Determining Optimal Financing Mix: Approaches and Alternatives

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 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

- It will depend upon:
  - (a) the components of financing: Debt, Equity or Preferred stock
  - (b) the cost of each component
- In summary, the cost of capital is the cost of each component weighted by its relative market value.

$$WACC = k_e (E/(D+E)) + k_d (D/(D+E))$$

Recapping the Measurement of cost of capital

- The cost of debt is the market interest rate that the firm has to pay on its borrowing. It will depend upon three components
  (a) The general level of interest rates
  (b) The default premium
  (c) The firm's tax rate
- The cost of equity is
  1. the required rate of return given the risk
  2. inclusive of both dividend yield and price appreciation
- The weights attached to debt and equity have to be market value weights, not book value weights.

Costs of Debt & Equity

A recent 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

- Yes
- No

Can equity ever be cheaper than debt?

- Yes
- No

Fallacies about Book Value

1. People will not lend on the basis of market value.
2. Book Value is more reliable than Market Value because it does not change as much.

Issue: Use of Book Value

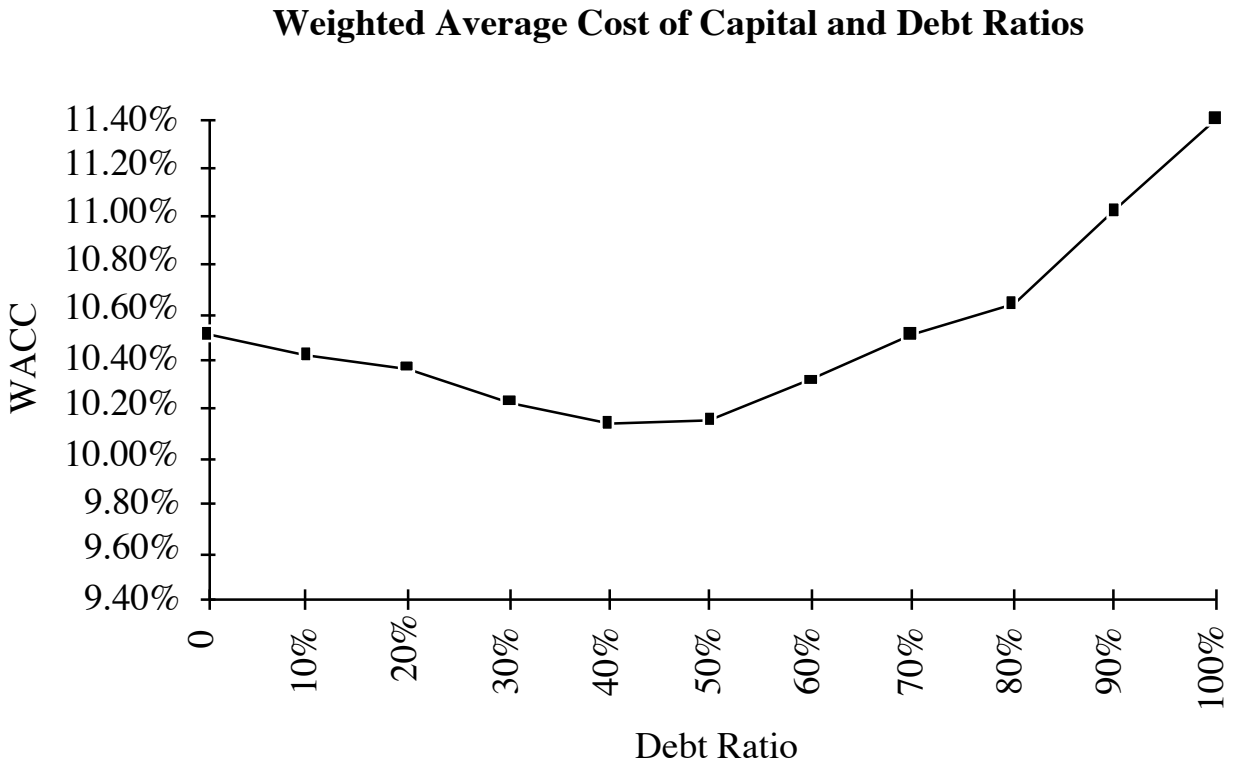
Many CFOs argue that using book value is more conservative than using market value, because the market value of equity is usually much higher than book value. Is this statement true, from a cost of capital perspective? (Will you get a more conservative estimate of cost of capital using book value rather than market value?)

- Yes
- No

Applying Cost of Capital Approach: The Textbook Example

D/(D+E)	ke	kd	After-tax Cost of Debt	WACC
0	10.50%	8%	4.80%	10.50%
10%	11%	8.50%	5.10%	10.41%
20%	11.60%	9.00%	5.40%	10.36%
30%	12.30%	9.00%	5.40%	10.23%
40%	13.10%	9.50%	5.70%	10.14%
50%	14%	10.50%	6.30%	10.15%
60%	15%	12%	7.20%	10.32%
70%	16.10%	13.50%	8.10%	10.50%
80%	17.20%	15%	9.00%	10.64%
90%	18.40%	17%	10.20%	11.02%
100%	19.70%	19%	11.40%	11.40%

WACC and Debt Ratios



Current Cost of Capital: Disney

- Equity
  - Cost of Equity = Riskfree rate + Beta * Risk Premium
    = 4% + 1.25 (4.82%) = 10.00%
  - Market Value of Equity = $55.101 Billion
  - Equity/(Debt+Equity) = 79%
- Debt
  - After-tax Cost of debt =(Riskfree rate + Default Spread) (1-t)
    = (4%+1.25%) (1-.373) = 3.29%
  - Market Value of Debt = $ 14.668 Billion
  - Debt/(Debt +Equity) = 21%
- Cost of Capital = 10.00%(.79)+3.29%(.21) = 8.59%

55.101(55.101+14.668)

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.

Process of Ratings and Rate Estimation

- We use the median interest coverage ratios for large manufacturing firms to develop “interest coverage ratio” ranges for each rating class.
- We then estimate a spread over the long term bond rate for each ratings class, based upon yields at which these bonds trade in the market place.

Medians of Key Ratios : 1998-2000

	AAA	*AA*	*A*	*BBB*	*BB*	*B*	*CCC*
EBIT interest cov. (x)	17.5	10.8	6.8	3.9	2.3	1.0	0.2
EBITDA interest cov.	21.8	14.6	9.6	6.1	3.8	2.0	1.4
Funds flow/total debt	105.8	55.8	46.1	30.5	19.2	9.4	5.8
Free oper. cash flow/total debt (%)	55.4	24.6	15.6	6.6	1.9	–4.5	-14.0
Return on capital (%)	28.2	22.9	19.9	14.0	11.7	7.2	0.5
Oper.income/sales (%)	29.2	21.3	18.3	15.3	15.4	11.2	13.6
Long-term debt/capital (%)	15.2	26.4	32.5	41.0	55.8	70.7	80.3
Total Debt/ Capital (%)	26.9	35.6	40.1	47.4	61.3	74.6	89.4
Number of firms	10	34	150	234	276	240	23

Interest Coverage Ratios and Bond Ratings: Large market cap, manufacturing firms

Interest Coverage Ratio	Rating
> 8.5	AAA
6.50 - 6.50	AA
5.50 – 6.50	A+
4.25 – 5.50	A
3.00 – 4.25	A-
2.50 – 3.00	BBB
2.05 - 2.50	BB+
1.90 – 2.00	BB
1.75 – 1.90	B+
1.50 - 1.75	B
1.25 – 1.50	B-
0.80 – 1.25	CCC
0.65 – 0.80	CC
0.20 – 0.65	C
< 0.20	D

For more detailed interest coverage ratios and bond ratings, try the ratings.xls spreadsheet on my web site.

Spreads over long bond rate for ratings classes: 2003

Rating	*Typical default spread*	*Market interest rate on debt*
AAA	0.35%	4.35%
AA	0.50%	4.50%
A+	0.70%	4.70%
A	0.85%	4.85%
A-	1.00%	5.00%
BBB	1.50%	5.50%
BB+	2.00%	6.00%
BB	2.50%	6.50%
B+	3.25%	7.25%
B	4.00%	8.00%
B-	6.00%	10.00%
CCC	8.00%	12.00%
CC	10.00%	14.00%
C	12.00%	16.00%
D	20.00%	24.00%

Riskless Rate = 4%

Current Income Statement for Disney: 1996

	2003	*2002*
Revenues	27061	25329
- Operating expenses (other than depreciation)	23289	21924
EBITDA	3772	3405
- Depreciation and Amortization	1059	1021
EBIT	2713	2384
- Interest Expenses	666	708
+ Interest Income	127	255
Taxable Income	2174	1931
- Taxes	907	695
Net Income	1267	1236

Estimating Cost of Equity

Unlevered Beta = 1.0674 (Bottom up beta based upon Disney's businesses)

Market premium = 4.82% T.Bond Rate = 4.00% Tax rate=37.3%

Debt Ratio	*D/E Ratio*	*Levered Beta*	*Cost of Equity*
0.00%	0.00%	1.0674	9.15%
10.00%	11.11%	1.1418	9.50%
20.00%	25.00%	1.2348	9.95%
30.00%	42.86%	1.3543	10.53%
40.00%	66.67%	1.5136	11.30%
50.00%	100.00%	1.7367	12.37%
60.00%	150.00%	2.0714	13.98%
70.00%	233.33%	2.6291	16.67%
80.00%	400.00%	3.7446	22.05%
90.00%	900.00%	7.0911	38.18%

Estimating Cost of Debt

Start with the current market value of the firm = 55,101 + 14668 = $69, 769 mil

D/(D+E)	0.00%	10.00%	Debt to capital
D/E	0.00%	11.11%	D/E = 10/(10 + 100) = .1111
$ Debt	$0	$6,977	10% of $69,769
EBITDA	$3,882	$3,882	Same as 0% debt
Depreciation	$1,077	$1,077	Same as 0% debt
EBIT	$2,805	$2,805	Same as 0% debt
Interest	$0	$303	Pre-tax cost of debt * $ Debt
Pre-tax Int. cov	∞	9.24	EBIT/ Interest Expenses
Likely Rating	AAA	AAA	From Ratings table
Pre-tax cost of debt	4.35%	4.35%	Riskless Rate + Spread

The Ratings Table

Interest Coverage Ratio	*Rating*	*Typical default spread*	*Market interest rate on debt*
> 8.5	AAA	0.35%	4.35%
6.50 - 6.50	AA	0.50%	4.50%
5.50 – 6.50	A+	0.70%	4.70%
4.25 – 5.50	A	0.85%	4.85%
3.00 – 4.25	A-	1.00%	5.00%
2.50 – 3.00	BBB	1.50%	5.50%
2.05 - 2.50	BB+	2.00%	6.00%
1.90 – 2.00	BB	2.50%	6.50%
1.75 – 1.90	B+	3.25%	7.25%
1.50 - 1.75	B	4.00%	8.00%
1.25 – 1.50	B-	6.00%	10.00%
0.80 – 1.25	CCC	8.00%	12.00%
0.65 – 0.80	CC	10.00%	14.00%
0.20 – 0.65	C	12.00%	16.00%
< 0.20	D	20.00%	24.00%

A Test: Can you do the 20% level?

D/(D+E)	*0.00%*	*10.00%*	*20.00%*	*2nd Iteration*	*3rd?*
D/E	0.00%	11.11%			
$ Debt	$0	$6,977			
EBITDA	$3,882	$3,882			
Depreciation	$1,077	$1,077			
EBIT	$2,805	$2,805			
Interest	$0	$303			
Pre-tax Int. cov	∞	9.24			
Likely Rating	AAA	AAA			
Cost of debt	4.35%	4.35%			

Bond Ratings, Cost of Debt and Debt Ratios

Debt Ratio	*Debt*	*Interest expense*	*Interest Coverage Ratio*	*Bond Rating*	*Interest rate on debt*	*Tax Rate*	*Cost of Debt (after-tax)*
0%	$0	$0	∞	AAA	4.35%	37.30%	2.73%
10%	$6,977	$303	9.24	AAA	4.35%	37.30%	2.73%
20%	$13,954	$698	4.02	A-	5.00%	37.30%	3.14%
30%	$20,931	$1,256	2.23	BB+	6.00%	37.30%	3.76%
40%	$27,908	$3,349	0.84	CCC	12.00%	31.24%	8.25%
50%	$34,885	$5,582	0.50	C	16.00%	18.75%	13.00%
60%	$41,861	$6,698	0.42	C	16.00%	15.62%	13.50%
70%	$48,838	$7,814	0.36	C	16.00%	13.39%	13.86%
80%	$55,815	$8,930	0.31	C	16.00%	11.72%	14.13%
90%	$62,792	$10,047	0.28	C	16.00%	10.41%	14.33%

Stated versus Effective Tax Rates

- You need taxable income for interest to provide a tax savings
- In the Disney case, consider the interest expense at 30% and 40%

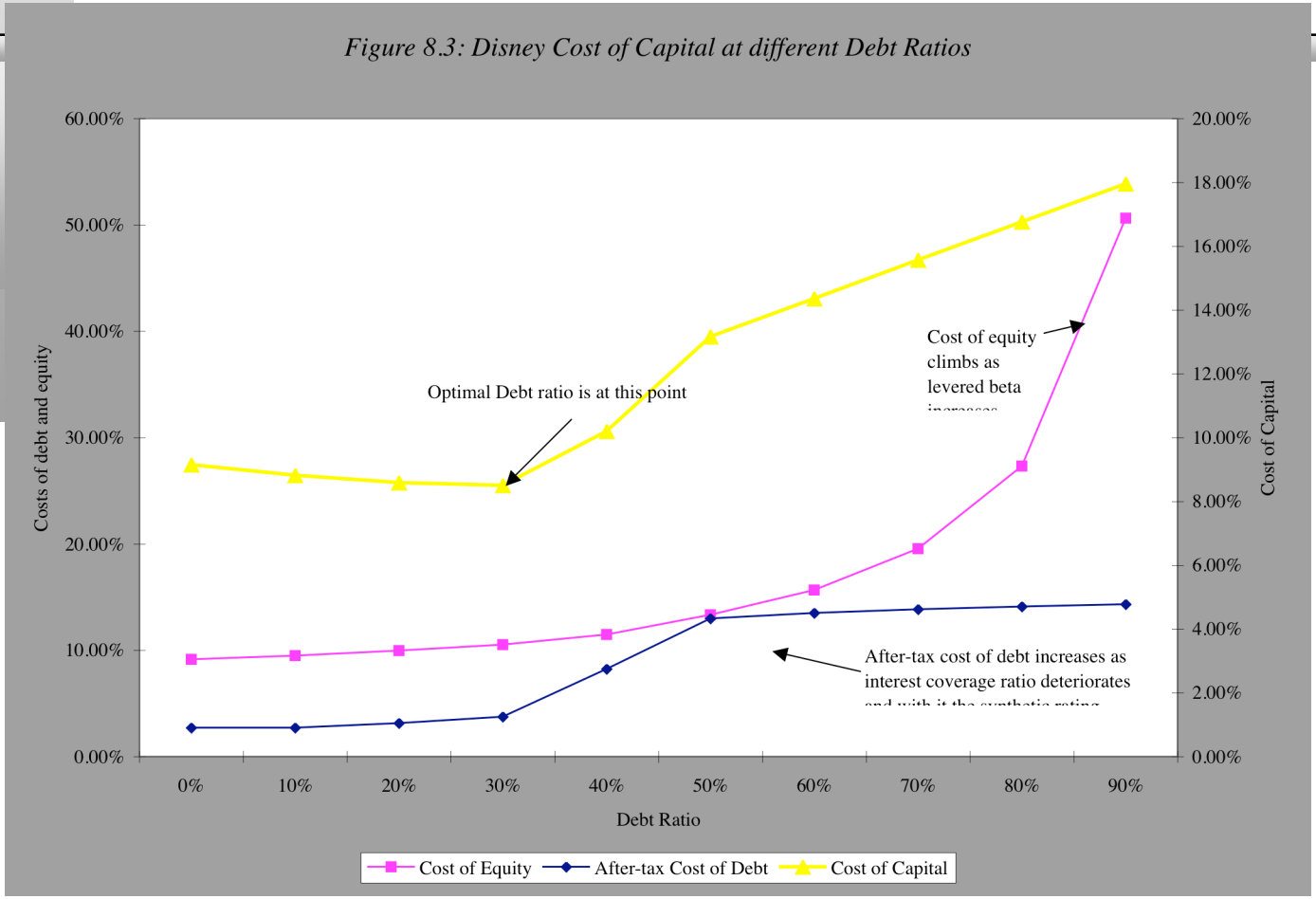
		30% Debt Ratio	*40% Debt Ratio*
EBIT	$ 2,805 m	$ 2,805 m	
Interest Expense	$ 1,256 m	$ 3,349 m	
Tax Savings		$ 1,256*.373=468	2,805*.373 = $ 1,046
Tax Rate		37.30%	1,046/3,349= 31.2%
Pre-tax interest rate		6.00%	12.00%
After-tax Interest Rate		3.76%	8.25%

- You can deduct only $2,805 million of the $3,349 million of the interest expense at 40%. Therefore, only 37.3% of $ 2,805 million is considered as the tax savings.

Disney's Cost of Capital Schedule

Debt Ratio	Cost of Equity	Cost of Debt (after-tax)	Cost of Capital
0%	9.15%	2.73%	9.15%
10%	9.50%	2.73%	8.83%
20%	9.95%	3.14%	8.59%
30%	10.53%	3.76%	8.50%
40%	11.50%	8.25%	10.20%
50%	13.33%	13.00%	13.16%
60%	15.66%	13.50%	14.36%
70%	19.54%	13.86%	15.56%
80%	27.31%	14.13%	16.76%
90%	50.63%	14.33%	17.96%

Disney: Cost of Capital Chart



Effect on Firm Value

- Firm Value before the change = 55,101+14,668= $ 69,769

  $WACC_b$ = 8.59% Annual Cost = $69,769 *8.59%= $5,993 million

  $WACC_a$ = 8.50% Annual Cost = $69,769 *8.50% = $5,930 million

  Δ WACC = 0.09% Change in Annual Cost = $ 63 million

- If there is no growth in the firm value, (Conservative Estimate)
  - Increase in firm value = $63 / .0850= $ 741 million
  - Change in Stock Price = $741/2047.6= $0.36 per share
- If we assume a perpetual growth of 4% in firm value over time,
  - Increase in firm value = $63 /(.0850-.04) = $ 1,400 million
  - Change in Stock Price = $1,400/2,047.6 = $ 0.68 per share

Implied Growth Rate obtained by

Firm value Today =FCFF(1+g)/(WACC-g): Perpetual growth formula

$69,769 = $1,722(1+g)/(.0859-g): Solve for g -> Implied growth = 5.98%

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 $ 26.91) Assuming that firm value will grow by 4% a year, estimate the maximum price.

- What would happen to the stock price after the buyback if you were able to buy stock back at $ 26.91?

Buybacks and Stock Prices

- Assume that Disney does make a tender offer for it's shares but pays $28 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 $26.91
  b. The share price will be between $26.91 and the estimated value (above) or $27.59
  c. The share price will be higher than $27.59

The Downside Risk

- Doing What-if analysis on Operating Income
  - A. Standard Deviation Approach
    - Standard Deviation In Past Operating Income
    - Standard Deviation In Earnings (If Operating Income Is Unavailable)
    - Reduce Base Case By One Standard Deviation (Or More)
  - B. Past Recession Approach
    - Look At What Happened To Operating Income During The Last Recession. (How Much Did It Drop In % Terms?)
    - Reduce Current Operating Income By Same Magnitude
- Constraint on Bond Ratings

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%

Disney: Effects of Past Downturns

Recession	*Decline in Operating Income*
2002	Drop of 15.82%
1991	Drop of 22.00%
1981-82	Increased
Worst Year	Drop of 26%

- The standard deviation in past operating income is about 20%.

Disney: The Downside Scenario

% Drop in EBITDA	*EBIT*	*Optimal Debt Ratio*
0%	$ 2,805	30%
5%	$ 2,665	20%
10%	$ 2,524	20%
15%	$ 2385	20%
20%	$ 2,245	20%

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 (so do not do both)
  - a drop in ratings might affect operating income
  - there is an ego factor associated with high ratings
- Caveat: Every Rating Constraint Has A Cost.
  - Provide Management With A Clear Estimate Of How Much The Rating Constraint Costs By Calculating The Value Of The Firm Without The Rating Constraint And Comparing To The Value Of The Firm With The Rating Constraint.

Ratings Constraints for Disney

- At its optimal debt ratio of 30%, Disney has an estimated rating of BB+.
- Assume that Disney imposes a rating constraint of A or greater.
- The optimal debt ratio for Disney is then 20% (see next page)
- The cost of imposing this rating constraint can then be calculated as follows:

Value at 30% Debt	= $ 71,239 million
- Value at 20% Debt	= $ 69,837 million
Cost of Rating Constraint	= $ 1,376 million

Effect of Ratings Constraints: Disney

Debt Ratio	Rating	Firm Value
0%	AAA	$62,279
10%	AAA	$66,397
20%	A-	$69,837
30%	BB+	$71,239
40%	CCC	$51,661
50%	C	$34,969
60%	C	$30,920
70%	C	$27,711
80%	C	$25,105
90%	C	$22,948

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.

Analyzing Financial Service Firms

- The interest coverage ratios/ratings relationship is likely to be different for financial service firms.
- The definition of debt is messy for financial service firms. In general, using all debt for a financial service firm will lead to high debt ratios. Use only interest-bearing long term debt in calculating debt ratios.
- The effect of ratings drops will be much more negative for financial service firms.
- There are likely to regulatory constraints on capital

Interest Coverage ratios, ratings and Operating income

Long Term Interest Coverage Ratio	*Rating is*	*Spread is*	*Operating Income Decline*
< 0.05	D	16.00%	-50.00%
0.05 – 0.10	C	14.00%	-40.00%
0.10 – 0.20	CC	12.50%	-40.00%
0.20 - 0.30	CCC	10.50%	-40.00%
0.30 – 0.40	B-	6.25%	-25.00%
0.40 – 0.50	B	6.00%	-20.00%
0.50 – 0.60	B+	5.75%	-20.00%
0.60 – 0.75	BB	4.75%	-20.00%
0.75 – 0.90	BB+	4.25%	-20.00%
0.90 – 1.20	BBB	2.00%	-20.00%
1.20 – 1.50	A-	1.50%	-17.50%
1.50 – 2.00	A	1.40%	-15.00%
2.00 – 2.50	A+	1.25%	-10.00%
2.50 – 3.00	AA	0.90%	-5.00%
> 3.00	AAA	0.70%	0.00%

Deutsche Bank: Optimal Capital Structure

Debt Ratio	*Beta*	*Cost of Equity*	*Bond Rating*	*Interest rate on deb*	*Tax Rate*	*Cost of Debt (after-tax)*	*WACC*	*Firm Value (G)*
0%	0.44	6.15%	AAA	4.75%	38.00%	2.95%	6.15%	$111,034
10%	0.47	6.29%	AAA	4.75%	38.00%	2.95%	5.96%	$115,498
20%	0.50	6.48%	AAA	4.75%	38.00%	2.95%	5.77%	$120,336
30%	0.55	6.71%	AAA	4.75%	38.00%	2.95%	5.58%	$125,597
40%	0.62	7.02%	AAA	4.75%	38.00%	2.95%	5.39%	$131,339
50%	0.71	7.45%	A+	5.30%	38.00%	3.29%	5.37%	$118,770
60%	0.84	8.10%	A	5.45%	38.00%	3.38%	5.27%	$114,958
70%	1.07	9.19%	A	5.45%	38.00%	3.38%	5.12%	$119,293
80%	1.61	11.83%	BB+	8.30%	32.43%	5.61%	6.85%	$77,750
90%	3.29	19.91%	BB	8.80%	27.19%	6.41%	7.76%	$66,966

Analyzing Companies after Abnormal Years

- The operating income that should be used to arrive at an optimal debt ratio is a "normalized" operating income
- A normalized operating income is the income that this firm would make in a normal year.
  - For a cyclical firm, this may mean using the average operating income over an economic cycle rather than the latest year's income
  - For a firm which has had an exceptionally bad or good year (due to some firm-specific event), this may mean using industry average returns on capital to arrive at an optimal or looking at past years
  - For any firm, this will mean not counting one time charges or profits

Analyzing Aracruz Cellulose's Optimal Debt Ratio

- Aracruz Cellulose, the Brazilian pulp and paper manufacturing firm, reported operating income of 887 million BR on revenues of 3176 million BR in 2003. This was significantly higher than it's operating income of 346 million BR in 2002 and 196 million Br in 2001.
- In 2003, Aracruz had depreciation of 553 million BR and capital expenditures amounted to 661 million BR.
- Aracruz had debt outstanding of 4,094 million BR with a dollar cost of debt of 7.25%. Aracruz had 859.59 million shares outstanding, trading 10.69 BR per share.
- The beta of the stock is estimated, using comparable firms, to be 0.7040.
- The corporate tax rate in Brazil is estimated to be 34%.

Aracruz's Current Cost of Capital

- Current $ Cost of Equity = 4% + 0.7040 (12.49%) = 12.79%
- Market Value of Equity = 10.69 BR/share * 859.59= 9,189 million BR

Current $ Cost of Capital

= 12.79% (9,189/(9,189+4,094)) + 7.25% (1-.34) (4,094/(9189+4,094) = 10.33%

Modifying the Cost of Capital Approach for Aracruz

- The operating income at Aracruz is a function of the price of paper and pulp in global markets. While 2003 was a very good year for the company, its income history over the last decade reflects the volatility created by pulp prices. We computed Aracruz's average pre-tax operating margin over the last 10 years to be 25.99%. Applying this lower average margin to 2003 revenues generates a normalized operating income of 796.71 million BR.
- Aracruz's synthetic rating of BBB, based upon the interest coverage ratio, is much higher than its actual rating of B- and attributed the difference to Aracruz being a Brazilian company, exposed to country risk. Since we compute the cost of debt at each level of debt using synthetic ratings, we run to risk of understating the cost of debt. The difference in interest rates between the synthetic and actual ratings is 1.75% and we add this to the cost of debt estimated at each debt ratio from 0% to 90%.
- We used the interest coverage ratio/ rating relationship for smaller companies to estimate synthetic ratings at each level of debt.

Aracruz's Optimal Debt Ratio

Debt Ratio	*Beta*	*Cost of Equity*	*Bond Rating*	*Interest rate on debt*	*Tax Rate*	*Cost of Debt (after-tax)*	*WACC*	*Firm Value in BR*
0%	0.54	10.80%	AAA	6.10%	34.00%	4.03%	10.80%	12,364
10%	0.58	11.29%	AAA	6.10%	34.00%	4.03%	10.57%	12,794
20%	0.63	11.92%	A	6.60%	34.00%	4.36%	10.40%	13,118
30%	0.70	12.72%	BBB	7.25%	34.00%	4.79%	10.34%	13,256
40%	0.78	13.78%	CCC	13.75%	34.00%	9.08%	11.90%	10,633
50%	0.93	15.57%	CCC	13.75%	29.66%	9.67%	12.62%	9,743
60%	1.20	19.04%	C	17.75%	19.15%	14.35%	16.23%	6,872
70%	1.61	24.05%	C	17.75%	16.41%	14.84%	17.60%	6,177
80%	2.41	34.07%	C	17.75%	14.36%	15.20%	18.98%	5,610
90%	4.82	64.14%	C	17.75%	12.77%	15.48%	20.35%	5,138

Analyzing a Private Firm

- The approach remains the same with important caveats
  - It is far more difficult estimating firm value, since the equity and the debt of private firms do not trade
  - Most private firms are not rated.
  - If the cost of equity is based upon the market beta, it is possible that we might be overstating the optimal debt ratio, since private firm owners often consider all risk.

Bookscape's current cost of capital

- We assumed that Bookscape would have a debt to capital ratio of 16.90%, similar to that of publicly traded book retailers, and that the tax rate for the firm is 40%. We computed a cost of capital based on that assumption.
- We also used a "total beta"of 2.0606 to measure the additional risk that the owner of Bookscape is exposed to because of his lack of diversification.
- Cost of Capital
  - Cost of equity = Risfree Rate + Total Beta * Risk Premium
    = 4% + 2.0606 * 4.82% = 13.93%
  - Pre-tax Cost of debt = 5.5% (based upon synthetic rating of BBB)
  - Cost of capital = 13.93% (.8310) + 5.5% (1-.40) (.1690) = 12.14%

The Inputs: Bookscape

- While Bookscapes has no conventional debt outstanding, it does have one large operating lease commitment. Given that the operating lease has 25 years to run and that the lease commitment is $500,000 for each year, the present value of the operating lease commitments is computed using Bookscape's pre-tax cost of debt of 5.5%:
  - Present value of Operating Lease commitments (in '000s) = $500 (PV of annuity, 5.50%, 25 years) = 6,708
- Bookscape had operating income before taxes of $ 2 million in the most recent financial year. Since we consider the present value of operating lease expenses to be debt, we add back the imputed interest expense on the present value of lease expenses to the earnings before interest and taxes.
  - Adjusted EBIT (in '000s) = EBIT + Pre-tax cost of debt * PV of operating lease expenses = $ 2,000+ .055 * $6,7078 = $2,369
- Estimated Market Value of Equity (in '000s) = Net Income for Bookscape * Average PE for publicly traded book retailers = 1,320 * 16.31 = $21,525

Interest Coverage Ratios, Spreads and Ratings: Small Firms

Interest Coverage Ratio	Rating	Spread over T Bond Rate
> 12.5	AAA	0.35%
9.50-12.50	AA	0.50%
7.5 - 9.5	A+	0.70%
6.0 - 7.5	A	0.85%
4.5 - 6.0	A-	1.00%
4.0 - 4.5	BBB	1.50%
3.5 – 4.0	BB+	2.00%
3.0 - 3.5	BB	2.50%
2.5 - 3.0	B+	3.25%
2.0 - 2.5	B	4.00%
1.5 - 2.0	B-	6.00%
1.25 - 1.5	CCC	8.00%
0.8 - 1.25	CC	10.00%
0.5 - 0.8	C	12.00%
< 0.5	D	20.00%

Optimal Debt Ratio for Bookscape

Debt Ratio	*Total Beta*	*Cost of Equity*	*Bond Rating*	*Interest rate on debt*	*Tax Rate*	*Cost of Debt (after-tax)*	*WACC*	*Firm Value (G)*
0%	1.84	12.87%	AAA	4.35%	40.00%	2.61%	12.87%	$25,020
10%	1.96	13.46%	AAA	4.35%	40.00%	2.61%	12.38%	$26,495
20%	2.12	14.20%	A+	4.70%	40.00%	2.82%	11.92%	$28,005
30%	2.31	15.15%	A-	5.00%	40.00%	3.00%	11.51%	$29,568
40%	2.58	16.42%	BB	6.50%	40.00%	3.90%	11.41%	$29,946
50%	2.94	18.19%	B	8.00%	40.00%	4.80%	11.50%	$29,606
60%	3.50	20.86%	CC	14.00%	39.96%	8.41%	13.39%	$23,641
70%	4.66	26.48%	CC	14.00%	34.25%	9.21%	14.39%	$21,365
80%	7.27	39.05%	C	16.00%	26.22%	11.80%	17.25%	$16,745
90%	14.54	74.09%	C	16.00%	23.31%	12.27%	18.45%	$15,355

Determinants of Optimal Debt Ratios

- Firm Specific Factors
  - 1. Tax Rate
  - Higher tax rates - - > Higher Optimal Debt Ratio
  - Lower tax rates - - > Lower Optimal Debt Ratio
  - 2. Pre-Tax CF on Firm = EBITDA / MV of Firm
  - Higher Pre-tax CF - - > Higher Optimal Debt Ratio
  - Lower Pre-tax CF - - > Lower Optimal Debt Ratio
  - 3. Variance in Earnings [Shows up when you do 'what if' analysis]
  - Higher Variance - - > Lower Optimal Debt Ratio
  - Lower Variance - - > Higher Optimal Debt Ratio
- Macro-Economic Factors
  - 1. Default Spreads

    Higher - - > Lower Optimal Debt Ratio

    Lower - - > Higher Optimal Debt Ratio

Application Test: Your firm's optimal financing mix

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

II. 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:
  1. 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)
  2. 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

Bond Rating	*Default Rate*
D	100.00%
C	80.00%
CC	65.00%
CCC	46.61%
B-	32.50%
B	26.36%
B+	19.28%
BB	12.20%
BBB	2.30%
A-	1.41%
A	0.53%
A+	0.40%
AA	0.28%
AAA	0.01%

Disney: Estimating Unlevered Firm Value

Current Market Value of the Firm = $55,101+$14,668 = $ 69,789
- Tax Benefit on Current Debt = $14,668* 0.373 = $ 5,479 million
+ Expected Bankruptcy Cost = 1.41% * (0.25* 69,789)= $ 984 million
Unlevered Value of Firm = $65,294 million

Cost of Bankruptcy for Disney = 25% of firm value
Probability of Bankruptcy = 1.41%, based on firm's current rating of A-
Tax Rate = 37.3%

Disney: APV at Debt Ratios

Debt Ratio	$ Debt	Tax Rate	Unlevered Firm Value	Tax Benefits	Bond Rating	Probability of Default	Expected Bankruptcy Cost	Value of Levered Firm
0%	$0	37.30%	$64,556	$0	AAA	0.01%	$2	$64,555
10%	$6,979	37.30%	$64,556	$2,603	AAA	0.01%	$2	$67,158
20%	$13,958	37.30%	$64,556	$5,206	A-	1.41%	$246	$69,517
30%	$20,937	37.30%	$64,556	$7,809	BB+	7.00%	$1,266	$71,099
40%	$27,916	31.20%	$64,556	$8,708	CCC	50.00%	$9,158	$64,107
50%	$34,894	18.72%	$64,556	$6,531	C	80.00%	$14,218	$56,870
60%	$41,873	15.60%	$64,556	$6,531	C	80.00%	$14,218	$56,870
70%	$48,852	13.37%	$64,556	$6,531	C	80.00%	$14,218	$56,870
80%	$55,831	11.70%	$64,556	$6,531	C	80.00%	$14,218	$56,870
90%	$62,810	10.40%	$64,556	$6,531	C	80.00%	$14,218	$56,870

III. Relative Analysis

I. Industry Average with Subjective Adjustments

- 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

	Disney	*Entertainment*	*Aracruz*	*Paper and Pulp (Emerging Market)*
Market Debt Ratio	21.02%	19.56%	30.82%	27.71%
Book Debt Ratio	35.10%	28.86%	43.12%	49.00%

Getting past simple averages: Using Statistics

- 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)
- Step 2: Estimate 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 entertainment firms, we arrived at the following regression:

  Debt/Capital = 0.2156 - 0.1826 (Sales Growth) + 0.6797 (EBITDA/ Value)

  (4.91) (1.91) (2.05)

- The R squared of the regression is 14%. This regression can be used to arrive at a predicted value for Disney of:

Predicted Debt Ratio = 0.2156 - 0.1826 (.0668) + 0.6797 (.0767) = 0.2555 or 25.55%

Based upon the capital structure of other firms in the entertainment industry, Disney should have a market value debt ratio of 25.55%.

Extending to the entire market: 2003 Data

- Using 2003 data for firms listed on the NYSE, AMEX and NASDAQ data bases. The regression provides the following results –

DFR = 0.0488 + 0.810 Tax Rate –0.304 CLSH + 0.841 E/V –2.987 CPXFR
(1.41[a]) (8.70[a]) (3.65[b]) (7.92[b]) (13.03[a])

where,

DFR	= Debt / (Debt + Market Value of Equity)
Tax Rate	= Effective Tax Rate
CLSH	= Closely held shares as a percent of outstanding shares
CPXFR	= Capital Expenditures / Book Value of Capital
E/V	= EBITDA/ Market Value of Firm

- The regression has an R-squared of only 53.3%.

Applying the Regression

Lets check whether we can use this regression. Disney had the following values for these inputs in 1996. Estimate the optimal debt ratio using the debt regression.

Effective Tax Rate = 34.76%

Closely held shares as percent of shares outstanding = 2.2%

Capital Expenditures as fraction of firm value = 2.09%

EBITDA/Value = 7.67%

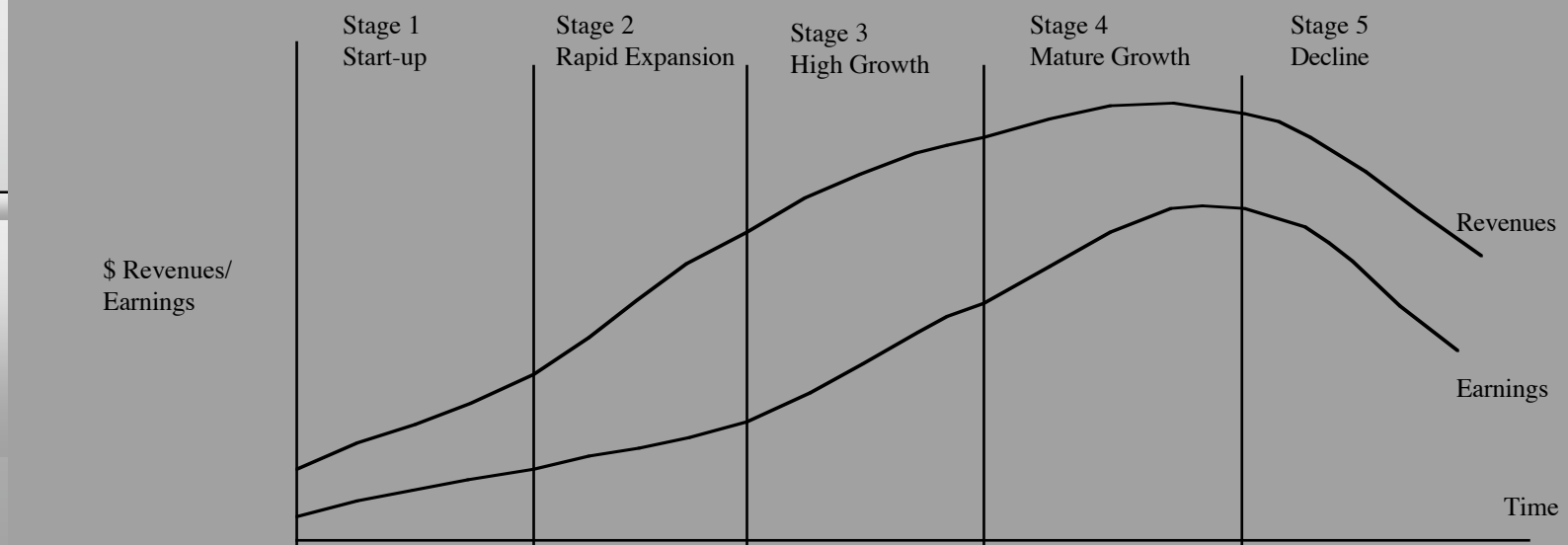
Optimal Debt Ratio

= 0.0488 + 0.810 ( ) –0.304 ( ) + 0.841( ) –2.987 ( )

What does this optimal debt ratio tell you?

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

IV. The Debt-Equity Trade off and Life Cycle

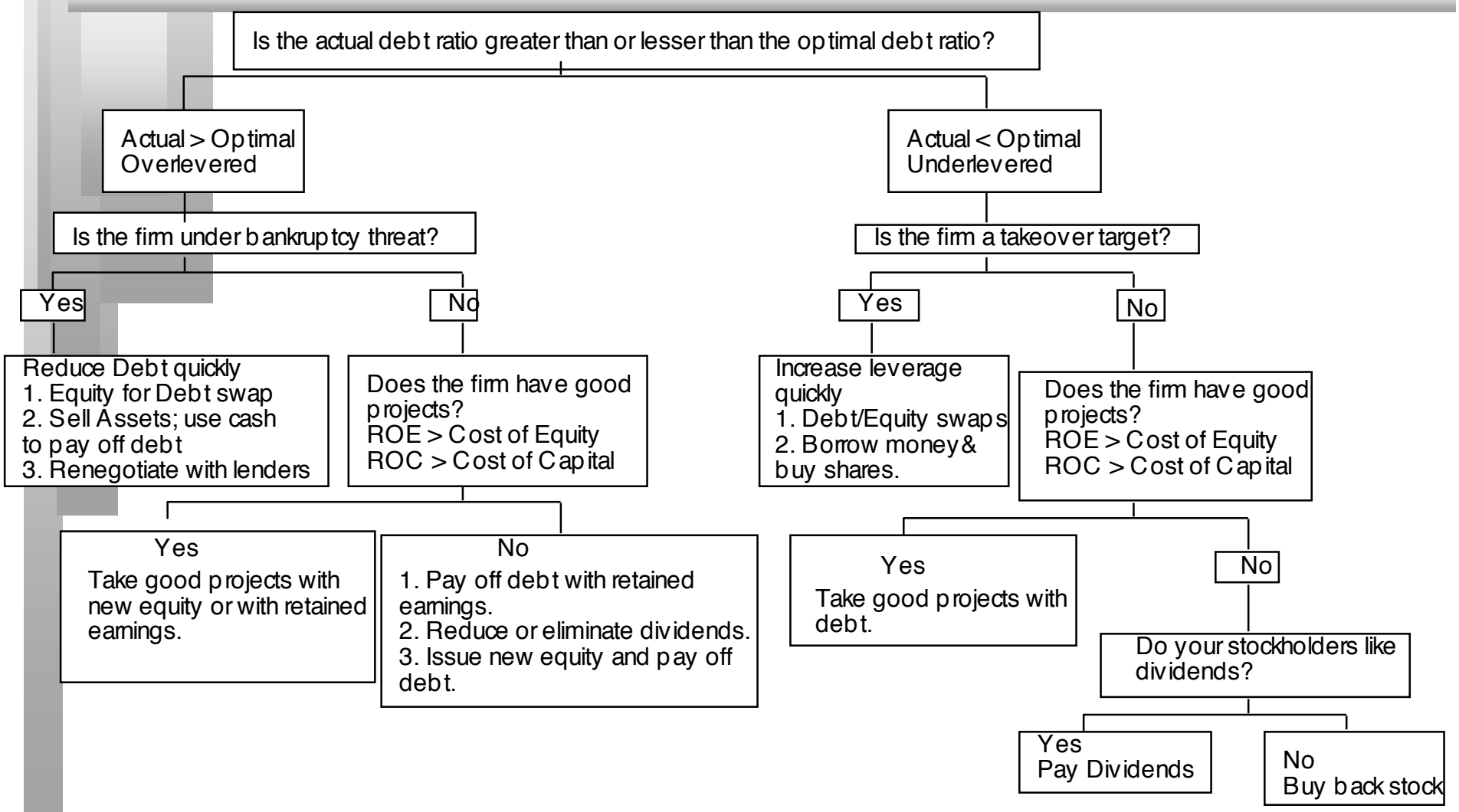


	Stage 1 Start-up	Stage 2 Rapid Expansion	Stage 3 High Growth	Stage 4 Mature Growth	Stage 5 Decline
Tax Benefits	Zero, if losing money	Low, as earnings are limited	Increase, with earnings	High	High, but declining
Added Disceipline of Debt	Low, as owners run the firm	Low. Even if public, firm is closely held.	Increasing, as managers own less of firm	High. Managers are separated from owners	Declining, as firm does not take many new investments
Bamkruptcy Cost	Very high. Firm has no or negative earnings.	Very high. Earnings are low and volatile	High. Earnings are increasing but still volatile	Declining, as earnings from existing assets increase.	Low, but increases as existing projects end.
Agency Costs	Very high, as firm has almost no assets	High. New investments are difficult to monitor	High. Lots of new investments and unstable risk.	Declining, as assets in place become a larger portion of firm.	Low. Firm takes few new investments
Need for Flexibility	Very high, as firm looks for ways to establish itself	High. Expansion needs are large and unpredicatble	High. Expansion needs remain unpredictable	Low. Firm has low and more predictable investment needs.	Non-existent. Firm has no new investment needs.
Net Trade Off	Costs exceed benefits Minimal debt	Costs still likely to exceed benefits. Mostly equity	Debt starts yielding net benefits to the firm	Debt becomes a more attractive option.	Debt will provide benefits.

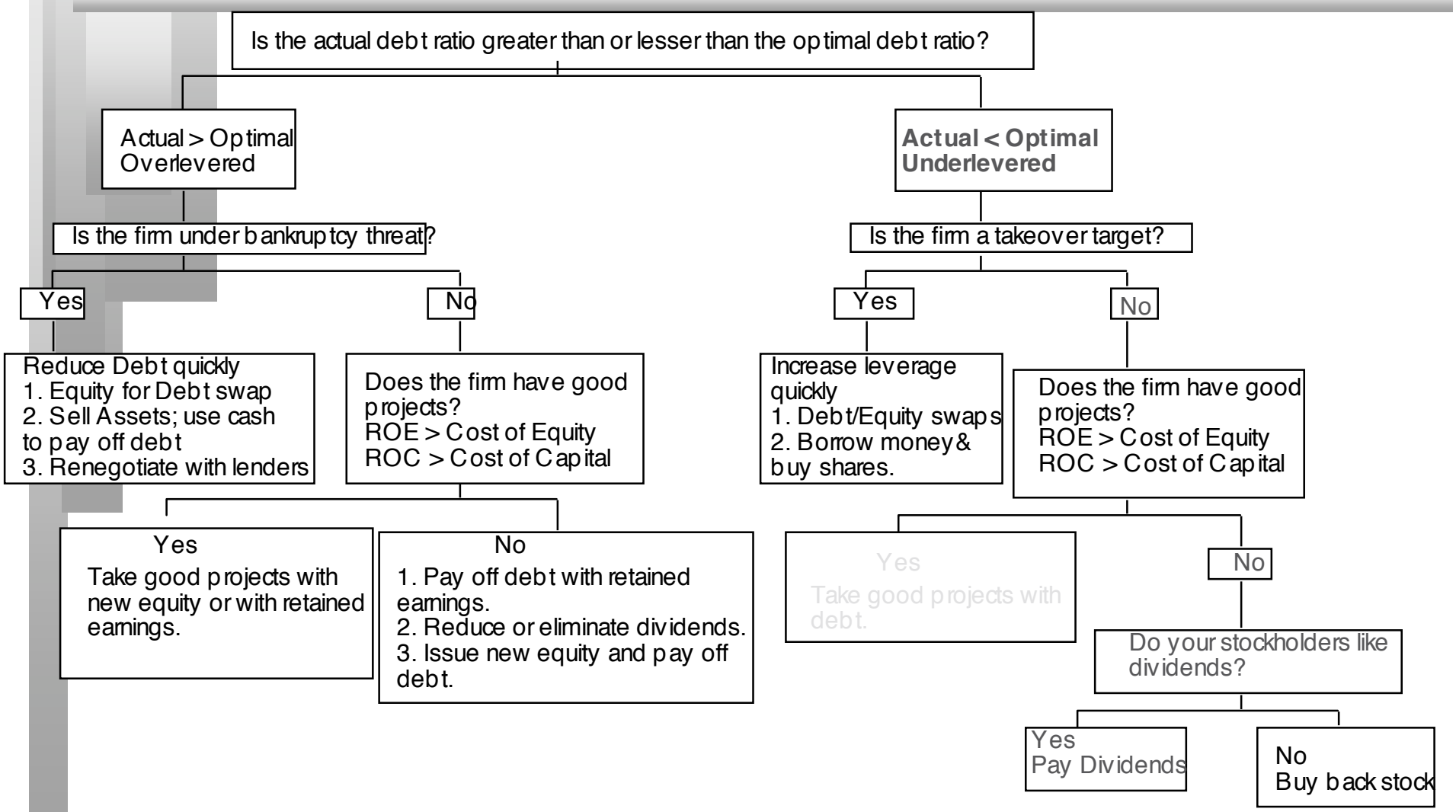
Summarizing for Disney

Approach Used	**Optimal**
1a. Cost of Capital unconstrained	30%
1b. Cost of Capital w/ lower EBIT	20%
1c. Cost of Capital w/ Rating constraint	20%
II. APV Approach	30%
IIIa. Entertainment Sector Regression	25.55%
IIIb. Market Regression	32.57%
IV. Life Cycle Approach	Mature Growth
Actual Debt Ratio	**21%**

A Framework for Getting to the Optimal



Disney: Applying the Framework



Application Test: Getting to the Optimal

- Based upon your analysis of both the firm's capital structure and investment record, what path would you map out for the firm?
  - Immediate change in leverage
  - Gradual change in leverage
  - No change in leverage
- Would you recommend that the firm change its financing mix by
  - Paying off debt/Buying back equity
  - Take projects with equity/debt