

Finding the Right Financing Mix: The Capital Structure Decision

Aswath Damodaran

Stern School of Business

First Principles

- Invest in projects that yield a return greater than the minimum acceptable hurdle rate.
 - The hurdle rate should be higher for riskier projects and reflect the financing mix used - owners' funds (equity) or borrowed money (debt)
 - Returns on projects should be measured based on cash flows generated and the timing of these cash flows; they should also consider both positive and negative side effects of these projects.
- **Choose a financing mix that minimizes the hurdle rate and matches the assets being financed.**
- If there are not enough investments that earn the hurdle rate, return the cash to stockholders.
 - The form of returns - dividends and stock buybacks - will depend upon the stockholders' characteristics.

The Agenda

- What determines the optimal mix of debt and equity for a company?
- How does altering the mix of debt and equity affect investment analysis and value at a company?
- What is the right kind of debt for a company?

Costs and Benefits of Debt

- Benefits of Debt
 - Tax Benefits
 - Adds discipline to management
- Costs of Debt
 - Bankruptcy Costs
 - Agency Costs
 - Loss of Future Flexibility

Tax Benefits of Debt

- (a) Tax Benefits: Interest on debt is tax deductible whereas cashflows on equity (like dividends) are not.
 - Tax benefit each year = $t r B$
 - After tax interest rate of debt = $(1-t) r$
- Proposition 1: Other things being equal, the higher the marginal tax rate of a corporation, the more debt it will have in its capital structure.

Issue 1: The Effects of Taxes

1. You are comparing the debt ratios of real estate corporations, which pay the corporate tax rate, and real estate investment trusts, which are not taxed, but are required to pay 95% of their earnings as dividends to their stockholders. Which of these two groups would you expect to have the higher debt ratios?
 - The real estate corporations
 - The real estate investment trusts
 - Cannot tell, without more information

Debt adds discipline to management

- Equity is a cushion; Debt is a sword;
- The management of firms which have high cashflows left over each year are more likely to be complacent and inefficient.

Issue 2: Debt and Discipline

2. Assume that you buy into this argument that debt adds discipline to management. Which of the following types of companies will most benefit from debt adding this discipline?
- Conservatively financed, privately owned businesses
 - Conservatively financed, publicly traded companies, with a wide and diverse stock holding
 - Conservatively financed, publicly traded companies, with an activist and primarily institutional holding.

Bankruptcy Cost

- The expected bankruptcy cost is a function of two variables--
 - the cost of going bankrupt
 - direct costs: Legal and other Deadweight Costs
 - indirect costs: Lost Sales...
 - durable versus non-durable goods (cars)
 - quality/safety is important (airlines)
 - supplementary services (copiers)
 - the probability of bankruptcy

The Bankruptcy Cost Proposition

- Proposition 2: Other things being equal, the greater the implicit bankruptcy cost and/or probability of bankruptcy in the operating cashflows of the firm, the less debt the firm can afford to use.

Issue 3 : Debt & Bankruptcy Cost

3. Rank the following companies on the magnitude of bankruptcy costs from most to least, taking into account both explicit and implicit costs:
- A Grocery Store
 - An Airplane Manufacturer
 - High Technology company

Agency Cost

- Stockholders incentives are different from bondholder incentives
 - Taking of Risky Projects
 - Paying large dividends
- Proposition 3: Other things being equal, the greater the agency problems associated with lending to a firm, the less debt the firm can afford to use.

Loss of future financing flexibility

- When a firm borrows up to its capacity, it loses the flexibility of financing future projects with debt.
- Proposition 4: Other things remaining equal, the more uncertain a firm is about its future financing requirements and projects, the less debt the firm will use for financing current projects.

Relative Importance Of Financing Planning Principles

Planning Principle by Order of Importance	Unimportant	Percentage of Responses Within Each Rank ^a					Mean ^b
		2	3	4	Important	Not Ranked	
1. Maintaining financial flexibility	0.6	0.0	4.5	33.0	61.4	0.6	4.55
2. Ensuring long-term survivability	4.0	1.7	6.8	10.8	76.7	0.0	4.55
3. Maintaining a predictable source of funds	1.7	2.8	20.5	39.2	35.8	0.0	4.05
4. Maximizing security prices	3.4	4.5	19.3	33.5	37.5	1.7	3.99
5. Maintaining financial independence	3.4	4.5	22.2	27.3	40.9	1.7	3.99
6. Maintaining a high debt rating	2.3	9.1	32.4	43.2	13.1	0.0	3.56
7. Maintaining comparability with other firms in the industry	15.9	36.9	33.0	10.8	2.8	0.6	2.47

Debt: A Balance Sheet Format

Advantages of Borrowing

1. Tax Benefit:

Higher tax rates --> Higher tax benefit

2. Added Discipline:

Greater the separation between managers and stockholders --> Greater the benefit

Disadvantages of Borrowing

1. Bankruptcy Cost:

Higher business risk --> Higher Cost

2. Agency Cost:

Greater the separation between stockholders & lenders --> Higher Cost

3. Loss of Future Financing Flexibility:

Greater the uncertainty about future financing needs --> Higher Cost

A Hypothetical Scenario

- Assume you operate in an environment, where
 - (a) there are no taxes
 - (b) there is no separation between stockholders and managers.
 - (c) there is no default risk
 - (d) there is no separation between stockholders and bondholders
 - (e) firms know their future financing needs

The Miller-Modigliani Theorem

- In an environment, where there are no taxes, default risk or agency costs, capital structure is irrelevant.
- The value of a firm is independent of its debt ratio.

Implications of MM Theorem

- (a) Leverage is irrelevant. A firm's value will be determined by its project cash flows.
- (b) 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

What do firms look at in financing?

- A. Is there a financing hierarchy?
- Argument:
 - 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.

Rationale for Financing Hierarchy

- Managers value flexibility. External financing reduces flexibility more than internal financing.
- Managers value control. Issuing new equity weakens control and new debt creates bond covenants.

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

Issue 5: Financing Choices

5. 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?

- Nothing
- Healthier than the average firm
- In much more financial trouble than the average firm

What to include in debt...

- General Rule: Debt generally has the following characteristics:
 - Commitment to make fixed payments in the future
 - The fixed payments are tax deductible
 - Failure to make the payments can lead to either default or loss of control of the firm to the party to whom payments are due.

What would you include in debt?

- Any interest-bearing liability, whether short term or long term.
- Any lease obligation, whether operating or capital.

Converting Operating Leases to Debt

- The “debt value” of operating leases is the present value of the lease payments, at a rate that reflects their risk.
- In general, this rate will be close to or equal to the rate at which the company can borrow.

Operating Leases at The Gap

- Operating lease expenses in 1995 = \$304.6 million
- Cost of Debt in 1995 = 7.30%
- Duration of Lease Obligations = 12 yrs
- PV of Lease Expenses = \$304.6 million for 12 years at 7.30% = \$2,381 million

Measuring Financial Leverage

- Two variants of debt ratio
 - Debt to Capital Ratio = $\text{Debt} / (\text{Debt} + \text{Equity})$
 - Debt to Equity Ratio = $\text{Debt} / \text{Equity}$
- Ratios can be based only on long term debt or total debt.
- Ratios can be based upon book value or market value.

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.

$$\text{WACC} = k_e (E/(D+E)) + k_d (D/(D+E))$$

The Cost of Debt

- 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

What the cost of debt is and is not..

- The cost of debt is
 - the rate at which the company can borrow at today
 - corrected for the tax benefit it gets for interest payments.
Cost of debt = $k_d = \text{Yield} (1 - \text{Tax rate})$
- The cost of debt is not
 - the interest rate at which the company obtained the debt it has on its books.

What the cost of equity is and is not..

- The cost of equity is
 - 1. the required rate of return given the risk
 - 2. inclusive of both dividend yield and price appreciation
- The cost of equity is not
 - 1. the dividend yield
 - 2. the earnings/price ratio

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

Calculate the weights of each component

- Use target/average debt weights rather than project-specific weights.
- Use market value weights for debt and equity.

Target versus Project-specific weights

- If firm uses project-specific weights, projects financed with debt will have lower costs of capital than projects financed with equity.
 - Is that fair?
 - What do you think will happen to the firm's debt ratio over time, with this approach?

Market Value Weights

- Always use the market weights of equity, preferred stock and debt for constructing the weights.
- Book values are often misleading and outdated.

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.
3. Using book value is more conservative than using market value.

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

Why does the cost of capital matter?

- Value of a Firm = Present Value of Cash Flows to the Firm, discounted back at the cost of capital.

Optimum Capital Structure and Cost of Capital

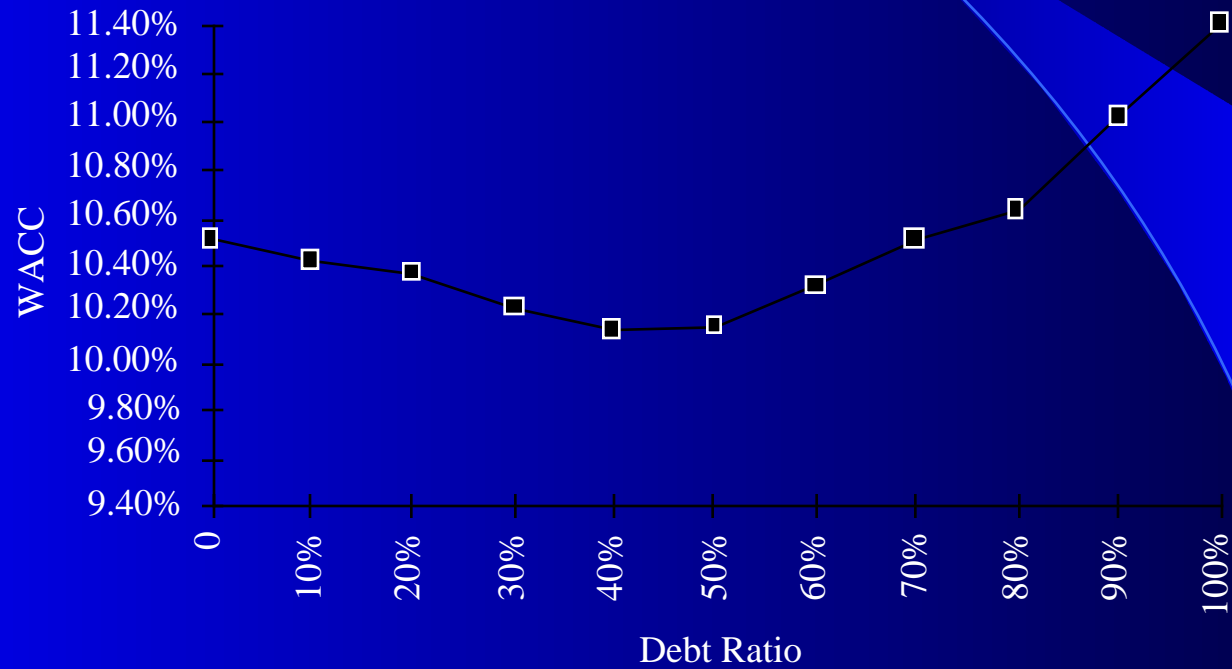
- If the cash flows to the firm are held constant, and the cost of capital is minimized, the value of the firm will be maximized.

Applying 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

Weighted Average Cost of Capital and Debt Ratios



Current Cost of Capital: Disney

- Equity

- Cost of Equity = 13.85%
- Market Value of Equity = \$54.88 Billion
- Equity/(Debt+Equity) = 82%

- Debt

- After-tax Cost of debt = $7.50\% (1-.36) = 4.80\%$
- Market Value of Debt = \$ 11.18 Billion
- Debt/(Debt +Equity) = 18%

- Cost of Capital = $13.85\% (.82) + 4.80\% (.18) = 12.22\%$

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 ($\text{EBIT} / \text{Interest expense}$)

3. Estimate the Cost of Capital at different levels of debt

4. Calculate the effect on Firm Value and Stock Price.

Medians of Key Ratios : 1993-1995

	<i>AAA</i>	<i>AA</i>	<i>A</i>	<i>BBB</i>	<i>BB</i>	<i>B</i>	<i>CCC</i>
Pretax Interest Coverage	13.50	9.67	5.76	3.94	2.14	1.51	0.96
EBITDA Interest Coverage	17.08	12.80	8.18	6.00	3.49	2.45	1.51
Funds from Operations / Total Debt (%)	98.2%	69.1%	45.5%	33.3%	17.7%	11.2%	6.7%
Free Operating Cashflow/ Total Debt (%)	60.0%	26.8%	20.9%	7.2%	1.4%	1.2%	0.96%
Pretax Return on Permanent Capital (%)	29.3%	21.4%	19.1%	13.9%	12.0%	7.6%	5.2%
Operating Income/Sales (%)	22.6%	17.8%	15.7%	13.5%	13.5%	12.5%	12.2%
Long Term Debt/ Capital	13.3%	21.1%	31.6%	42.7%	55.6%	62.2%	69.5%
Total Debt/Capitalization	25.9%	33.6%	39.7%	47.8%	59.4%	67.4%	69.1%

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.

Interest Coverage Ratios and Bond Ratings

If Interest Coverage Ratio is	Estimated Bond Rating
> 8.50	AAA
6.50 - 8.50	AA
5.50 - 6.50	A+
4.25 - 5.50	A
3.00 - 4.25	A-
2.50 - 3.00	BBB
2.00 - 2.50	BB
1.75 - 2.00	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

Spreads over long bond rate for ratings classes

<i>Rating</i>	<i>Spread</i>
AAA	0.20%
AA	0.50%
A+	0.80%
A	1.00%
A-	1.25%
BBB	1.50%
BB	2.00%
B+	2.50%
B	3.25%
B-	4.25%
CCC	5.00%
CC	6.00%
C	7.50%
D	10.00%

Current Income Statement for Disney: 1996

Revenues	18,739
-Operating Expenses	12,046
EBITDA	6,693
-Depreciation	1,134
EBIT	5,559
-Interest Expense	479
Income before taxes	5,080
-Taxes	847
Income after taxes	4,233

- Interest coverage ratio= $5,559/479 = 11.61$

(Amortization from Capital Cities acquisition not considered)

Estimating Cost of Equity

Current Beta = 1.25

Unlevered Beta = 1.09

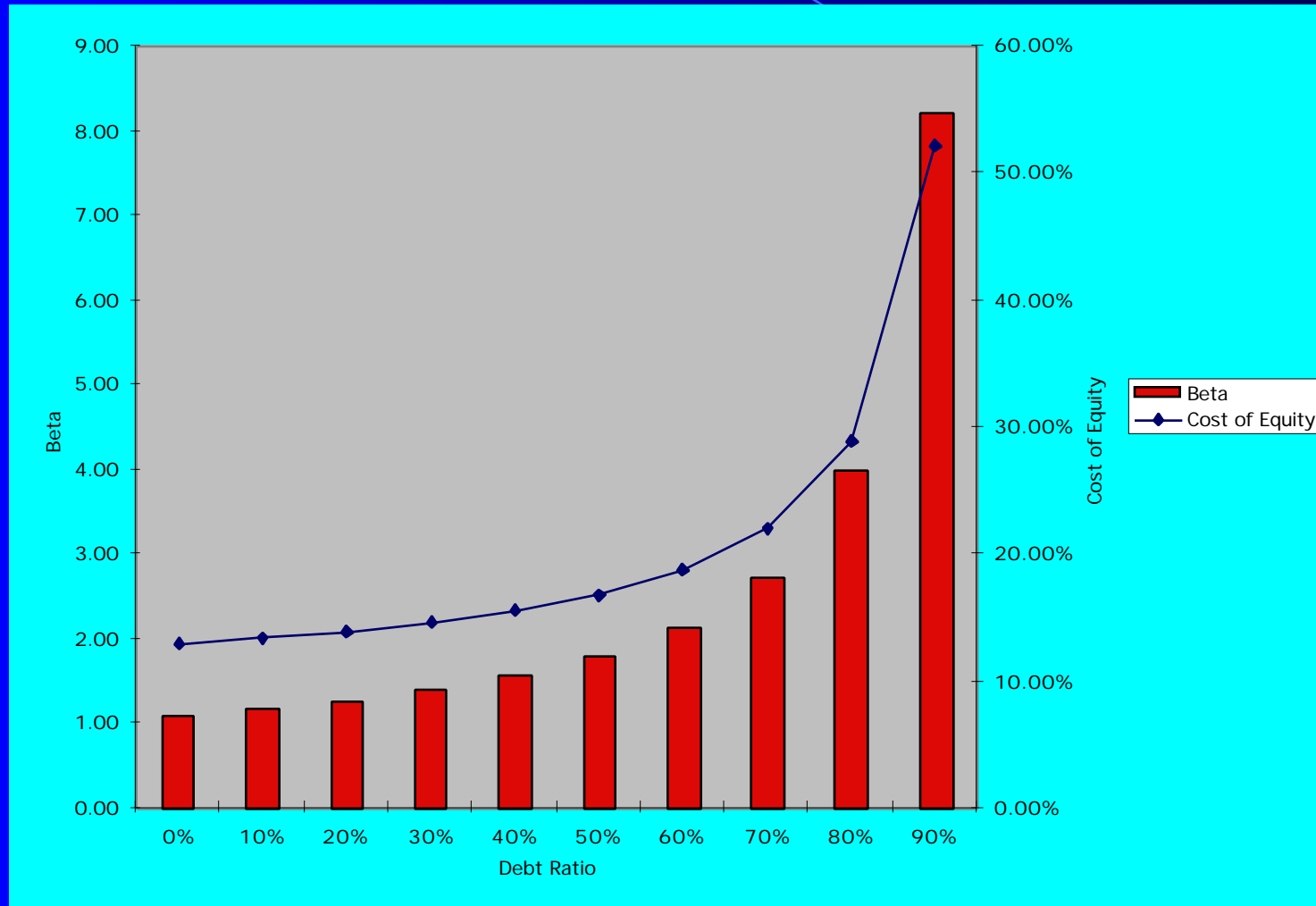
Market premium = 5.5%

T.Bond Rate = 7.00%

t=36%

<i>Debt Ratio</i>	<i>D/E Ratio</i>	<i>Beta</i>	<i>Cost of Equity</i>
0%	0%	1.09	13.00%
10%	11%	1.17	13.43%
20%	25%	1.27	13.96%
30%	43%	1.39	14.65%
40%	67%	1.56	15.56%
50%	100%	1.79	16.85%
60%	150%	2.14	18.77%
70%	233%	2.72	21.97%
80%	400%	3.99	28.95%
90%	900%	8.21	52.14%

Disney: Beta, Cost of Equity and D/E Ratio



Estimating Cost of Debt

	0.00%	10.00%	Calculation Details	Step
D/(D+E)	0.00%	10.00%		
D/E	0.00%	11.11%	= $[D/(D+E)] / (1 - [D/(D+E)])$	
\$ Debt	\$0	\$6,207	= $[D/(D+E)] * \text{Firm Value}$	1
EBITDA	\$6,693	\$6,693	Kept constant as debt changes.	
Depreciation	\$1,134	\$1,134	"	
EBIT	\$5,559	\$5,559		
Interest	\$0	\$447	= Interest Rate * \$ Debt	2
Taxable Income	\$5,559	\$5,112	= OI - Depreciation - Interest	
Tax	\$2,001	\$1,840	= Tax Rate * Taxable Income	
Net Income	\$3,558	\$3,272	= Taxable Income - Tax	
Pre-tax Int. cov		12.44	= $(\text{OI} - \text{Deprec'n}) / \text{Int. Exp}$	3
Likely Rating	AAA	AAA	Based upon interest coverage	4
Interest Rate	7.20%	7.20%	Interest rate for given rating	5
Eff. Tax Rate	36.00%	36.00%	See notes on effective tax rate	
After-tax k_d	4.61%	4.61%	= Interest Rate * $(1 - \text{Tax Rate})$	

Firm Value = 50,888 + 11,180 = \$62,068

The Ratings Table

If Interest Coverage Ratio is	Estimated Bond Rating
> 8.50	AAA
6.50 - 8.50	AA
5.50 - 6.50	A+
4.25 - 5.50	A
3.00 - 4.25	A-
2.50 - 3.00	BBB
2.00 - 2.50	BB
1.75 - 2.00	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

A Test: Can you do the 20% level?

	0.00%	10.00%	20.00%	<i>Second Iteration</i>
<i>D/(D+E)</i>	0.00%	10.00%	20.00%	
D/E	0.00%	11.11%		
\$ Debt	\$0	\$6,207		
EBITDA	\$6,968	\$6,968		
Depreciation	\$1,409	\$1,409		
EBIT	\$5,559	\$5,559		
Interest Expense	\$0	\$447		
Taxable Income	\$5,559	\$5,112		
Pre-tax Int. cov		12.44		
Likely Rating	AAA	AAA		
Interest Rate	7.20%	7.20%		
Eff. Tax Rate	36.00%	36.00%		
Cost of Debt	4.61%	4.61%		

Bond Ratings, Cost of Debt and Debt Ratios

WORKSHEET FOR ESTIMATING RATINGS/INTEREST RATES

D/(D+E)	0.00%	10.00%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	90.00%
D/E	0.00%	11.11%	25.00%	42.86%	66.67%	100.00%	150.00%	233.33%	400.00%	900.00%
\$ Debt	\$0	\$6,207	\$12,414	\$18,621	\$24,827	\$31,034	\$37,241	\$43,448	\$49,655	\$55,862
Operating Inc.	\$6,693	\$6,693	\$6,693	\$6,693	\$6,693	\$6,693	\$6,693	\$6,693	\$6,693	\$6,693
Depreciation	\$1,134	\$1,134	\$1,134	\$1,134	\$1,134	\$1,134	\$1,134	\$1,134	\$1,134	\$1,134
Interest	\$0	\$447	\$968	\$1,536	\$2,234	\$3,181	\$4,469	\$5,214	\$5,959	\$7,262
Taxable Income	\$5,559	\$5,112	\$4,591	\$4,023	\$3,325	\$2,378	\$1,090	\$345	(\$400)	(\$1,703)
Tax	\$2,001	\$1,840	\$1,653	\$1,448	\$1,197	\$856	\$392	\$124	(\$144)	(\$613)
Net Income	\$3,558	\$3,272	\$2,938	\$2,575	\$2,128	\$1,522	\$698	\$221	(\$256)	(\$1,090)
Pre-tax Int. co		12.44	5.74	3.62	2.49	1.75	1.24	1.07	0.93	0.77
Likely Rating	AAA	AAA	A+	A-	BB	B	CCC	CCC	CCC	CC
Interest Rate	7.20%	7.20%	7.80%	8.25%	9.00%	10.25%	12.00%	12.00%	12.00%	13.00%
Eff. Tax Rate	36.00%	36.00%	36.00%	36.00%	36.00%	36.00%	36.00%	36.00%	33.59%	27.56%
Cost of debt	4.61%	4.61%	4.99%	5.28%	5.76%	6.56%	7.68%	7.68%	7.97%	9.42%

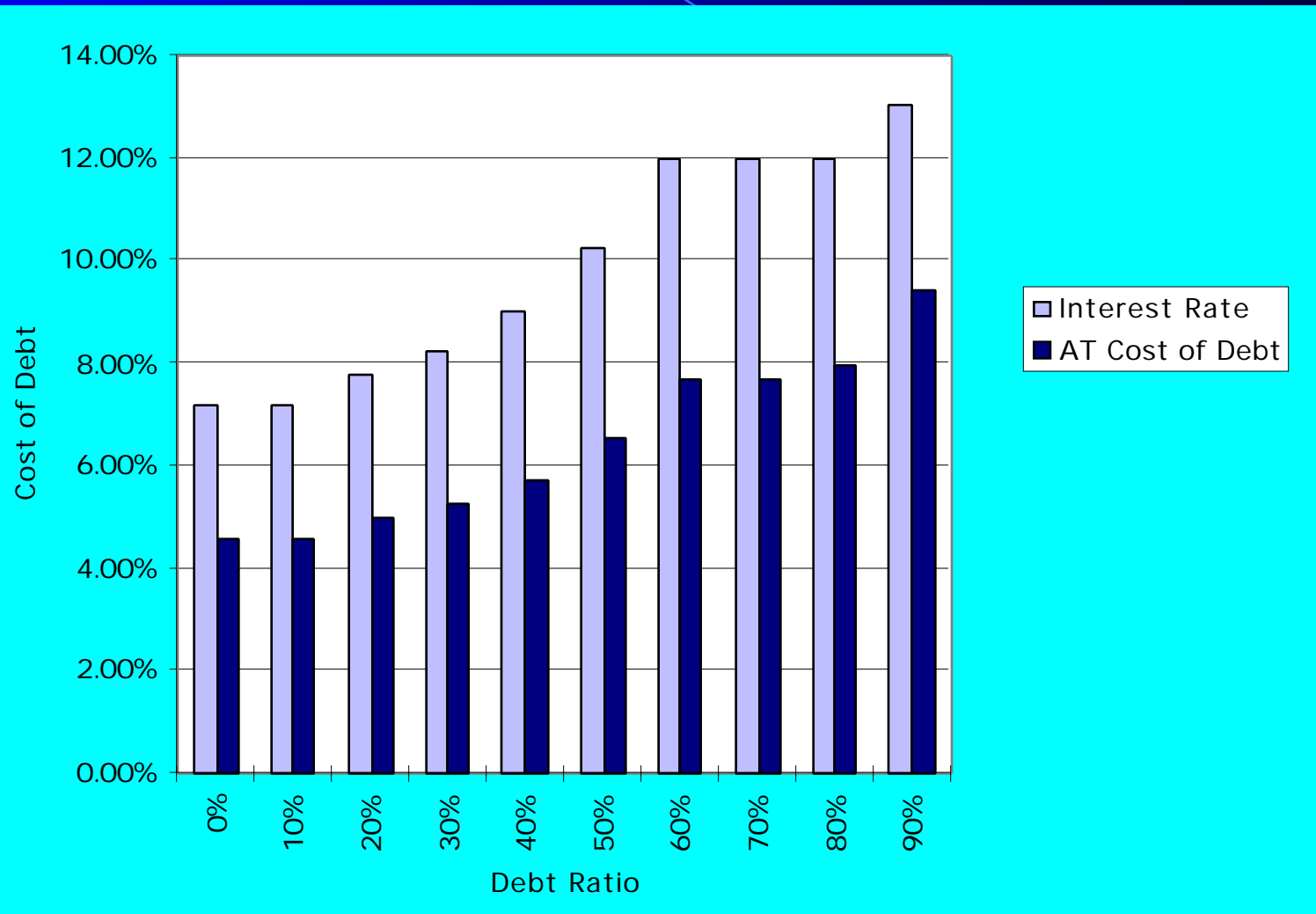
Stated versus Effective Tax Rates

- You need taxable income for interest to provide a tax savings
- In the Disney case, consider the interest expense at 70% and 80%

	<i>70% Debt Ratio</i>	<i>80% Debt Ratio</i>
EBIT	\$ 5,559 m	\$ 5,559 m
Interest Expense	\$ 5,214 m	\$ 5,959 m
Tax Savings	\$ 1,866 m	\$ 2,001m
Effective Tax Rate	36.00%	$2001/5959 = 33.59\%$
Pre-tax interest rate	12.00%	12.00%
After-tax Interest Rate	7.68%	7.97%

- You can deduct only \$5,559million of the \$5,959 million of the interest expense at 80%. Therefore, only 36% of \$ 5,559 is considered as the tax savings.

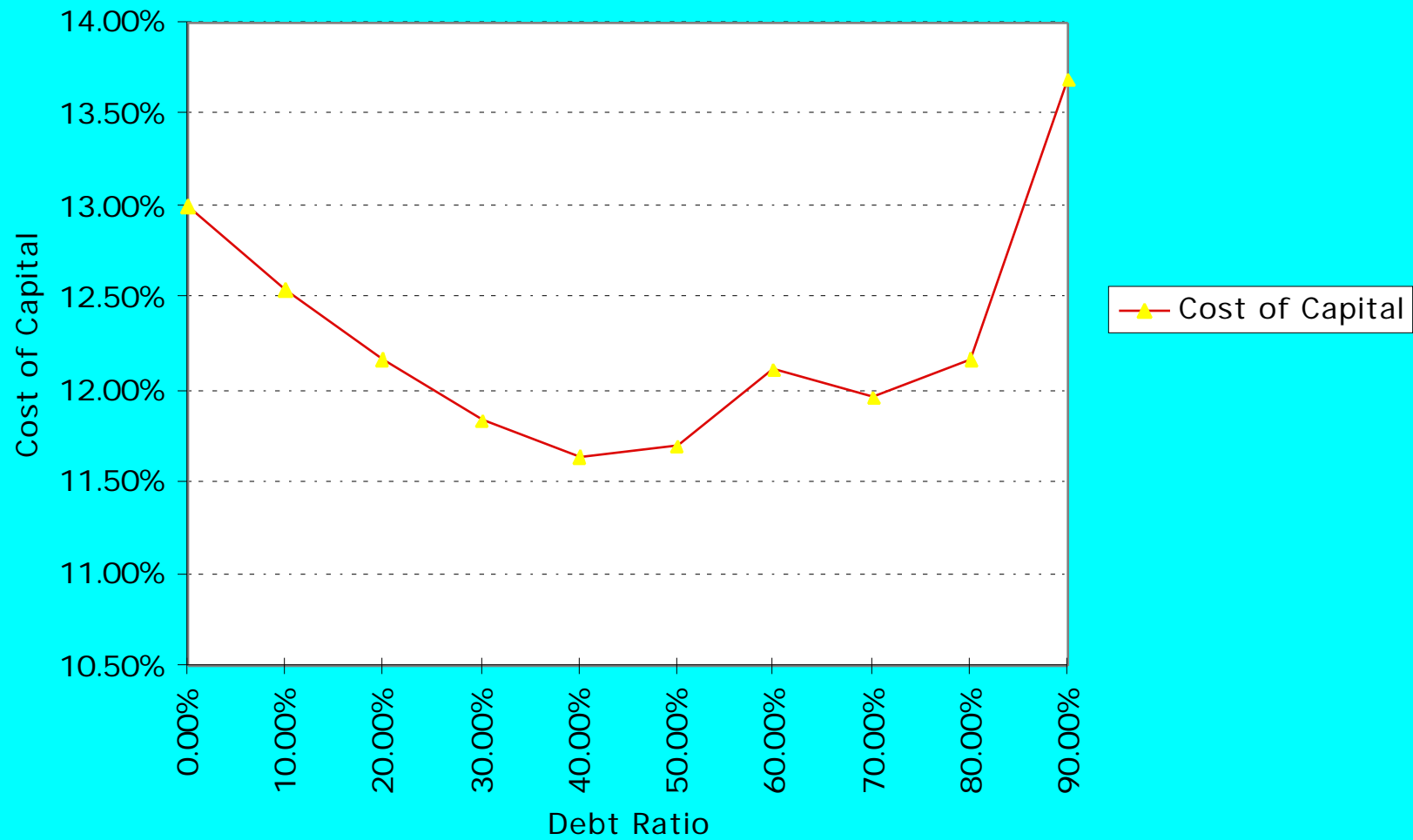
Cost of Debt



Disney's Cost of Capital Schedule

<i>Debt Ratio</i>	<i>Cost of Equity</i>	<i>AT Cost of Debt</i>	<i>Cost of Capital</i>
0.00%	13.00%	4.61%	13.00%
10.00%	13.43%	4.61%	12.55%
20.00%	13.96%	4.99%	12.17%
30.00%	14.65%	5.28%	11.84%
40.00%	15.56%	5.76%	11.64%
50.00%	16.85%	6.56%	11.70%
60.00%	18.77%	7.68%	12.11%
70.00%	21.97%	7.68%	11.97%
80.00%	28.95%	7.97%	12.17%
90.00%	52.14%	9.42%	13.69%

Disney: Cost of Capital Chart



Effect on Firm Value

- Firm Value before the change = $50,888 + 11,180 = \$ 62,068$
 - WACC_b = 12.22% Annual Cost = $\$62,068 * 12.22\% = \$7,583$ million
 - WACC_a = 11.64% Annual Cost = $\$62,068 * 11.64\% = \$7,226$ million
 - WACC = 0.58% Change in Annual Cost = $\$ 357$ million
- If there is no growth in the firm value, (Conservative Estimate)
 - Increase in firm value = $\$357 / .1164 = \$3,065$ million
 - Change in Stock Price = $\$3,065 / 675.13 = \4.54 per share
- If there is growth (of 7.13%) in firm value over time,
 - Increase in firm value = $\$357 * 1.0713 / (.1164 - .0713) = \$ 8,474$
 - Change in Stock Price = $\$2284 / 232 = \12.55 per share

Implied Growth Rate obtained by

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

$\$62,068 = \$3,222(1+g)/(.1222-g)$: Solve for g

A Test: The Repurchase Price

- 11. 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 \$ 75.38) Assuming that firm value will grow by 7.13% 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 \$ 75.38?

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

<i>Year</i>	<i>Operating Income</i>	<i>Change in Operating Income</i>
1981	\$ 119.35	
1982	\$ 141.39	18.46%
1983	\$ 133.87	-5.32%
1984	\$ 142.60	6.5%
1985	\$ 205.60	44.2%
1986	\$ 280.58	36.5%
1987	\$ 707.00	152.0%
1988	\$ 789.00	11.6%
1989	\$ 1,109.00	40.6%
1990	\$ 1,287.00	16.1%
1991	\$ 1,004.00	-22.0%
1992	\$ 1,287.00	28.2%
1993	\$ 1,560.00	21.2%
1994	\$ 1,804.00	15.6%
1995	\$ 2,262.00	25.4%
1996	\$ 3,024.00	33.7%

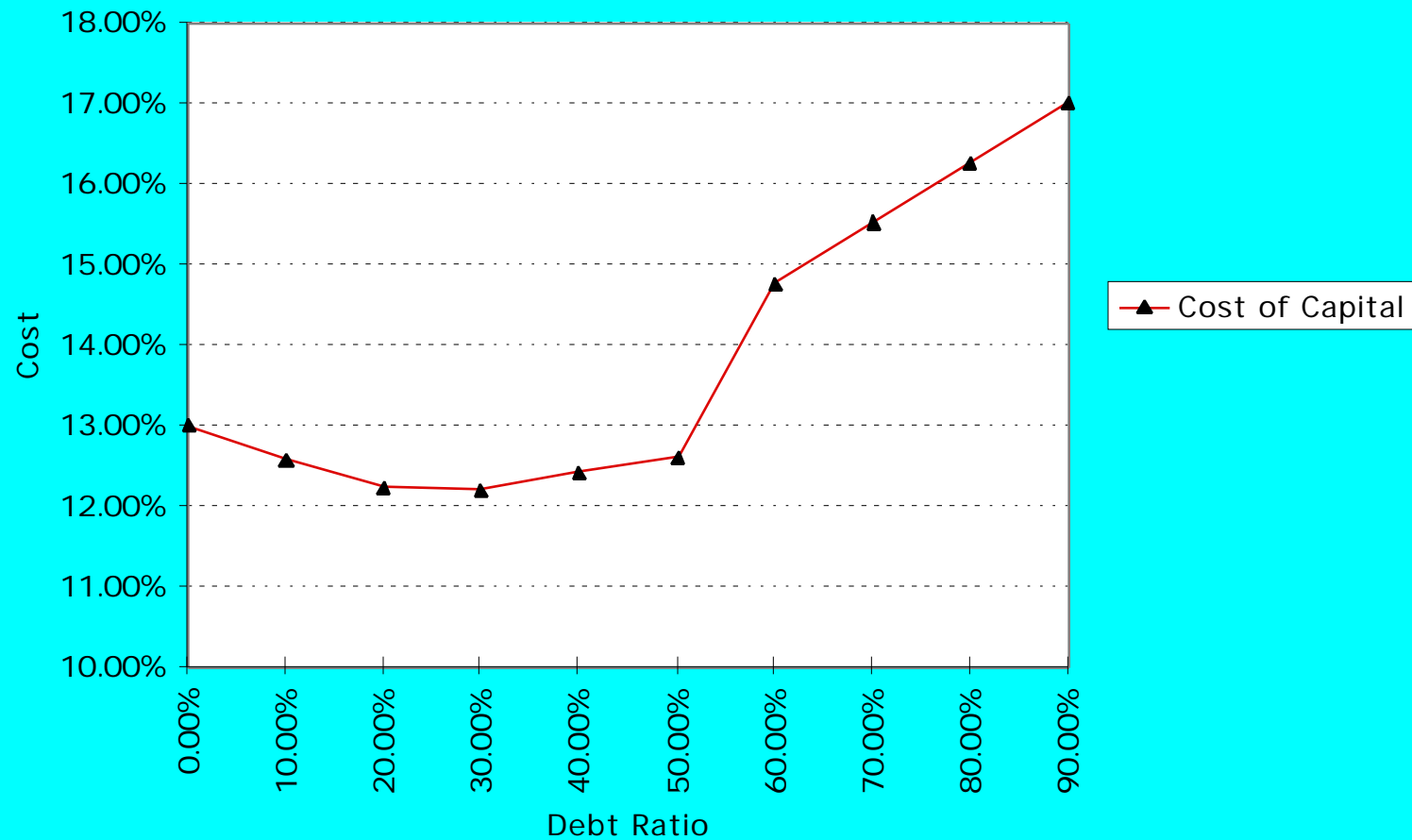
Disney: Effects of Past Downturns

<i>Recession</i>	<i>Decline in Operating Income</i>
1991	Drop of 22.00%
1981-82	Increased
Worst Year	Drop of 26%

- The standard deviation in past operating income is about 39%.

Disney: The Downside Scenario

Disney: Cost of Capital with 40% lower EBIT



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

- Assume that Disney imposes a rating constraint of BBB or greater.
- The optimal debt ratio for Disney is then 30% (see next page)
- The cost of imposing this rating constraint can then be calculated as follows:

Value at 40% Debt	= \$ 70,542 million
- Value at 30% Debt	= \$ 67,419 million
Cost of Rating Constraint	= \$ 3,123 million

Effect of A Ratings Constraint: Disney

Debt Ratio	Rating	Firm Value
0%	AAA	\$53,172
10%	AAA	\$58,014
20%	A+	\$62,705
30%	A-	\$67,419
40%	BB	\$70,542
50%	B	\$69,560
60%	CCC	\$63,445
70%	CCC	\$65,524
80%	CCC	\$62,751
90%	CC	\$47,140

Why Is The Rating At The Current Debt Ratio In The Spreadsheet Different From The Firm's Current Rating?

1. Differences between current market interest rates and rates at which company was able to borrow historically-
 - If current market rates $>$ Historical interest rates --> Rating will be lower
 - If current market rates $<$ Historical interest rates --> Rating will be higher
2. Subjective factors
3. Lags in the rating process

Ways of dealing with this inconsistency

1. Do nothing: This will give you an estimate of the optimal capital structure assuming refinancing at current market interest rates.
2. Build in existing interest costs into the analysis, i.e. Allow existing debt to be carried at existing rates for the rest of their maturity.
3. Build in the subjective factors into ratings. For instance, if the company is currently rated two notches above the rating you get from the interest coverage ratio, add two notches to each of the calculated ratings in the analysis.

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 took 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

Interest Coverage Ratio	Rating is	Spread is	Operating Income Decline
< 0.05	D	10.00%	-50.00%
0.05 - 0.10	C	7.50%	-40.00%
0.10 - 0.20	CC	6.00%	-40.00%
0.20 - 0.30	CCC	5.00%	-40.00%
0.30 - 0.40	B-	4.25%	-25.00%
0.40 - 0.50	B	3.25%	-20.00%
0.50 - 0.60	B+	2.50%	-20.00%
0.60 - 0.80	BB	2.00%	-20.00%
0.80 - 1.00	BBB	1.50%	-20.00%
1.00 - 1.50	A-	1.25%	-17.50%
1.50 - 2.00	A	1.00%	-15.00%
2.00 - 2.50	A+	0.80%	-10.00%
2.50 - 3.00	AA	0.50%	-5.00%
> 3.00	AAA	0.20%	0.00%

Deutsche Bank: Optimal Capital Structure

Debt Ratio	Cost of Equity	Cost of Debt	WACC	Firm Value
0%	10.13%	4.24%	10.13%	DM 124,288.85
10%	10.29%	4.24%	9.69%	DM 132,558.74
20%	10.49%	4.24%	9.24%	DM 142,007.59
30%	10.75%	4.24%	8.80%	DM 152,906.88
40%	11.10%	4.24%	8.35%	DM 165,618.31
50%	11.58%	4.24%	7.91%	DM 165,750.19
60%	12.30%	4.40%	7.56%	DM 162,307.44
70%	13.51%	4.57%	7.25%	DM 157,070.00
80%	15.92%	4.68%	6.92%	DM 151,422.87
90%	25.69%	6.24%	8.19%	DM 30,083.27

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

- In 1996, Aracruz had earnings before interest and taxes of only 15 million BR, and claimed depreciation of 190 million Br. Capital expenditures amounted to 250 million BR.
- Aracruz had debt outstanding of 1520 million BR. While the nominal rate on this debt, especially the portion that is in Brazilian Real, is high, we will continue to do the analysis in real terms, and use a current real cost of debt of 5.5%, which is based upon a real riskfree rate of 5% and a default spread of 0.5%.
- The corporate tax rate in Brazil is estimated to be 32%.
- Aracruz had 976.10 million shares outstanding, trading 2.05 BR per share. The beta of the stock is estimated, using comparable firms, to be 0.71.

Setting up for the Analysis

Current Cost of Equity = $5\% + 0.71 (7.5\%) = 10.33\%$

Market Value of Equity = $2.05 \text{ BR} * 976.1 = 2,001 \text{ million BR}$

Current Cost of Capital

= $10.33\% (2001/(2001+1520)) + 5.5\% (1-.32) (1520/(2001+1520)) = 7.48\%$

- 1996 was a poor year for Aracruz, both in terms of revenues and operating income. In 1995, Aracruz had earnings before interest and taxes of 271 million BR. We will use this as our normalized EBIT.

Aracruz's Optimal Debt Ratio

<i>Debt Ratio</i>	<i>Beta</i>	<i>Cost of Equity</i>	<i>Rating</i>	<i>Cost of Debt</i>	<i>AT Cost of Debt</i>	<i>Cost of Capital</i>	<i>Firm Value</i>
0.00%	0.47	8.51%	AAA	5.20%	3.54%	8.51%	2,720 BR
10.00%	0.50	8.78%	AAA	5.20%	3.54%	8.25%	2,886 BR
20.00%	0.55	9.11%	AA	5.50%	3.74%	8.03%	3,042 BR
30.00%	0.60	9.53%	A	6.00%	4.08%	7.90%	3,148 BR
40.00%	0.68	10.10%	A-	6.25%	4.25%	7.76%	3,262 BR
50.00%	0.79	10.90%	BB	7.00%	4.76%	7.83%	3,205 BR
60.00%	0.95	12.09%	B-	9.25%	6.29%	8.61%	2,660 BR
70.00%	1.21	14.08%	CCC	10.00%	6.80%	8.98%	2,458 BR
80.00%	1.76	18.23%	CCC	10.00%	6.92%	9.18%	2,362 BR
90.00%	3.53	31.46%	CCC	10.00%	7.26%	9.68%	2,149 BR

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.

Estimating the Optimal Debt Ratio for a Private Bookstore

- Adjusted EBIT = EBIT + Operating Lease Expenses
= \$ 2,000,000 + \$ 500,000 = \$ 2,500,000
- While Bookscape has no debt outstanding, the present value of the operating lease expenses of \$ 3.36 million is considered as debt.
- To estimate the market value of equity, we use a multiple of 10 times earnings before interest, lease expenses, taxes and depreciation. This multiple is the average multiple at which comparable firms which are publicly traded are valued.

$$\begin{aligned}\text{Estimated Market Value of Equity} &= \text{EBITDA} * \text{Average Multiple} \\ &= (2,500,000 + 500,000) * 10 = 26,000,000\end{aligned}$$

- The interest rates at different levels of debt will be estimated based upon a “synthetic” bond rating. This rating will be assessed using interest coverage ratios for small firms which are rated by S&P.

Interest Coverage Ratios, Spreads and Ratings: Small Firms

<i>Interest Coverage Ratio</i>	<i>Rating</i>	<i>Spread over T-Bond Rate</i>
> 12.5	AAA	0.20%
9.50-12.50	AA	0.50%
7.5 - 9.5	A+	0.80%
6.0 - 7.5	A	1.00%
4.5 - 6.0	A-	1.25%
3.5 - 4.5	BBB	1.50%
3.0 - 3.5	BB	2.00%
2.5 - 3.0	B+	2.50%
2.0 - 2.5	B	3.25%
1.5 - 2.0	B-	4.25%
1.25 - 1.5	CCC	5.00%
0.8 - 1.25	CC	6.00%
0.5 - 0.8	C	7.50%
< 0.5	D	10.00%

Optimal Debt Ratio for Bookscape

Debt Ratio	Beta	Cost of Equity	Bond Rating	Interest Rate	AT Cost of Debt	Cost of Capital	Firm Value
0%	1.03	12.65%	AA	7.50%	4.35%	12.65%	\$26,781
10%	1.09	13.01%	AA	7.50%	4.35%	12.15%	\$29,112
20%	1.18	13.47%	BBB	8.50%	4.93%	11.76%	\$31,182
30%	1.28	14.05%	B+	9.50%	5.51%	11.49%	\$32,803
40%	1.42	14.83%	B-	11.25%	6.53%	11.51%	\$32,679
50%	1.62	15.93%	CC	13.00%	7.54%	11.73%	\$31,341
60%	1.97	17.84%	CC	13.00%	7.96%	11.91%	\$30,333
70%	2.71	21.91%	C	14.50%	10.18%	13.70%	\$22,891
80%	4.07	29.36%	C	14.50%	10.72%	14.45%	\$20,703
90%	8.13	51.72%	C	14.50%	11.14%	15.20%	\$18,872

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 Returns on Firm = (Operating Income) / MV of Firm

- Higher Pre-tax Returns - - > Higher Optimal Debt Ratio

- Lower Pre-tax Returns - - > 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

Optimal Debt Ratios and EBITDA/Value

- You are estimating the optimal debt ratios for two firms. Reebok has an EBITDA of \$ 450 million, and a market value for the firm of \$ 2.2 billion. Nike has an EBITDA of \$ 745 million and a market value for the firm of \$ 8.8 billion. Which of these firms should have the higher optimal debt ratio
 - Nike
 - Reebok

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)

Disney's Comparables

Company Name	Market Debt Ratio	Book Debt Ratio
Disney (Walt)	18.19%	43.41%
Time Warner	29.39%	68.34%
Westinghouse Electric	26.98%	51.97%
Viacom Inc. 'A'	48.14%	46.54%
Gaylord Entertainm. 'A'	13.92%	41.47%
Belo (A.H.) 'A' Corp.	23.34%	63.04%
Evergreen Media 'A'	16.77%	39.45%
Tele-Communications Intl Inc	23.28%	34.60%
King World Productions	0.00%	0.00%
Jacor Communications	30.91%	57.91%
LIN Television	19.48%	71.66%
Regal Cinemas	4.53%	15.24%
Westwood One	11.40%	60.03%
United Television	4.51%	15.11%
Average of Large Firms	19.34%	43.48%

II. Regression Methodology

- Step 1: Run a regression of debt ratios on proxies for benefits and costs. For example,

$$\text{DEBT RATIO} = a + b (\text{TAX RATE}) + c (\text{EARNINGS VARIABILITY}) + d (\text{FIXED ASSETS/TOTAL ASSETS})$$

- Step 2: Estimate the proxies for the firm under consideration. Plugging into the crosssectional 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 50 entertainment firms, we arrived at the following regression:

$$\text{Debt Ratio} = -0.1067 + 0.69 \text{ Tax Rate} + 0.61 \text{ EBITDA/Value} - 0.07 \text{ OI} \\ (0.90) \quad (2.58) \quad (2.21) \quad (0.60)$$

- The R squared of the regression is 27.16%. This regression can be used to arrive at a predicted value for Disney of:

$$\text{Predicted Debt Ratio} = -0.1067 + 0.69 (.4358) + 0.61 (.0837) - 0.07 (.2257) = .2314$$

- Based upon the capital structure of other firms in the entertainment industry, Disney should have a market value debt ratio of 23.14%.

Cross Sectional Regression: 1996 Data

- Using 1994 data for 2284 firms listed on the NYSE, AMEX and NASDAQ data bases. The regression provides the following results –

$$\text{DFR} = 0.1906 - 0.0552 \text{ PRVAR} - .1340 \text{ CLSH} - 0.3105 \text{ CPXFR} + 0.1447 \text{ FCP}$$

(37.97a) (2.20a) (6.58a) (8.52a) (12.53a)

where,

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

PRVAR = Variance in Firm Value

CLSH = Closely held shares as a percent of outstanding shares

CPXFR = Capital Expenditures / Book Value of Capital

FCP = Free Cash Flow to Firm / Market Value of Equity

- While the coefficients all have the right sign and are statistically significant, the regression itself has an R-squared of only 13.57%.

An Aggregated Regression

- One way to improve the predictive power of the regression is to aggregate the data first and then do the regression. To illustrate with the 1994 data, the firms are aggregated into two-digit SIC codes, and the same regression is re-run.

$$\text{DFR} = 0.2370 - 0.1854 \text{ PRVAR} + .1407 \text{ CLSH} + 1.3959 \text{ CPXF} - .6483 \text{ FCP}$$

(6.06a) (1.96b) (1.05a) (5.73a) (3.89a)

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.

Variance in Firm Value = .04

Closely held shares as percent of shares outstanding = 4% (.04)

Capital Expenditures as fraction of firm value = 6.00% (.06)

Free Cash Flow as percent of Equity Value = 3% (.03)

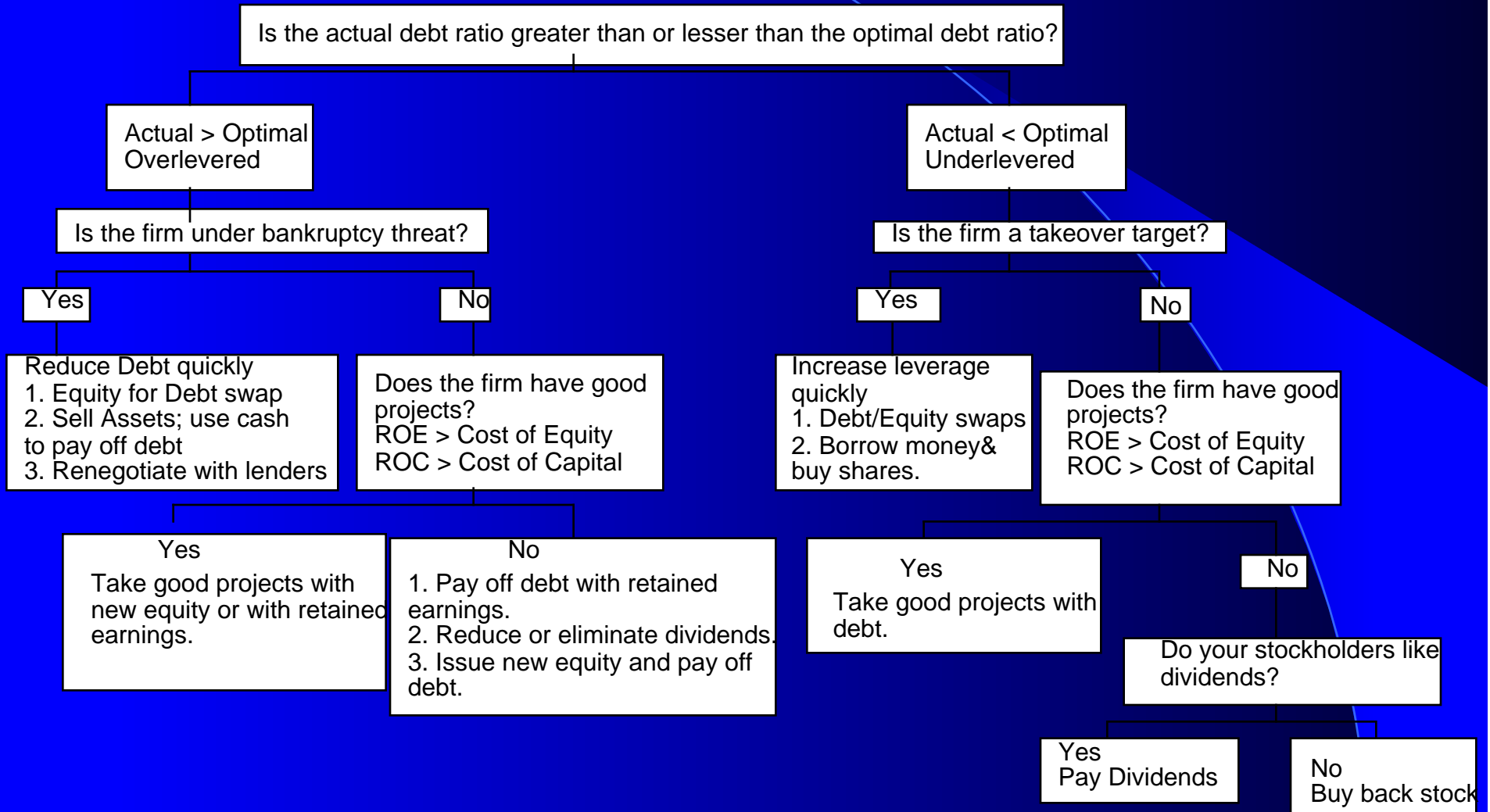
Optimal Debt Ratio

$$=0.2370 - 0.1854 (\quad) + .1407 (\quad) + 1.3959 (\quad) - .6483 (\quad)$$

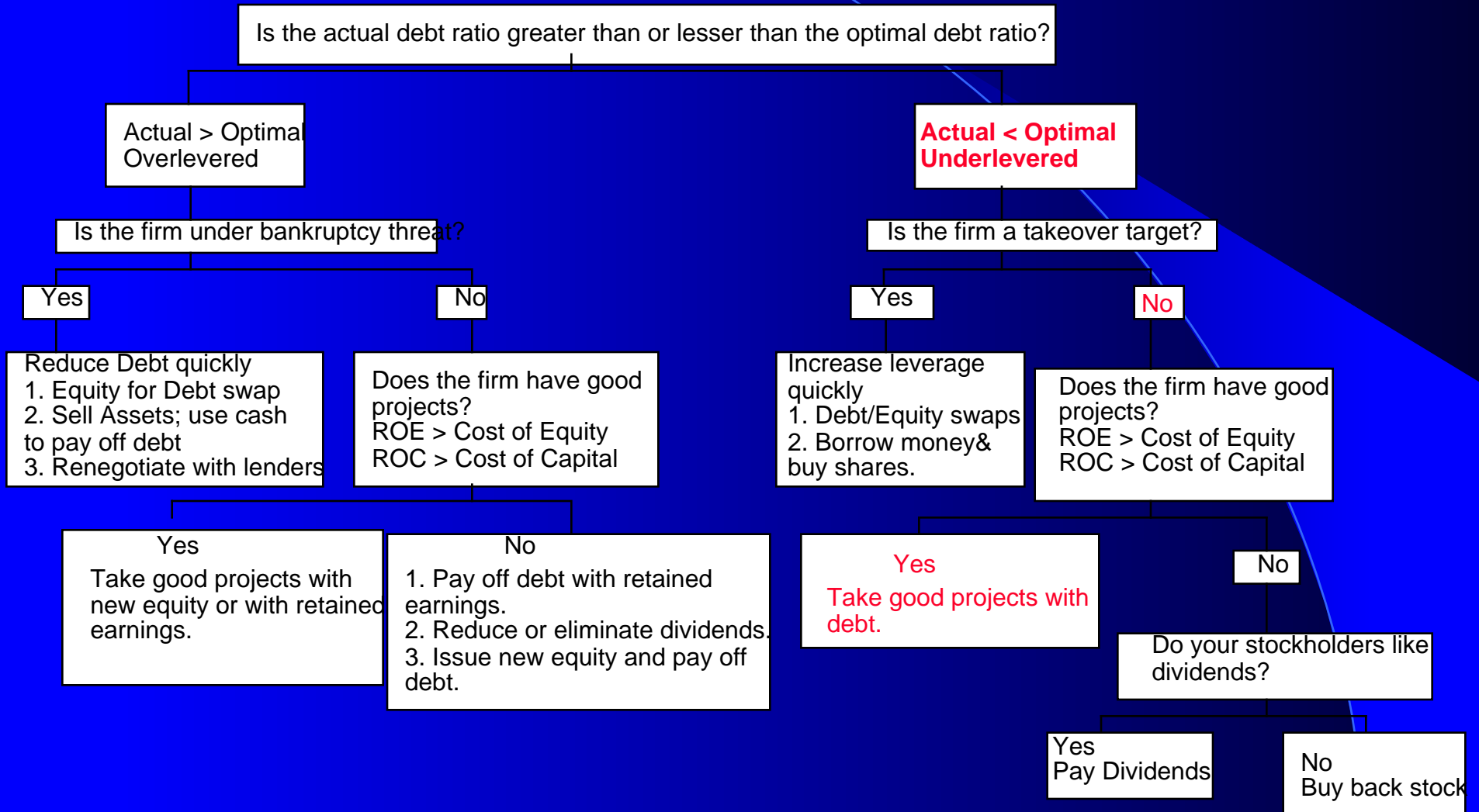
What does this optimal debt ratio tell you?

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

A Framework for Getting to the Optimal

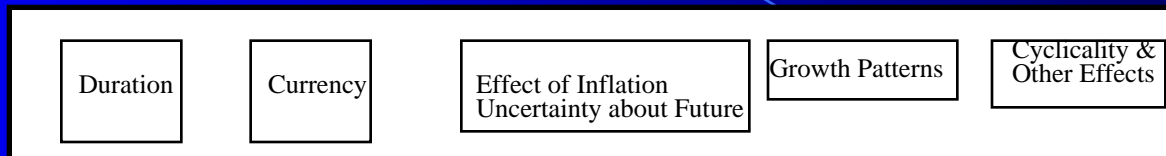


Disney: Applying the Framework

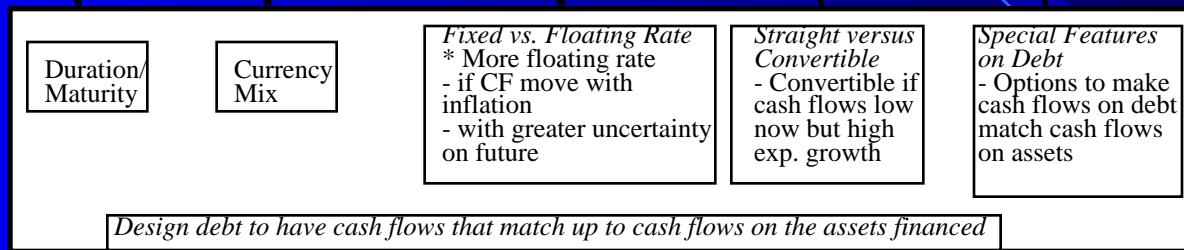


Designing Debt

Start with the Cash Flows on Assets/Projects

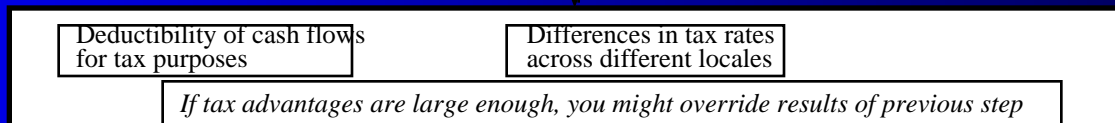


Define Debt Characteristics



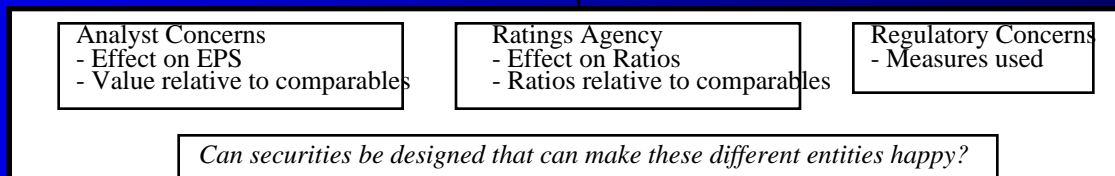
Commodity Bonds
Catastrophe Notes

Overlay tax preferences



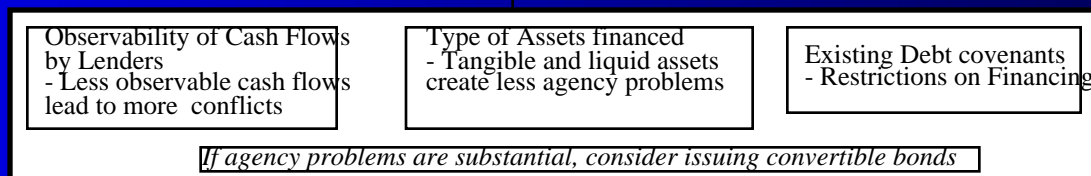
Zero Coupons

Consider ratings agency & analyst concerns



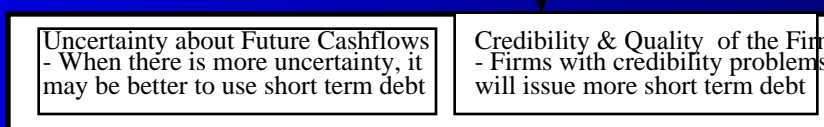
Operating Leases
MIPs
Surplus Notes

Factor in agency conflicts between stock and bond holders

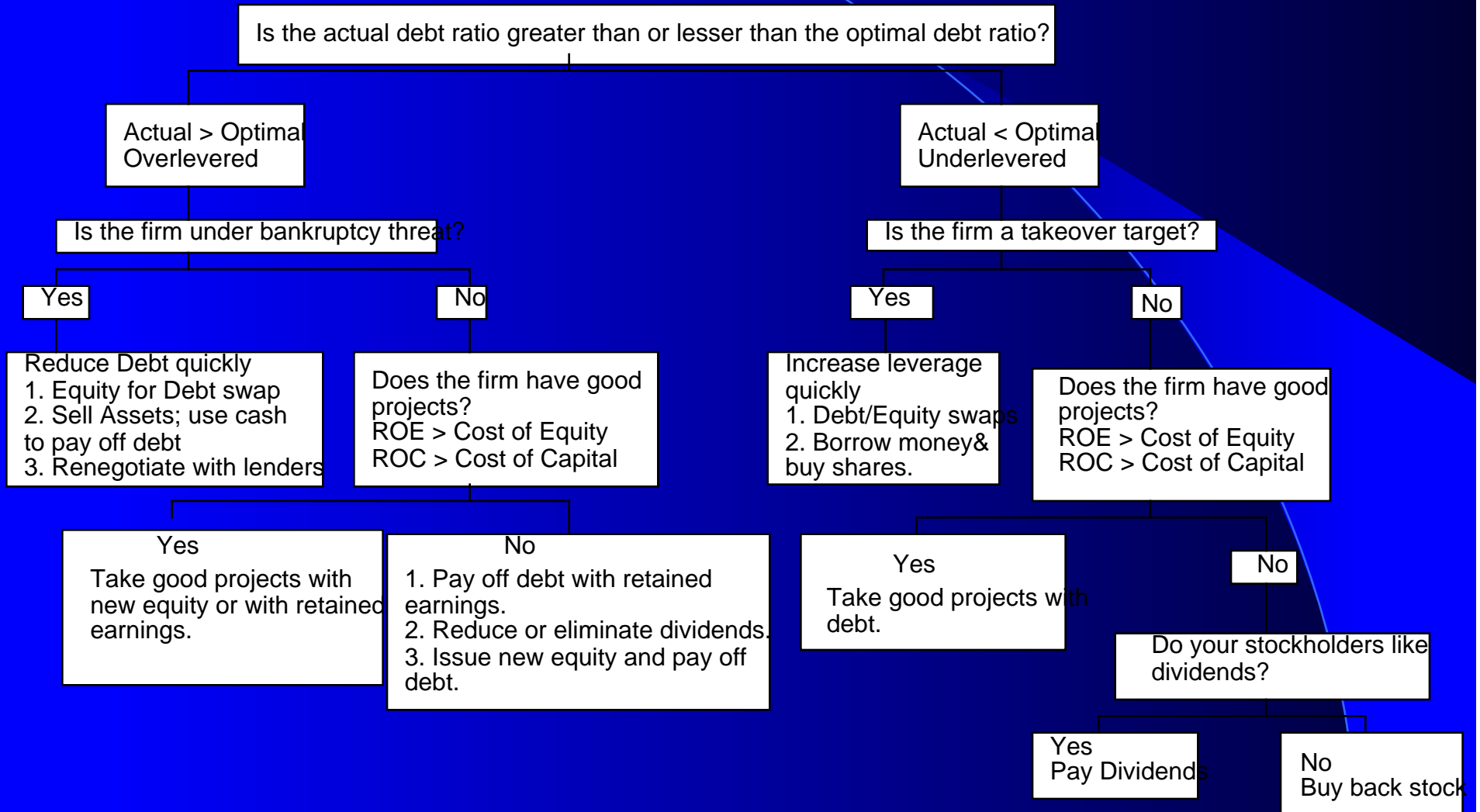


Convertibles
Puttable Bonds
Rating Sensitive Notes
LYONs

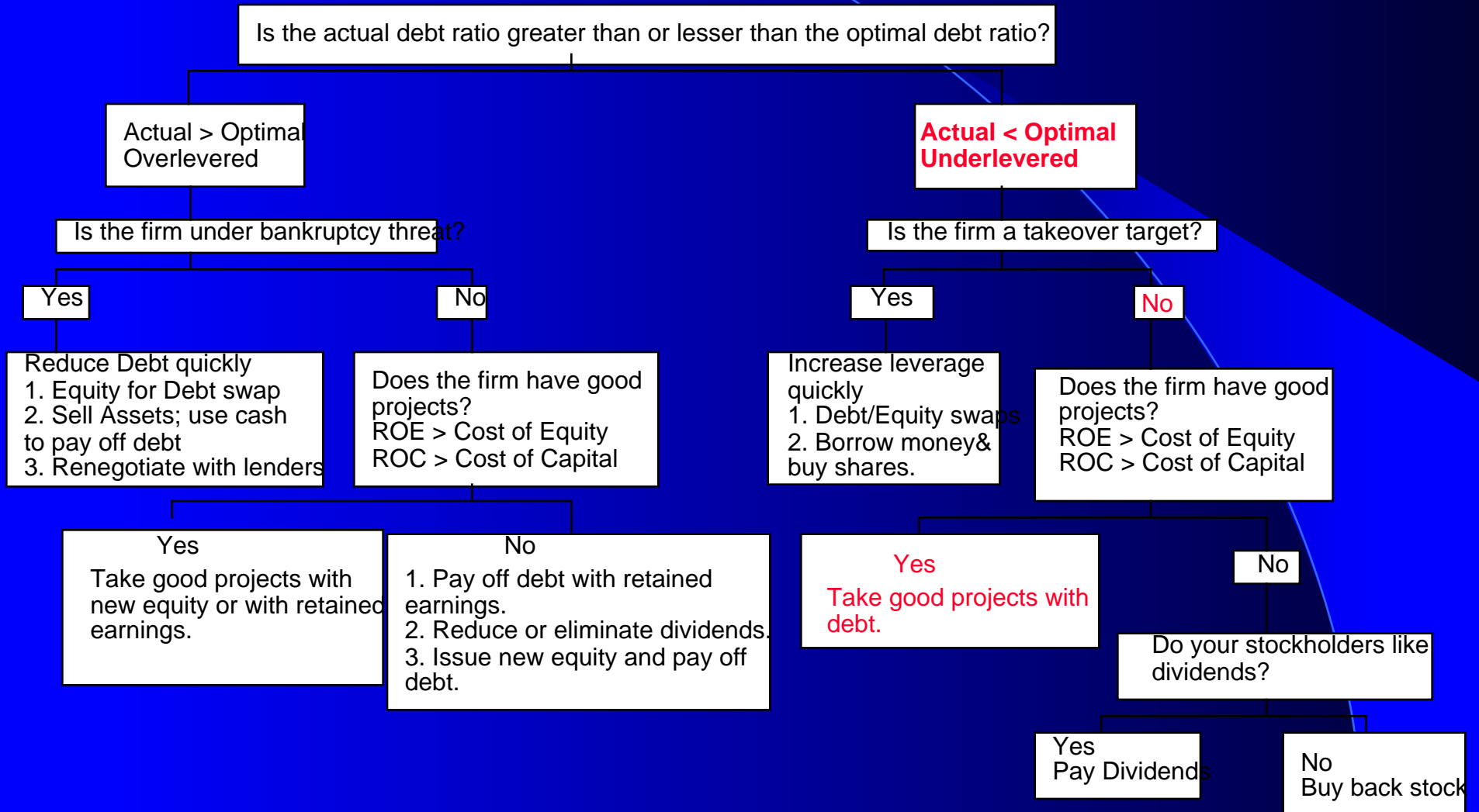
Consider Information Asymmetries



A Framework for Getting to the Optimal

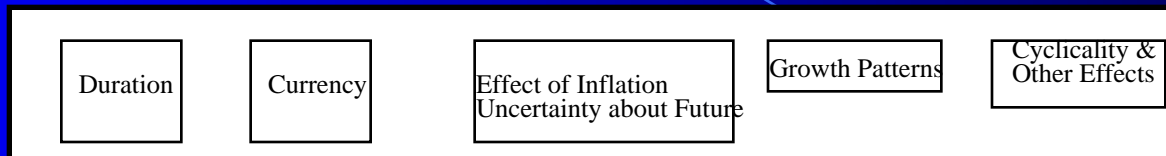


Disney: Applying the Framework

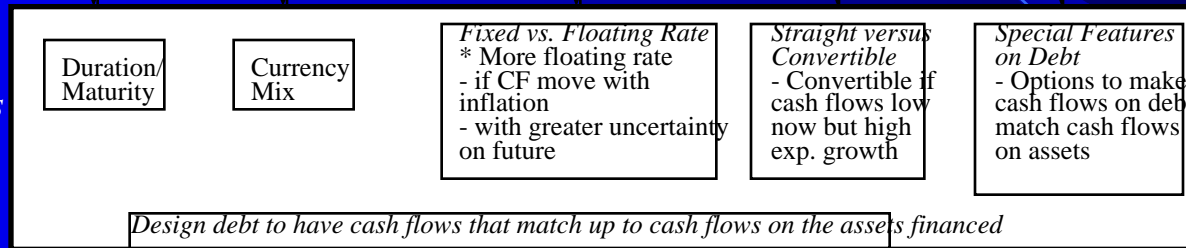


Designing Debt

Start with the Cash Flows on Assets/Projects

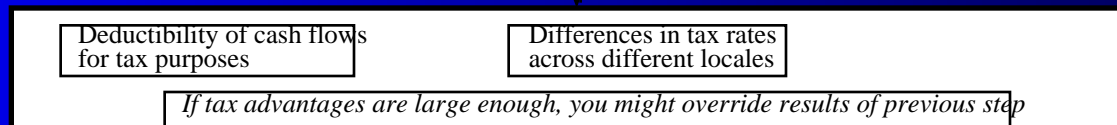


Define Debt Characteristics



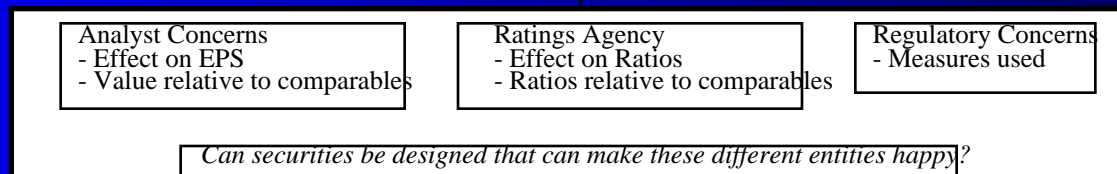
Commodity Bonds
Catastrophe Notes

Overlay tax preferences



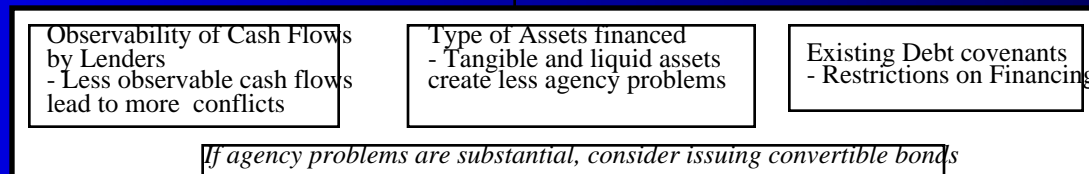
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Consider ratings agency & analyst concerns



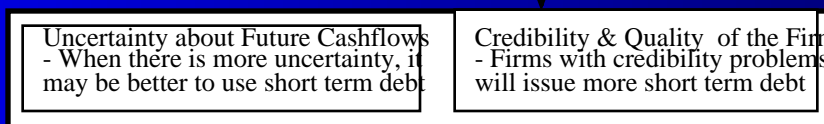
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Factor in agency conflicts between stock and bond holders



Convertibles
Puttable Bonds
Rating Sensitive Notes
LYONs

Consider Information Asymmetries



Approaches for evaluating Asset Cash Flows

- I. Intuitive Approach
 - Are the projects typically long term or short term? What is the cash flow pattern on projects?
 - How much growth potential does the firm have relative to current projects?
 - How cyclical are the cash flows? What specific factors determine the cash flows on projects?
- II. Project Cash Flow Approach
 - Project cash flows on a typical project for the firm
 - Do scenario analyses on these cash flows, based upon different macro economic scenarios
- III. Historical Data
 - Operating Cash Flows
 - Firm Value

Coming up with the financing details: Intuitive Approach

<i>Business</i>	<i>Project Cash Flow Characteristics</i>	<i>Type of Financing</i>
Creative Content	<p>Projects are likely to</p> <ol style="list-style-type: none"> 1. be short term 2. have cash outflows are primarily in dollars (but cash inflows could have a substantial foreign currency component) 3. have net cash flows which are heavily driven by whether the movie or T.V series is a “hit” 	<p>Debt should be</p> <ol style="list-style-type: none"> 1. short term 2. primarily dollar 3. if possible, tied to the success of movies.
Retailing	<p>Projects are likely to be</p> <ol style="list-style-type: none"> 1. medium term (tied to store life) 2. primarily in dollars (most in US still) 3. cyclical 	<p>Debt should be in the form of operating leases.</p>
Broadcasting	<p>Projects are likely to be</p> <ol style="list-style-type: none"> 1. short term 2. primarily in dollars, though foreign component is growing 3. driven by advertising revenues and show success 	<p>Debt should be</p> <ol style="list-style-type: none"> 1. short term 2. primarily dollar debt 3. if possible, linked to network ratings.

Financing Details: Other Divisions

Theme Parks	Projects are likely to be <ol style="list-style-type: none">1. very long term2. primarily in dollars, but a significant proportion of revenues come from foreign tourists.3. affected by success of movie and broadcasting divisions.	Debt should be <ol style="list-style-type: none">1. long term2. mix of currencies, based upon tourist make up.
Real Estate	Projects are likely to be <ol style="list-style-type: none">1. long term2. primarily in dollars.3. affected by real estate values in the area	Debt should be <ol style="list-style-type: none">1. long term2. dollars3. real-estate linked <p>(Mortgage Bonds)</p>

II. QUANTITATIVE APPROACH

1. Operating Cash Flows

- The question of how sensitive a firm's asset cash flows are to a variety of factors, such as interest rates, inflation, currency rates and the economy, can be directly tested by regressing changes in the operating income against changes in these variables.
- $\text{Change in Operating Income}(t) = a + b \text{ Change in Macro Economic Variable}(t)$
- This analysis is useful in determining the coupon/interest payment structure of the debt.

2. Firm Value

- The firm value is clearly a function of the level of operating income, but it also incorporates other factors such as expected growth & cost of capital.
- The firm value analysis is useful in determining the overall structure of the debt, particularly maturity.

The Historical Data

Year	Firm Value	% Change	Operating Income	% Change
1981	\$ 1,707		\$ 119.35	
1982	\$ 2,108	23.46%	\$ 141.39	18.46%
1983	\$ 1,817	-13.82%	\$ 133.87	-5.32%
1984	\$ 2,024	11.4%	\$ 142.60	6.5%
1985	\$ 3,655	80.6%	\$ 205.60	44.2%
1986	\$ 5,631	54.1%	\$ 280.58	36.5%
1987	\$ 8,371	48.7%	\$ 707.00	152.0%
1988	\$ 9,195	9.8%	\$ 789.00	11.6%
1989	\$ 16,015	74.2%	\$ 1,109.00	40.6%
1990	\$ 14,963	-6.6%	\$ 1,287.00	16.1%
1991	\$ 17,122	14.4%	\$ 1,004.00	-22.0%
1992	\$ 24,771	44.7%	\$ 1,287.00	28.2%
1993	\$ 25,212	1.8%	\$ 1,560.00	21.2%
1994	\$ 26,506	5.1%	\$ 1,804.00	15.6%
1995	\$ 33,858	27.7%	\$ 2,262.00	25.4%
1996	\$ 39,561	16.8%	\$ 3,024.00	33.7%

The Macroeconomic Data

Long Bond Rate	Change in Interest	Real GNP	GNP Growth	Weighted Dollar	Change in Dollar	Inflation Rate	Change in Inflation
13.98%		3854		115.65		8.90%	
10.47%	-3.51%	3792	-1.6%	123.14	6.48%	3.80%	-5.10%
11.80%	1.33%	4047	6.7%	128.65	4.47%	3.80%	0.00%
11.51%	-0.29%	4216	4.2%	138.89	8.0%	4.00%	0.20%
8.99%	-2.52%	4350	3.2%	125.95	-9.3%	3.80%	-0.20%
7.22%	-1.77%	4431	1.9%	112.89	-10.4%	1.20%	-2.60%
8.86%	1.64%	4633	4.6%	95.88	-15.1%	4.40%	3.20%
9.14%	0.28%	4789	3.4%	95.32	-0.6%	4.40%	0.00%
7.93%	-1.21%	4875	1.8%	102.26	7.3%	4.60%	0.20%
8.07%	0.14%	4895	0.4%	96.25	-5.9%	6.10%	1.50%
6.70%	-1.37%	4894	0.0%	98.82	2.7%	3.10%	-3.00%
6.69%	-0.01%	5061	3.4%	104.58	5.8%	2.90%	-0.20%
5.79%	-0.90%	5219	3.1%	105.22	0.6%	2.70%	-0.20%
7.82%	2.03%	5416	3.8%	98.6	-6.3%	2.70%	0.00%
5.57%	-2.25%	5503	1.6%	95.1	-3.5%	2.50%	-0.20%
6.42%	0.85%	5679	3.2%	101.5	6.7%	3.30%	0.80%

Sensitivity to Interest Rate Changes

- The answer to this question is important because it
 - it provides a measure of the duration of the firm's projects
 - it provides insight into whether the firm should be using fixed or floating rate debt.

Firm Value versus Interest Rate Changes

- Regressing changes in firm value against changes in interest rates over this period yields the following regression –

$$\text{Change in Firm Value} = 0.22 \quad - 7.43 \text{ (Change in Interest Rates)}$$

(3.09) (1.69)

- Conclusion: The duration (interest rate sensitivity) of Disney's asset values is about 7.43 years. Consequently, its debt should have at least as long a duration.

Regression Constraints

Which of the following aspects of this regression would bother you the most?

- The low R-squared of only 10%
- The fact that Disney today is a very different firm from the firm captured in the data from 1981 to 1996
- Both
- Neither

Why the coefficient on the regression is duration..

- The duration of a straight bond or loan issued by a company can be written in terms of the coupons (interest payments) on the bond (loan) and the face value of the bond to be –

$$\text{Duration of Bond} = dP/dr = \frac{\sum_{t=1}^{t=N} \frac{t * \text{Coupon}_t}{(1+r)^t} + \frac{N * \text{Face Value}}{(1+r)^N}}{\sum_{t=1}^{t=N} \frac{\text{Coupon}_t}{(1+r)^t} + \frac{\text{Face Value}}{(1+r)^N}}$$

- Holding other factors constant, the duration of a bond will increase with the maturity of the bond, and decrease with the coupon rate on the bond.

Duration of a Firm's Assets

- This measure of duration can be extended to any asset with expected cash flows on it. Thus, the duration of a project or asset can be estimated in terms of the pre-debt operating cash flows on that project.

$$\text{Duration of Project/Asset} = \frac{dPV/dr = \frac{\sum_{t=1}^{t=N} t * CF_t}{(1+r)^t} + \frac{N * \text{Terminal Value}}{(1+r)^N}}{\sum_{t=1}^{t=N} \frac{CF_t}{(1+r)^t} + \frac{\text{Terminal Value}}{(1+r)^N}}$$

where,

CF_t = After-tax operating cash flow on the project in year t

Terminal Value = Salvage Value at the end of the project lifetime

N = Life of the project

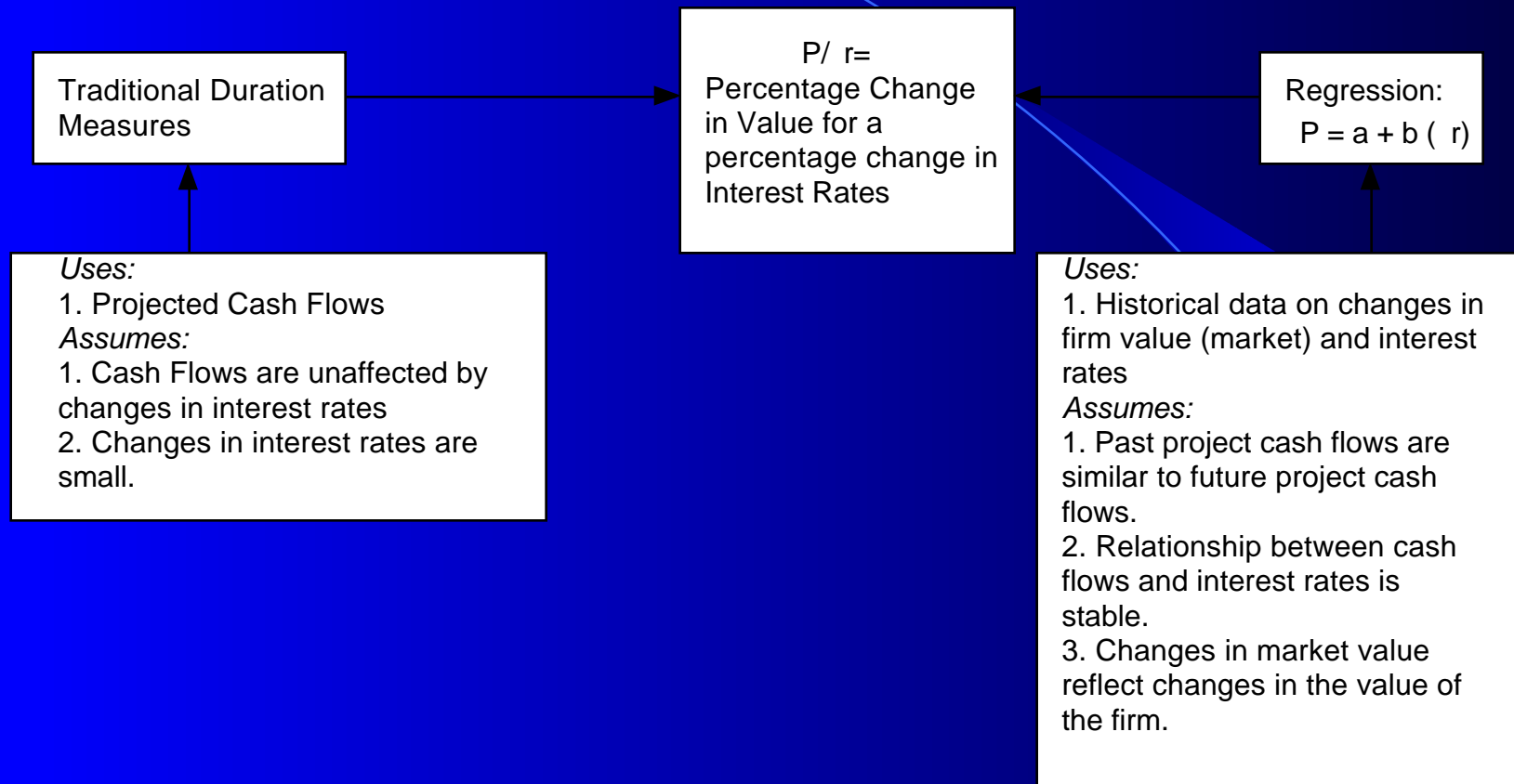
- The duration of any asset provides a measure of the interest rate risk embedded in that asset.

Duration of Disney Theme Park

<i>Year</i>	<i>FCFF</i>	<i>Terminal Value</i>	<i>Total FCFF</i>	<i>PV of FCFF</i>	<i>PV * t</i>
1	(\$39,078 Bt)		(\$39,078 Bt)	(31,180 Bt)	-31180.4
2	(\$36,199 Bt)		(\$36,199 Bt)	(23,046 Bt)	-46092.4
3	(\$11,759 Bt)		(\$11,759 Bt)	(5,973 Bt)	-17920
4	16,155 Bt		16,155 Bt	6,548 Bt	26193.29
5	21,548 Bt		21,548 Bt	6,969 Bt	34844.55
6	33,109 Bt		33,109 Bt	8,544 Bt	51264.53
7	46,692 Bt		46,692 Bt	9,614 Bt	67299.02
8	58,169 Bt		58,169 Bt	9,557 Bt	76454.39
9	70,423 Bt	838,720 Bt	909,143 Bt	119,182 Bt	1072635
Sum				100,214 Bt	1,233,498

Duration of the Project = $1,233,498 / 100,214 = 12.30$ years

Duration: Comparing Approaches



Operating Income versus Interest Rates

- Regressing changes in operating cash flow against changes in interest rates over this period yields the following regression –
Change in Operating Income = 0.31 - 4.99 (Change in Interest Rates)
(2.90) (0.78)
 - Conclusion: Disney's operating income, like its firm value, has been very sensitive to interest rates, which confirms our conclusion to use long term debt.
- Generally speaking, the operating cash flows are smoothed out more than the value and hence will exhibit lower duration than the firm value.

Sensitivity to Changes in GNP

- The answer to this question is important because
 - it provides insight into whether the firm's cash flows are cyclical and
 - whether the cash flows on the firm's debt should be designed to protect against cyclical factors.
- If the cash flows and firm value are sensitive to movements in the economy, the firm will either have to issue less debt overall, or add special features to the debt to tie cash flows on the debt to the firm's cash flows.

Regression Results

- Regressing changes in firm value against changes in the GNP over this period yields the following regression –

$$\text{Change in Firm Value} = 0.31 + 1.71 (\text{GNP Growth})$$

(2.43) (0.45)

- Conclusion: Disney is only mildly sensitive to cyclical movements in the economy.

- Regressing changes in operating cash flow against changes in GNP over this period yields the following regression –

$$\text{Change in Operating Income} = 0.17 + 4.06 (\text{GNP Growth})$$

(1.04) (0.80)

- Conclusion: Disney's operating income is slightly more sensitive to the economic cycle. This may be because of the lagged effect of GNP growth on operating income.

Sensitivity to Currency Changes

- The answer to this question is important, because
 - it provides a measure of how sensitive cash flows and firm value are to changes in the currency
 - it provides guidance on whether the firm should issue debt in another currency that it may be exposed to.
- If cash flows and firm value are sensitive to changes in the dollar, the firm should
 - figure out which currency its cash flows are in;
 - and issued some debt in that currency

Regression Results

- Regressing changes in firm value against changes in the dollar over this period yields the following regression –

$$\text{Change in Firm Value} = 0.26 - 1.01 (\text{Change in Dollar})$$

(3.46) (0.98)

- Conclusion: Disney's value has not been very sensitive to changes in the dollar over the last 15 years.

- Regressing changes in operating cash flow against changes in the dollar over this period yields the following regression –

$$\text{Change in Operating Income} = 0.26 - 3.03 (\text{Change in Dollar})$$

(3.14) (2.59)

- Conclusion: Disney's operating income has been much more significantly impacted by the dollar. A stronger dollar seems to hurt operating income.

Sensitivity to Inflation

- The answer to this question is important, because
 - it provides a measure of whether cash flows are positively or negatively impacted by inflation.
 - it then helps in the design of debt; whether the debt should be fixed or floating rate debt.
- If cash flows move with inflation, increasing (decreasing) as inflation increases (decreases), the debt should have a larger floating rate component.

Regression Results

- Regressing changes in firm value against changes in inflation over this period yields the following regression –

$$\text{Change in Firm Value} = 0.26 - 0.22 (\text{Change in Inflation Rate})$$

(3.36) (0.05)

- Conclusion: Disney's firm value does not seem to be affected too much by changes in the inflation rate.

- Regressing changes in operating cash flow against changes in inflation over this period yields the following regression –

$$\text{Change in Operating Income} = 0.32 + 10.51 (\text{Change in Inflation Rate})$$

(3.61) (2.27)

- Conclusion: Disney's operating income seems to increase in periods when inflation increases. However, this increase in operating income seems to be offset by the increase in discount rates leading to a much more muted effect on value.

Overall Recommendations

- The debt issued should be long term, and should have an average duration of approximately 7.5 years.
- Since the cashflows tend to weaken when the dollar strengthens, some of the debt should be in foreign currency, with the magnitude of the exposure and the currency used being determined by the mix of tourists that arrive at the theme parks and the expansion plans for the creative content and television businesses.
- Since the cash flows tend to move with inflation, a portion of the debt should be floating rate debt.

First Principles

- Invest in projects that yield a return greater than the minimum acceptable hurdle rate.
 - The hurdle rate should be higher for riskier projects and reflect the financing mix used - owners' funds (equity) or borrowed money (debt)
 - Returns on projects should be measured based on cash flows generated and the timing of these cash flows; they should also consider both positive and negative side effects of these projects.
- **Choose a financing mix that minimizes the hurdle rate and matches the assets being financed.**
- If there are not enough investments that earn the hurdle rate, return the cash to stockholders.
 - The form of returns - dividends and stock buybacks - will depend upon the stockholders' characteristics.