to stay with the bare minimum equity capital, as required by the regulatory ratios. In the most aggressive versions of this strategy, firms exploit loopholes in the regulatory framework to invest in those businesses where regulatory capital ratios are set too low (relative to the risk of these businesses).
- The Self-regulatory strategy: The objective for a bank raising equity is not to meet regulatory capital ratios but to ensure that losses from the business can be covered by the existing equity. In effect, financial service firms can assess how much equity they need to hold by evaluating the riskiness of their businesses and the potential for losses.
- Combination strategy: In this strategy, the regulatory capital ratios operate as a floor for established businesses, with the firm adding buffers for safety where needed..

Deutsche Bank's Financing Mix

- Deutsche Bank has generally been much more conservative in its use of equity capital. In October 2008, it raised its Tier 1 Capital Ratio to 10%, well above the Basel 1 regulatory requirement of 6%.
- While its loss of 4.8 billion Euros in the last quarter of 2008 did reduce equity capital, Deutsche Bank was confident (at least as of the first part of 2009) that it could survive without fresh equity infusions or government bailouts. In fact, Deutsche Bank reported net income of 1.2 billion Euros for the first quarter of 2009 and a Tier 1 capital ratio of 10.2%.
- If the capital ratio had dropped below 10%, the firm would have had to raise fresh equity.

Determinants of the Optimal Debt Ratio: 1. The marginal tax rate

- The primary benefit of debt is a tax benefit. The higher the marginal tax rate, the greater the benefit to borrowing:

Tax Rate	Disney	Aracruz	Tata Chemicals	Bookscape
0%	0%	0%	0%	0%
10%	0%	0%	0%	20%
20%	20%	0%	0%	20%
30%	30%	10%	0%	40%
40%	50%	10%	10%	40%
50%	60%	20%	20%	50%

2. Pre-tax Cash flow Return

- Firms that have more in operating income and cash flows, relative to firm value (in market terms), should have higher optimal debt ratios. We can measure operating income with EBIT and operating cash flow with EBITDA.

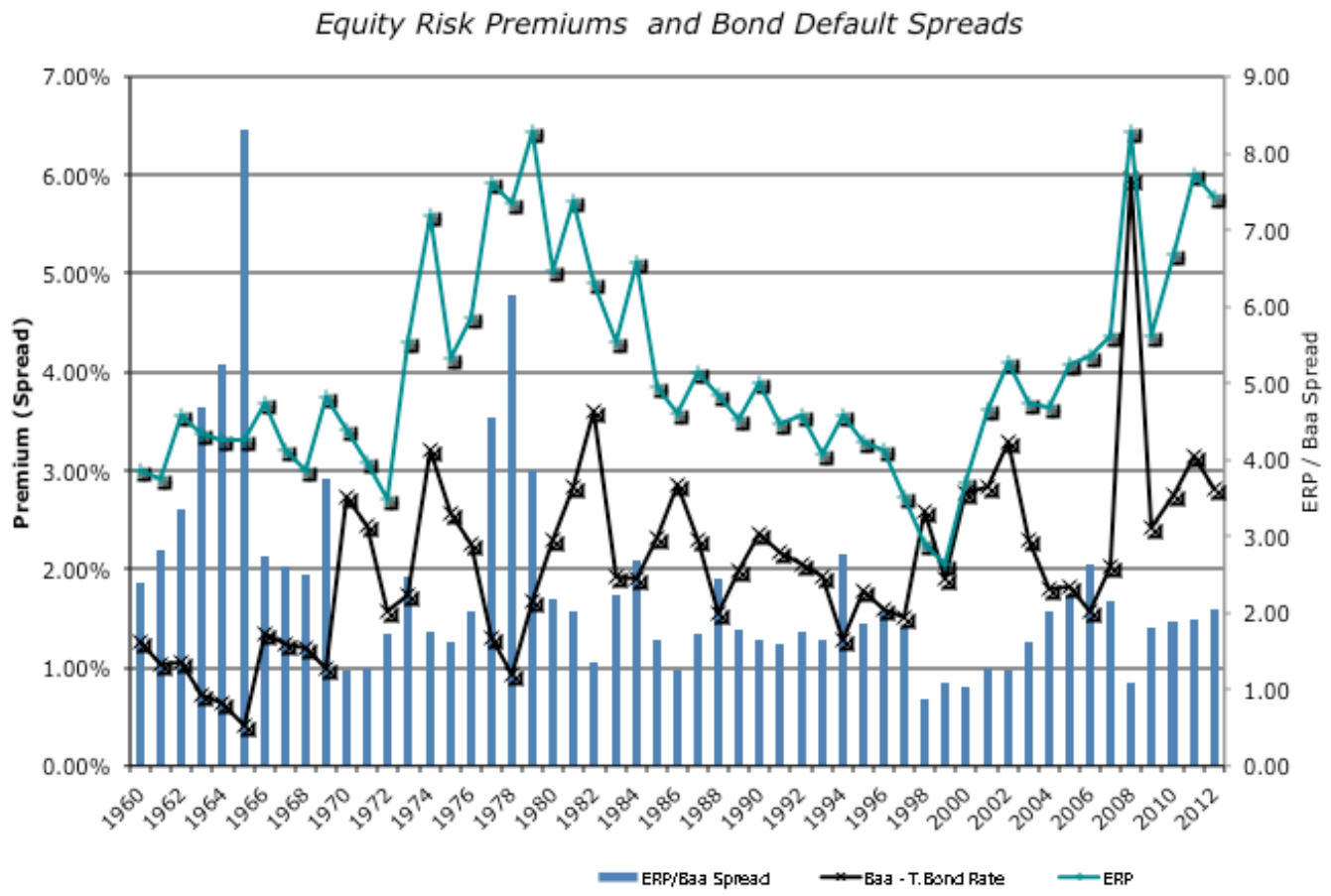
Cash flow potential = EBITDA/ (Market value of equity + Debt)

- Disney, for example, has operating income of $6,829 million, which is 11% of the market value of the firm of $61,875 million in the base case, and an optimal debt ratio of 40%. Increasing the operating income to 15% of the firm value will increase the optimal debt ratio to 60%.
- In general, growth firms will have lower cash flows, as a percent of firm value, and lower optimal debt ratios.

3. Operating Risk

- Firms that face more risk or uncertainty in their operations (and more variable operating income as a consequence) will have lower optimal debt ratios than firms that have more predictable operations.
- Operating risk enters the cost of capital approach in two places:
  - Unlevered beta: Firms that face more operating risk will tend to have higher unlevered betas. As they borrow, debt will magnify this already large risk and push up costs of equity much more steeply.
  - Bond ratings: For any given level of operating income, firms that face more risk in operations will have lower ratings. The ratings are based upon normalized income.

4. The only macro determinant: Equity vs Debt Risk Premiums



6 Application Test: Your firm's optimal financing mix

- Using the optimal capital structure spreadsheet provided:
  1. Estimate the optimal debt ratio for your firm
  2. Estimate the new cost of capital at the optimal
  3. Estimate the effect of the change in the cost of capital on firm value
  4. Estimate the effect on the stock price
- In terms of the mechanics, what would you need to do to get to the optimal immediately?

III. The APV Approach to Optimal Capital Structure

- In the adjusted present value approach, the value of the firm is written as the sum of the value of the firm without debt (the unlevered firm) and the effect of debt on firm value

  Firm Value = Unlevered Firm Value + (Tax Benefits of Debt - Expected Bankruptcy Cost from the Debt)

- The optimal dollar debt level is the one that maximizes firm value

Implementing the APV Approach

- Step 1: Estimate the unlevered firm value. This can be done in one of two ways:
  - Estimating the unlevered beta, a cost of equity based upon the unlevered beta and valuing the firm using this cost of equity (which will also be the cost of capital, with an unlevered firm)
  - Alternatively, Unlevered Firm Value = Current Market Value of Firm - Tax Benefits of Debt (Current) + Expected Bankruptcy cost from Debt
- Step 2: Estimate the tax benefits at different levels of debt. The simplest assumption to make is that the savings are perpetual, in which case
  - Tax benefits = Dollar Debt * Tax Rate
- Step 3: Estimate a probability of bankruptcy at each debt level, and multiply by the cost of bankruptcy (including both direct and indirect costs) to estimate the expected bankruptcy cost.

Estimating Expected Bankruptcy Cost

- Probability of Bankruptcy
  - Estimate the synthetic rating that the firm will have at each level of debt
  - Estimate the probability that the firm will go bankrupt over time, at that level of debt (Use studies that have estimated the empirical probabilities of this occurring over time - Altman does an update every year)
- Cost of Bankruptcy
  - The direct bankruptcy cost is the easier component. It is generally between 5-10% of firm value, based upon empirical studies
  - The indirect bankruptcy cost is much tougher. It should be higher for sectors where operating income is affected significantly by default risk (like airlines) and lower for sectors where it is not (like groceries)

Ratings and Default Probabilities: Results from Altman study of bonds

Rating	Likelihood of Default
AAA	0.07%
AA	0.51%
A+	0.60%
A	0.66%
A-	2.50%
BBB	7.54%
BB	16.63%
B+	25.00%
B	36.80%
B-	45.00%
CCC	59.01%
CC	70.00%
C	85.00%
D	100.00%

Altman estimated these probabilities by looking at bonds in each ratings class ten years prior and then examining the proportion of these bonds that defaulted over the ten years.

Disney: Estimating Unlevered Firm Value

Current Market Value of the Firm = = $45,193 + $16,682 = $ 61,875

- Tax Benefit on Current Debt = $16,682 * 0.38 = $ 6,339

+ Expected Bankruptcy Cost = 0.66% * (0.25 * 61,875) = $ 102

Unlevered Value of Firm = = $ 55,638

- Cost of Bankruptcy for Disney = 25% of firm value
- Probability of Bankruptcy = 0.66%, based on firm's current rating of A
- Tax Rate = 38%

Disney: APV at Debt Ratios

Debt Ratio	$ Debt	Tax Rate	Unlevered Firm Value	Tax Benefits	Expected Bankruptcy Cost	Value of Levered Firm
0%	$0	38.00%	$55,638	$0	$10	$55,629
10%	$6,188	38.00%	$55,638	$2,351	$10	$57,979
20%	$12,375	38.00%	$55,638	$4,703	$11	$60,330
30%	$18,563	38.00%	$55,638	$7,054	$94	$62,598
40%	$24,750	38.00%	$55,638	$9,405	$107	$64,936
50%	$30,938	38.00%	$55,638	$11,756	$421	$66,973
60%	$37,125	38.00%	$55,638	$14,108	$6,417	$63,329
70%	$43,313	38.00%	$55,638	$16,459	$10,636	$61,461
80%	$49,500	38.00%	$55,638	$18,810	$10,983	$63,466
90%	$55,688	34.52%	$55,638	$19,223	$11,044	$63,817

The optimal debt ratio is 50%, which is the point at which firm value is maximized.

IV. Relative Analysis

- The "safest" place for any firm to be is close to the industry average
- Subjective adjustments can be made to these averages to arrive at the right debt ratio.
  - Higher tax rates -> Higher debt ratios (Tax benefits)
  - Lower insider ownership -> Higher debt ratios (Greater discipline)
  - More stable income -> Higher debt ratios (Lower bankruptcy costs)
  - More intangible assets -> Lower debt ratios (More agency problems)

Comparing to industry averages

				Book Debt Ratio		*Market Debt Ratio*	
Company	*Book Debt Ratio*	*Market Debt Ratio*	*Comparable group*	*Average*	*Median*	*Average*	*Median*
Disney	32.89%	26.96%	US Entertainment companies	47.76%	43.59%	36.90%	37.83%
Aracruz	91.01%	52.47%	Emerging Market Paper companies	38.11%	40.74%	33.75%	34.22%
Tata Chemicals	42.95%	34.02%	Emerging Market chemical companies	33.88%	34.76%	25.56%	21.34%

Getting past simple averages

Step 1: Run a regression of debt ratios on the variables that you believe determine debt ratios in the sector. For example,

Debt Ratio = a + b (Tax rate) + c (Earnings Variability) + d (EBITDA/ Firm Value)

Check this regression for statistical significance (t statistics) and predictive ability (R squared)

Step 2: Estimate the values of the proxies for the firm under consideration. Plugging into the cross sectional regression, we can obtain an estimate of predicted debt ratio.

Step 3: Compare the actual debt ratio to the predicted debt ratio.

Applying the Regression Methodology: Entertainment Firms

- Using a sample of 80 entertainment firms, we arrived at the following regression:

Debt to Capital = 0.049 + 0.543 (Effective tax rate) + 0.692 (EBITDA/Firm Value)

(1.07) (4.10[a]) (4.08[a])

- The R squared of the regression is 40%. This regression can be used to arrive at a predicted value for Disney of:
- Predicted Debt Ratio = 0.049 + 0.543 (0.372) + 0.692 (0.1735) = 0.3710 or 37.10%
- Based upon the capital structure of other firms in the entertainment industry, Disney should have a market value debt ratio of 37.1%.

Extending to the entire market

- Using 2008 data for firms listed on the NYSE, AMEX and NASDAQ data bases. The regression provides the following results –

  DFR = 0.327 - 0.064 Intangible % – 0.138 CLSH + 0.026 E/V – 0.878 GEPS

  (25.45a) (2.16a) (2.88a) (1.25) (12.6a)

  where,

  DFR = Debt / (Debt + Market Value of Equity)

  Intangible % = Intangible Assets/ Total Assets (in book value terms)

  CLSH = Closely held shares as a percent of outstanding shares

  E/V = EBITDA/ (Market Value of Equity + Debt- Cash)

  GEPS = Expected growth rate in EPS

- The regression has an R-squared of 13%.

Applying the Regression

- Disney had the following values for these inputs in 2008. Estimate the optimal debt ratio using the debt regression.
  - Intangible Assets = 24%
  - Closely held shares as percent of shares outstanding = 7.7%
  - EBITDA/Value = 17.35%
  - Expected growth in EPS = 6.5%

Optimal Debt Ratio

= 0.327 - 0.064 (0.24) – 0.138 (0.077) + 0.0.26 (0.1735) – 0.878 (0.065)

= 0.2891 or 28.91%

- What does this optimal debt ratio tell you?

- Why might it be different from the optimal calculated using the weighted average cost of capital?

Summarizing the optimal debt ratios…

	Disney	*Aracruz*	*Tata Chemicals*
Actual Debt Ratio	27%	52.58%	34.02%
Optimal			
I. Operating income	50.00%	—	-
II. Standard Cost of capital	40.00%	10.00%	10.00%
III. Enhanced Cost of Capital	30.00%	10.00%	10.00%
IV. APV	50.00%	20.00%	10.00%
V. Comparable			
To industry	37.10%	34.22%	21.34%
To market	28.91%	—	-