Debt: Summarizing the trade off

Advantages of Debt	*Disadvantages of debt*
1. Tax Benefit: Interest expenses on debt are tax deductible but cash flows to equity are generally not. *Implication: The higher the marginal tax rate, the greater the benefits of debt.*	**1. Expected Bankruptcy Cost**: The expected cost of going bankrupt is a product of the probability of going bankrupt and the cost of going bankrupt. The latter includes both direct and indirect costs. The probability of going bankrupt will be higher in businesses with more volatile earnings and the cost of bankruptcy will also vary across businesses. *Implication:* *1. Firms with more stable earnings should borrow more, for any given level of earnings.* *2. Firms with lower bankruptcy costs should borrow more, for any given level of earnings.*
2. Added Discipline: Borrowing money may force managers to think about the consequences of the investment decisions a little more carefully and reduce bad investments. *Implication: As the separation between managers and stockholders increases, the benefits to using debt will go up.*	**2. Agency Costs**: Actions that benefit equity investors may hurt lenders. The greater the potential for this conflict of interest, the greater the cost borne by the borrower (as higher interest rates or more covenants). *Implication: Firms where lenders can monitor/ control how their money is being used should be able to borrow more than firms where this is difficult to do.*
	3. Loss of flexibility: Using up available debt capacity today will mean that you cannot draw on it in the future. This loss of flexibility can be disastrous if funds are needed and access to capital is shut off. *Implication:* 1. *Firms that can forecast future funding needs better should be able to borrow more.* 2. *Firms with better access to capital markets should be more willing to borrow more today.*

The Trade off for Disney, Vale, Tata Motors and Baidu

Debt trade off	*Discussion of relative benefits/costs*
Tax benefits	Marginal tax rates of 40% in US (Disney & Bookscape), 32.5% in India (Tata Motors), 25% in China (Baidu) and 34% in Brazil (Vale), but there is an offsetting tax benefit for equity in Brazil (interest on equity capital is deductible).
Added Discipline	The benefits should be highest at Disney, where there is a clear separation of ownership and management and smaller at the remaining firms.
Expected Bankruptcy Costs	Volatility in earnings: Higher at Baidu (young firm in technology), Tata Motors (cyclicality) and Vale (commodity prices) and lower at Disney (diversified across entertainment companies). Indirect bankruptcy costs likely to be highest at Tata Motors, since it's products (automobiles) have long lives and require service and lower at Disney and Baidu.
Agency Costs	Highest at Baidu, largely because it's assets are intangible and it sells services and lowest at Vale (where investments are in mines, highly visible and easily monitored) and Tata Motors (tangible assets, family group backing). At Disney, the agency costs will vary across its business, higher in the movie and broadcasting businesses and lower at theme parks.
Flexibility needs	Baidu will value flexibility more than the other firms, because technology is a shifting and unpredictable business, where future investment needs are difficult to forecast. The flexibility needs should be lower at Disney and Tata Motors, since they are mature companies with well-established investment needs. At Vale, the need for investment funds may vary with commodity prices, since the firm grows by acquiring both reserves and smaller companies. At Bookscape, the difficulty of accessing external capital will make flexibility more necessary.

⌛ Application Test: Would you expect your firm to gain or lose from using a lot of debt?

- Considering, for your firm,
  - The potential tax benefits of borrowing
  - The benefits of using debt as a disciplinary mechanism
  - The potential for expected bankruptcy costs
  - The potential for agency costs
  - The need for financial flexibility
- Would you expect your firm to have a high debt ratio or a low debt ratio?
- Does the firm's current debt ratio meet your expectations?

A Hypothetical Scenario

Assume that you live in a world where

(a) There are no taxes

(b) Managers have stockholder interests at heart and do what's best for stockholders.

(c) No firm ever goes bankrupt

(d) Equity investors are honest with lenders; there is no subterfuge or attempt to find loopholes in loan agreements.

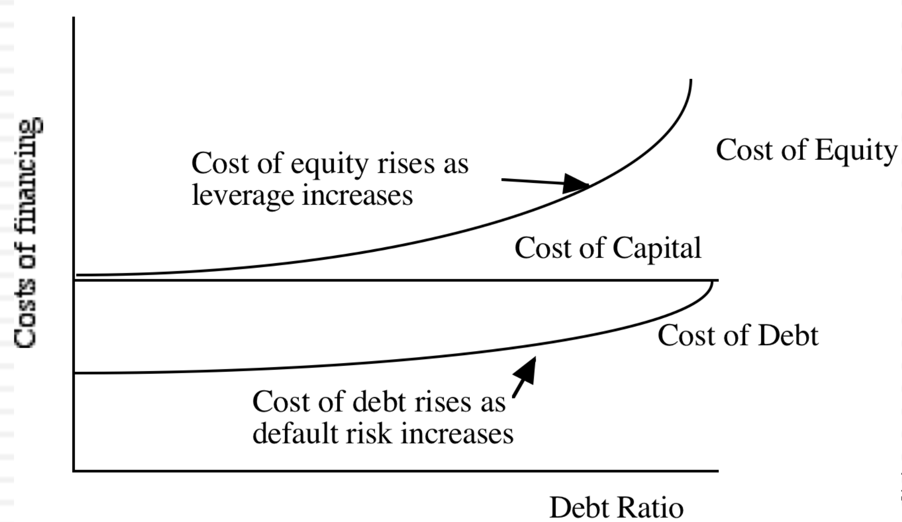
(e) Firms know their future financing needs with certainty

- What happens to the trade off between debt and equity? How much should a firm borrow?

The Miller-Modigliani Theorem

- In an environment, where there are no taxes, default risk or agency costs, capital structure is irrelevant.
- If the Miller Modigliani theorem holds:
  - A firm's value will be determined the quality of its investments and not by its financing mix.
  - The cost of capital of the firm will not change with leverage. As a firm increases its leverage, the cost of equity will increase just enough to offset any gains to the leverage.

Figure 7.9: Cost of Capital in the MM World



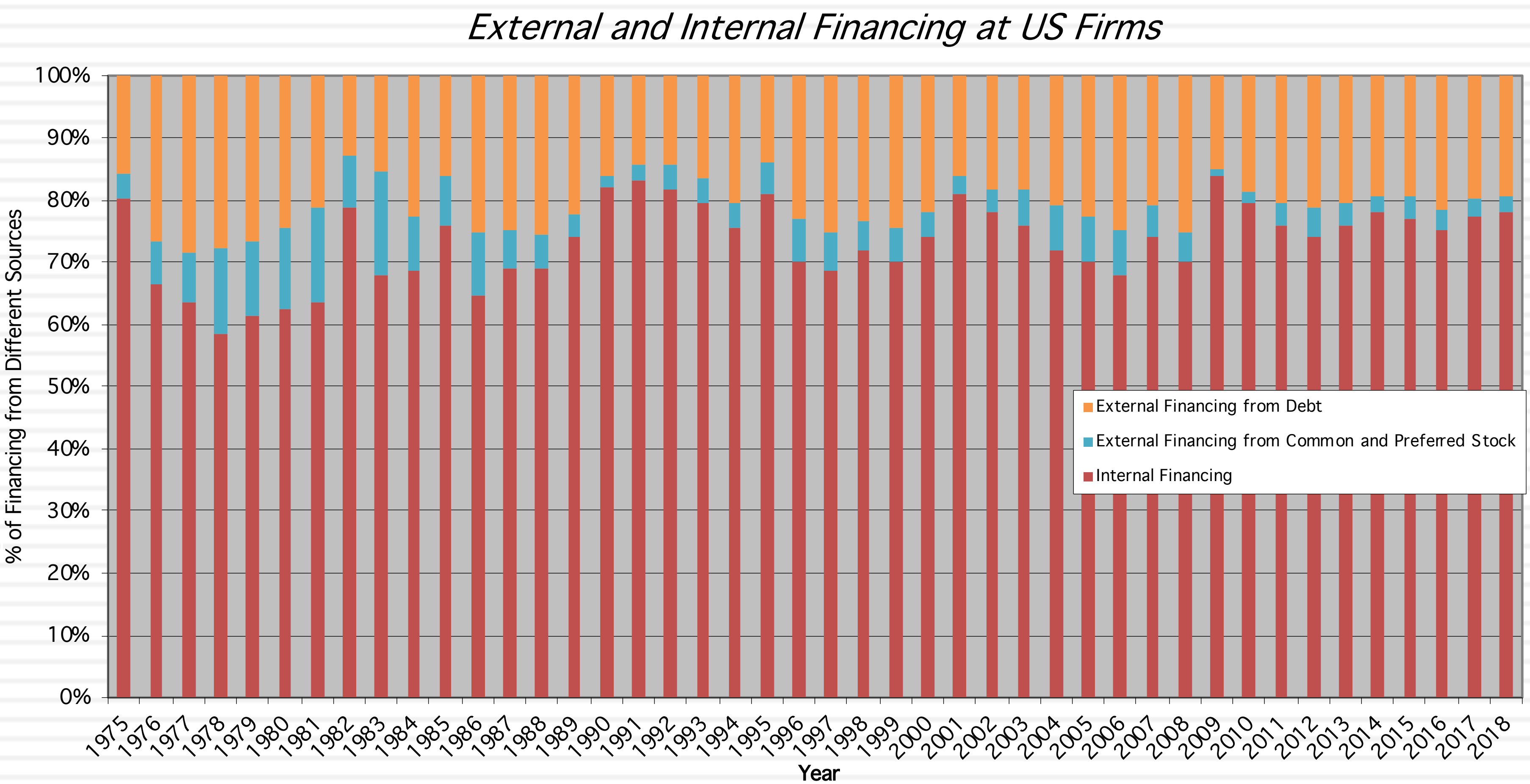
What do firms look at in financing?

- There are some who argue that firms follow a financing hierarchy, with retained earnings being the most preferred choice for financing, followed by debt and that new equity is the least preferred choice. In particular,
  - Managers value flexibility. Managers value being able to use capital (on new investments or assets) without restrictions on that use or having to explain its use to others.
  - Managers value control. Managers like being able to maintain control of their businesses.
- With flexibility and control being key factors:
  - Would you rather use internal financing (retained earnings) or external financing?
  - With external financing, would you rather use debt or equity?

Preference rankings long-term finance: Results of a survey

Ranking	Source	Score
1	Retained Earnings	5.61
2	Straight Debt	4.88
3	Convertible Debt	3.02
4	External Common Equity	2.42
5	Straight Preferred Stock	2.22
6	Convertible Preferred	1.72

And the unsurprising consequences..



Financing Choices

- You are reading the Wall Street Journal and notice a tombstone ad for a company, offering to sell convertible preferred stock. What would you hypothesize about the health of the company issuing these securities?

a. Nothing
b. Healthier than the average firm
c. In much more financial trouble than the average firm

CAPITAL STRUCTURE: FINDING THE RIGHT FINANCING MIX

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

The Big Picture..

- Maximize the value of the business (firm)
  - **The Investment Decision** Invest in assets that earn a return greater than the minimum acceptable hurdle rate
    - The **hurdle rate** should reflect the riskiness of the investment and the mix of debt and equity used to fund it.
    - The **return** should reflect the magnitude and the timing of the cashflows as well as all side effects.
  - **The Financing Decision** Find the right kind of debt for your firm and the right mix of debt and equity to fund your operations
    - The **optimal mix** of debt and equity maximizes firm value
    - The **right kind** of debt matches the tenor of your assets
  - **The Dividend Decision** If you cannot find investments that make your minimum acceptable rate, return the cash to owners of your business
    - **How much cash** you can return depends upon current & potential investment opportunities
    - **How you choose** to return cash to the owners will depend on whether they prefer dividends or buybacks

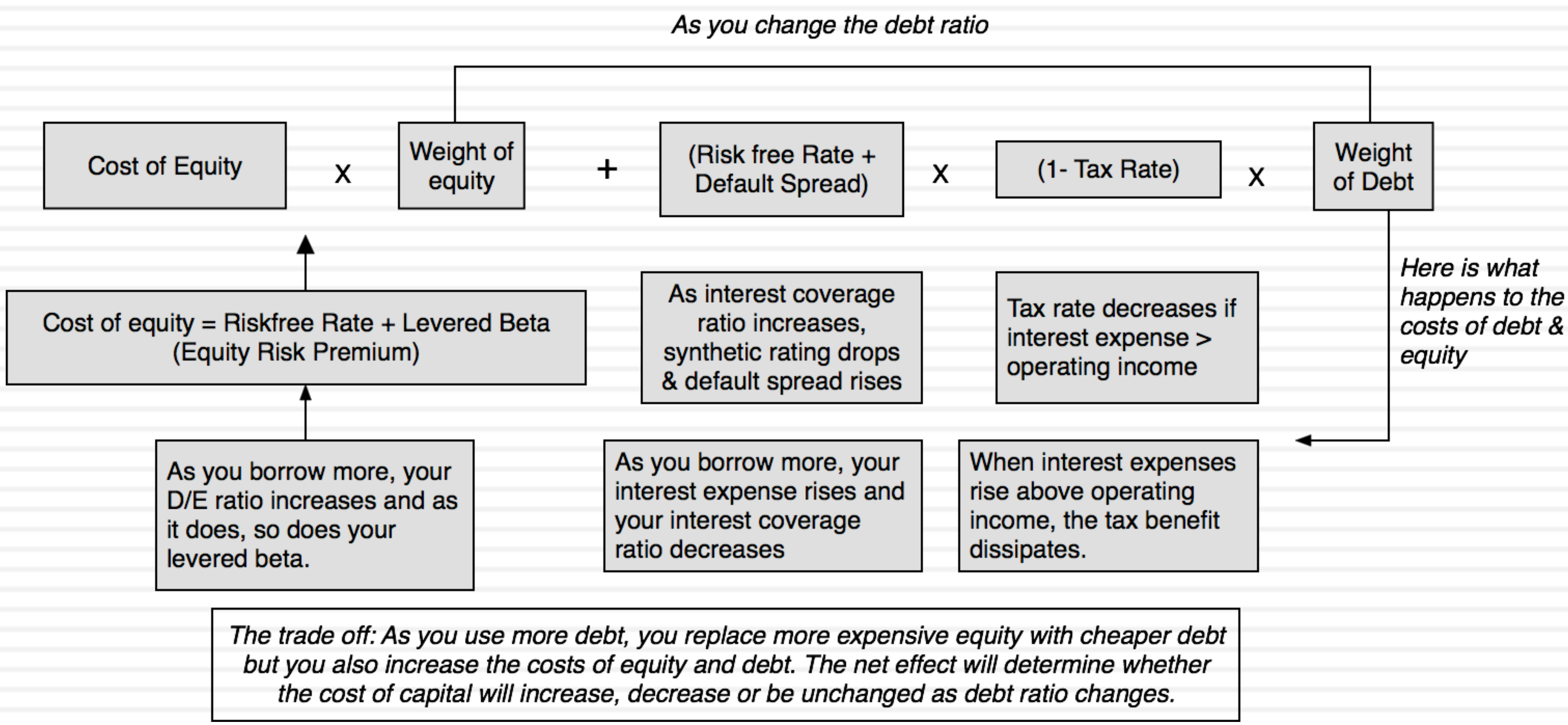
Pathways to the Optimal

1. The Cost of Capital Approach: The optimal debt ratio is the one that minimizes the cost of capital for a firm.
2. 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.
3. The Adjusted Present Value Approach: The optimal debt ratio is the one that maximizes the overall value of the firm.
4. The Sector Approach: The optimal debt ratio is the one that brings the firm closes to its peer group in terms of financing mix.
5. 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.
- Cost of Capital = Cost of Equity (E/(D+E)) + Pre-tax Cost of Debt (1- t) (D/(D+E))
  - The question then becomes a simple one. As the debt ratio changes, how does the cost of capital change?

The Debt Trade off on the Cost of Capital



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

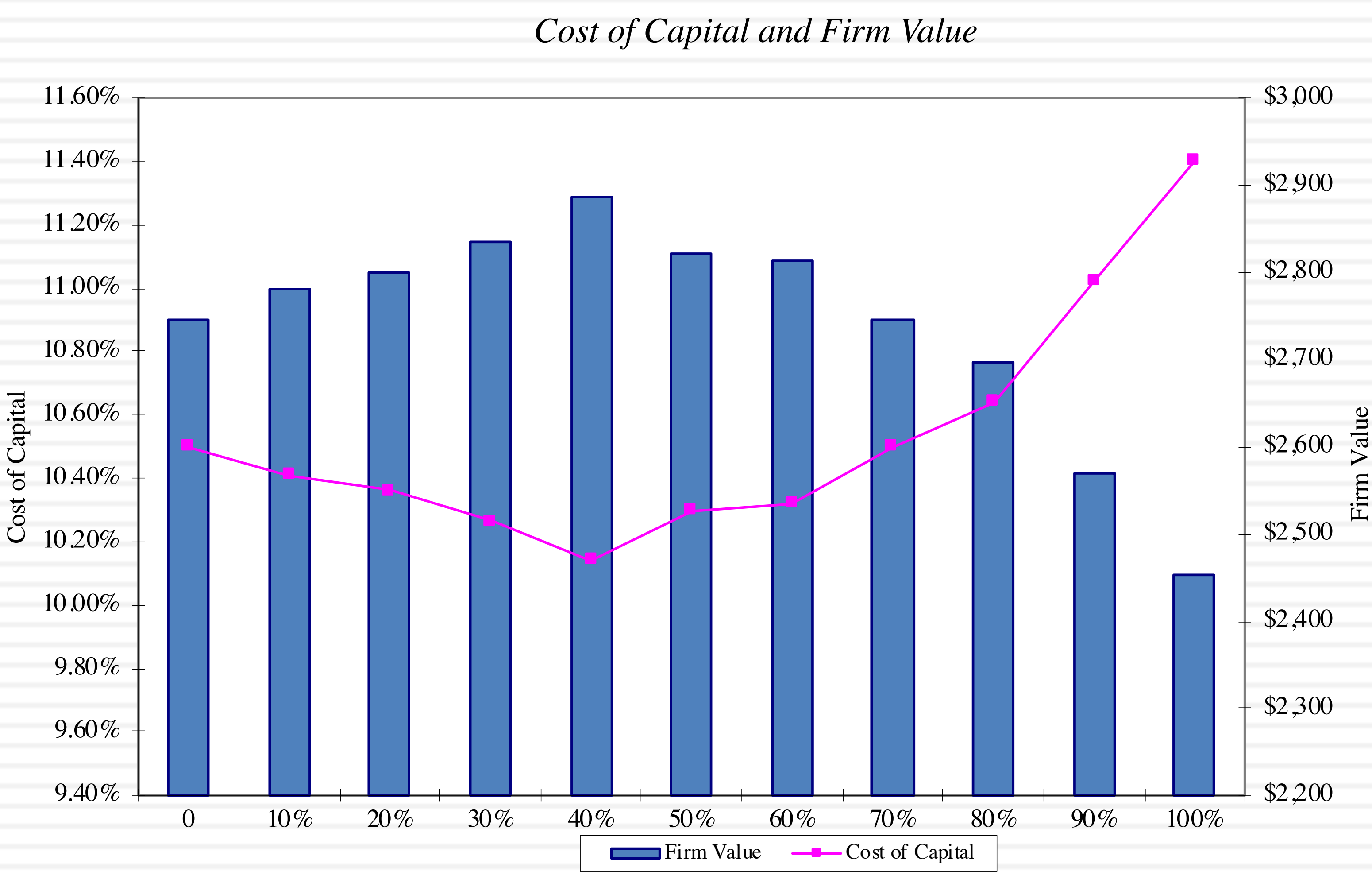
Applying Cost of Capital Approach: The Textbook Example

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…



Current Cost of Capital: Disney

- The beta for Disney's stock in November 2013 was 1.0013. The T. bond rate at that time was 2.75%. Using an estimated equity risk premium of 5.76%, we estimated the cost of equity for Disney to be 8.52%:

  Cost of Equity = 2.75% + 1.0013(5.76%) = 8.52%

- Disney's bond rating in May 2009 was A, and based on this rating, the estimated pretax cost of debt for Disney is 3.75%. Using a marginal tax rate of 36.1, the after-tax cost of debt for Disney is 2.40%.

  After-Tax Cost of Debt = 3.75% (1 – 0.361) = 2.40%

- The cost of capital was calculated using these costs and the weights based on market values of equity (121,878) and debt (15.961):

  Cost of capital =

$$= 8.52\% \frac{121{,}878}{(15{,}961+121{,}878)} + 2.40\% \frac{15{,}961}{(15{,}961+121{,}878)} = 7.81\%$$

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

- **The Regression Beta**: One approach is to use the regression beta (1.25) and then unlever, using the average debt to equity ratio (19.44%) during the period of the regression to arrive at an unlevered beta.

Unlevered beta = = 1.25 / (1 + (1 - 0.361)(0.1944))= 1.1119

- **The Bottom up Beta**: Alternatively, we can back to the source and estimate it from the betas of the businesses.

Business	*Revenues*	*EV/Sales*	*Value of Business*	*Proportion of Disney*	*Unlevered beta*	*Value*	*Proportion*
Media Networks	$20,356	3.27	$66,580	49.27%	1.03	$66,579.81	49.27%
Parks & Resorts	$14,087	3.24	$45,683	33.81%	0.70	$45,682.80	33.81%
Studio Entertainment	$5,979	3.05	$18,234	13.49%	1.10	$18,234.27	13.49%
Consumer Products	$3,555	0.83	$2,952	2.18%	0.68	$2,951.50	2.18%
Interactive	$1,064	1.58	$1,684	1.25%	1.22	$1,683.72	1.25%
Disney Operations	**$45,041**		**$135,132**	**100.00%**	**0.9239**	**$135,132.11**	**100.00%**

2. Get Disney's current financials…

	Most recent fiscal year (2012-13)	Prior year
Revenues	$45,041	$42,278
EBITDA	$10,642	$10,850
Depreciation & Amortization	$2,192	$1,987
EBIT	$9,450	$8,863
Interest Expenses	$349	$564
EBITDA (adjusted for leases)	$12,517	$11,168
Depreciation (adjusted for leases)	$ 2,485	$2,239
EBIT (adjusted for leases)	$10,032	$8,929
Interest Expenses (adjusted for leases)	$459	$630

I. Cost of Equity

Debt to Capital Ratio	D/E Ratio	Levered Beta	Cost of Equity
0%	0.00%	0.9239	8.07%
10%	11.11%	0.9895	8.45%
20%	25.00%	1.0715	8.92%
30%	42.86%	1.1770	9.53%
40%	66.67%	1.3175	10.34%
50%	100.00%	1.5143	11.48%
60%	150.00%	1.8095	13.18%
70%	233.33%	2.3016	16.01%
80%	400.00%	3.2856	21.68%
90%	900.00%	6.2376	38.69%

Levered Beta = 0.9239 (1 + (1- .361) (D/E))
Cost of equity = 2.75% + Levered beta * 5.76%

Estimating Cost of Debt

Start with the market value of the firm = = 121,878 + $15,961 = $137,839 million

D/(D+E)	0.00%	10.00%	Debt to capital
D/E	0.00%	11.11%	D/E = 10/90 = .1111
$ Debt	$0	$13,784	10% of $137,839
EBITDA	$12,517	$12,517	Same as 0% debt
Depreciation	$ 2,485	$ 2,485	Same as 0% debt
EBIT	$10,032	$10,032	Same as 0% debt
Interest	$0	$434	Pre-tax cost of debt * $ Debt
Pre-tax Int. cov	∞	23.10	EBIT/ Interest Expenses
Likely Rating	AAA	AAA	From Ratings table
Pre-tax cost of debt	3.15%	3.15%	Riskless Rate + Spread

The Ratings Table

Interest coverage ratio is	*Rating is*	*Spread is*	*Interest rate*
> 8.50	Aaa/AAA	0.40%	3.15%
6.5 – 8.5	Aa2/AA	0.70%	3.45%
5.5 – 6.5	A1/A+	0.85%	3.60%
4.25 – 5.5	A2/A	1.00%	3.75%
3 – 4.25	A3/A-	1.30%	4.05%
2.5 -3	Baa2/BBB	2.00%	4.75%
2.25 –2.5	Ba1/BB+	3.00%	5.75%
2 – 2.25	Ba2/BB	4.00%	6.75%
1.75 -2	B1/B+	5.50%	8.25%
1.5 – 1.75	B2/B	6.50%	9.25%
1.25 -1.5	B3/B-	7.25%	10.00%
0.8 -1.25	Caa/CCC	8.75%	11.50%
0.65 – 0.8	Ca2/CC	9.50%	12.25%
0.2 – 0.65	C2/C	10.50%	13.25%
<0.2	D2/D	12.00%	14.75%

T.Bond rate =2.75%

A Test: Can you do the 30% level?

		Iteration 1 (Debt @AAA rate)	*Iteration 2 (Debt @AA rate)*
D/(D + E)	*20.00%*	*30.00%*	*30.00%*
D/E	25.00%		
$ Debt	$27,568		
EBITDA	$12,517		
Depreciation	$2,485		
EBIT	$10,032		
Interest expense	$868		
Interest coverage ratio	11.55		
Likely rating	AAA		
Pretax cost of debt	3.15%		

Bond Ratings, Cost of Debt and Debt Ratios

Debt Ratio	$ Debt	Interest Expense	Interest Coverage Ratio	Bond Rating	Pre-tax cost of debt	Tax rate	After-tax cost of debt
0%	$0	$0	∞	Aaa/AAA	3.15%	36.10%	2.01%
10%	$13,784	$434	23.10	Aaa/AAA	3.15%	36.10%	2.01%
20%	$27,568	$868	11.55	Aaa/AAA	3.15%	36.10%	2.01%
30%	$41,352	$1,427	7.03	Aa2/AA	3.45%	36.10%	2.20%
40%	$55,136	$2,068	4.85	A2/A	3.75%	36.10%	2.40%
50%	$68,919	$6,892	1.46	B3/B-	10.00%	36.10%	6.39%
60%	$82,703	$9,511	1.05	Caa/CCC	11.50%	36.10%	7.35%
70%	$96,487	$11,096	0.90	Caa/CCC	11.50%	32.64%	7.75%
80%	$110,271	$13,508	0.74	Ca2/CC	12.25%	26.81%	8.97%
90%	$124,055	$16,437	0.61	C2/C	13.25%	22.03%	10.33%

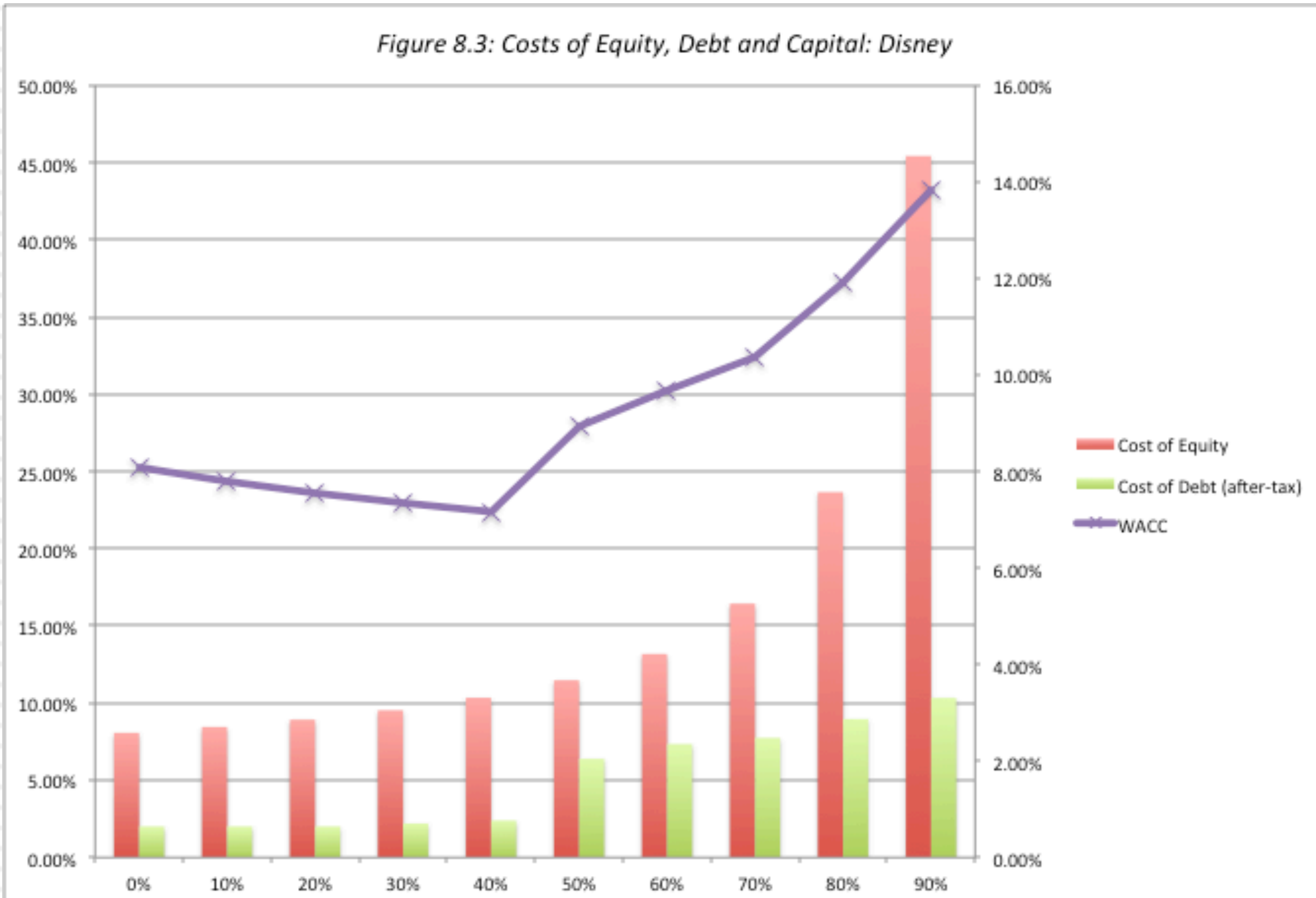
Stated versus Effective Tax Rates

- You need taxable income for interest to provide a tax savings. Note that the EBIT at Disney is $10,032 million. As long as interest expenses are less than $10,032 million, interest expenses remain fully tax-deductible and earn the 36.1% tax benefit. At an 60% debt ratio, the interest expenses are $9,511 million and the tax benefit is therefore 36.1% of this amount.
- At a 70% debt ratio, however, the interest expenses balloon to $11,096 million, which is greater than the EBIT of $10,032 million. We consider the tax benefit on the interest expenses up to this amount:
  - Maximum Tax Benefit = EBIT * Marginal Tax Rate = $10,032 million * 0.361 = $ 3,622 million
  - Adjusted Marginal Tax Rate = Maximum Tax Benefit/Interest Expenses = $3,622/$11,096 = 32.64%

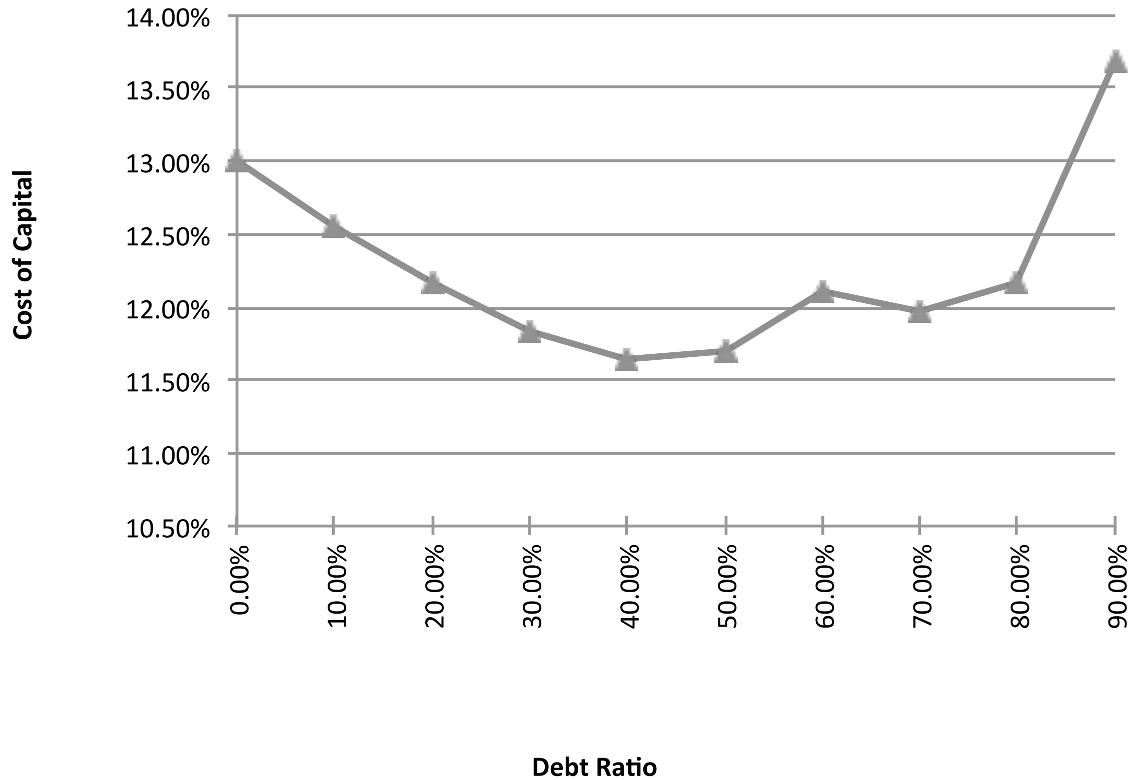
Disney's cost of capital schedule…

Debt Ratio	Beta	Cost of Equity	Cost of Debt (after-tax)	WACC
0%	0.9239	8.07%	2.01%	8.07%
10%	0.9895	8.45%	2.01%	7.81%
20%	1.0715	8.92%	2.01%	7.54%
30%	1.1770	9.53%	2.20%	7.33%
40%	1.3175	10.34%	2.40%	7.16%
50%	1.5143	11.48%	6.39%	8.93%
60%	1.8095	13.18%	7.35%	9.68%
70%	2.3762	16.44%	7.75%	10.35%
80%	3.6289	23.66%	8.97%	11.90%
90%	7.4074	45.43%	10.33%	13.84%

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 $15.96 billion in debt. The optimal dollar debt (at 40%) is roughly $55.1 billion. Disney has excess debt capacity of 39.14 billion.
- To move to its optimal and gain the increase in value, Disney should borrow $ 39.14 billion and buy back stock.
- Given the magnitude of this decision, you should expect to answer three questions:
  - Why should we do it?
  - What if something goes wrong?
  - 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

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

EBIT (1 – Tax Rate) = 10,032 (1 – 0.361) =	\$6,410
+ Depreciation and amortization =	\$2,485
– Capital expenditures =	\$5,239
– Change in noncash working capital	\$0
Free cash flow to the firm =	\$3,657

- Step 2: Back out the implied growth rate in the current market value
  - Current enterprise value = \$121,878 + 15,961 - 3,931 = 133,908
  - Value of firm = \$ 133,908 = $\dfrac{\mathrm{FCFF}_0(1+g)}{(\text{Cost of Capital -g})} = \dfrac{3,657(1+g)}{(.0781\ \text{-g})}$
  - Growth rate = (Firm Value * Cost of Capital – CF to Firm)/(Firm Value + CF to Firm)
  - = (133,908* 0.0781 – 3,657)/(133,908+ 3,657) = 0.0494 or 4.94%
- Step 3: Revalue the firm with the new cost of capital
  - Firm value = $\dfrac{\mathrm{FCFF}_0(1+g)}{(\text{Cost of Capital -g})} = \dfrac{3,657(1.0494)}{(.0716\ \text{-}0.0484)} = \$172,935 \text{ million}$
  - Increase in firm value = \$172,935 - \$133,908 = \$39,027 million

Effect on Value: Incremental approach

- 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.

Enterprise Value before the change = $133,908 million

Cost of financing Disney at existing debt ratio = $ 133,908 * 0.0781 = $10,458 million

Cost of financing Disney at optimal debt ratio = $ 133,908 * 0.0716 = $ 9,592 million

Annual savings in cost of financing = $10,458 million – $9,592 million = $866 million

$$\text{Increase in Value} = \frac{\text{Annual Savings next year}}{\text{(Cost of Capital - g)}} = \frac{\$866}{(0.0716 - 0.0275)} = \$19{,}623 \text{ million}$$

Enterprise value after recapitalization

= Existing enterprise value + PV of Savings = $133,908 + $19,623 = $153,531 million

From firm value to value per share: The Rational Investor Solution

- Because the increase in value accrues entirely to stockholders, we can estimate the increase in value per share by dividing by the total number of shares outstanding (1,800 million).
  - Increase in Value per Share = $19,623/1800 = $ 10.90
  - New Stock Price = $67.71 + $10.90= $78.61
- Implicit in this computation is the assumption that the increase in firm value will be spread evenly across both the stockholders who sell their stock back to the firm and those who do not and that is why we term this the "rational" solution, since it leaves investors indifferent between selling back their shares and holding on to them.

The more general solution, given a buyback price

- Start with the buyback price and compute the number of shares outstanding after the buyback:
  - Increase in Debt = Debt at optimal – Current Debt
  - # Shares after buyback = # Shares before – $\frac{\text{Increase in Debt}}{\text{Share Price}}$
- Then compute the equity value after the recapitalization, starting with the enterprise value at the optimal, adding back cash and subtracting out the debt at the optimal:
  - Equity value after buyback = Optimal Enterprise value + Cash – Debt
- Divide the equity value after the buyback by the post-buyback number of shares.
  - Value per share after buyback = Equity value after buyback/ Number of shares after buyback

Let's try a price: What if can buy shares back at the old price ($67.71)?

- Start with the buyback price and compute the number of shares outstanding after the buyback
  - Debt issued = $ 55,136 - $15,961 = $39,175 million
  - # Shares after buyback = 1800 - $39,175/$67.71 = 1221.43 m
- Then compute the equity value after the recapitalization, starting with the enterprise value at the optimal, adding back cash and subtracting out the debt at the optimal:
  - Optimal Enterprise Value = $153,531
  - Equity value after buyback = $153,531 + $3,931– $55,136 = $102,326
- Divide the equity value after the buyback by the post-buyback number of shares.
  - Value per share after buyback = $102,326/1221.43 = $83.78

Back to the rational price ($78.61): Here is the proof

- Start with the buyback price and compute the number of shares outstanding after the buyback
  - # Shares after buyback = 1800 - $39,175/$78.61 = 1301.65 m
- Then compute the equity value after the recapitalization, starting with the enterprise value at the optimal, adding back cash and subtracting out the debt at the optimal:
  - Optimal Enterprise Value = $153,531
  - Equity value after buyback = $153,531 + $3,931– $55,136 = $102,326
- Divide the equity value after the buyback by the post-buyback number of shares.
  - Value per share after buyback = $102,326/1301.65 = $78.61