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 = $\dfrac{\text{FCFF}_0(1+g)}{(\text{Cost of Capital -g})} = \dfrac{3{,}657(1+g)}{(.0781\text{ -g})}$
  - 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 = $\dfrac{\text{FCFF}_0(1+g)}{(\text{Cost of Capital -g})} = \dfrac{3{,}657(1.0494)}{(.0716\text{ -0.0484})} = \$172{,}935\text{ million}$
  - 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

2. What if something goes wrong? The Downside Risk

- Sensitivity to Assumptions

A. "What if" analysis

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

B. "Economic Scenario" Approach

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

- Constraint on Bond Ratings/ Book Debt Ratios

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

Disney's Operating Income: History

Year	EBIT	% Change in EBIT	Year	EBIT	% Change in EBIT
1987	$756		2001	$2,832	12.16%
1988	$848	12.17%	2002	$2,384	-15.82%
1989	$1,177	38.80%	2003	$2,713	13.80%
1990	$1,368	16.23%	2004	$4,048	49.21%
1991	$1,124	-17.84%	2005	$4,107	1.46%
1992	$1,287	14.50%	2006	$5,355	30.39%
1993	$1,560	21.21%	2007	$6,829	27.53%
1994	$1,804	15.64%	2008	$7,404	8.42%
1995	$2,262	25.39%	2009	$5,697	-23.06%
1996	$3,024	33.69%	2010	$6,726	18.06%
1997	$3,945	30.46%	2011	$7,781	15.69%
1998	$3,843	-2.59%	2012	$8,863	13.91%
1999	$3,580	-6.84%	2013	$9,450	6.62%
2000	$2,525	-29.47%			

Standard deviation in % change in EBIT = 19.17%

Recession	*Decline in Operating Income*
2009	Drop of 23.06%
2002	Drop of 15.82%
1991	Drop of 22.00%
1981-82	Increased by 12%
Worst Year	Drop of 29.47%

Disney: Safety Buffers?

EBIT drops by	EBIT	Optimal Debt ratio
0%	$10,032	40%
10%	$9,029	40%
20%	$8,025	40%
30%	$7,022	40%
40%	$6,019	30%
50%	$5,016	30%
60%	$4,013	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.
  - The cost of a rating constraint is the difference between the unconstrained value and the value of the firm with the constraint.
  - Managers need to be made aware of the costs of the constraints they impose.

Ratings Constraints for Disney

- At its optimal debt ratio of 40%, Disney has an estimated rating of A.
- If managers insisted on a AA rating, the optimal debt ratio for Disney is then 30% and the cost of the ratings constraint is fairly small:

  Cost of AA Rating Constraint = Value at 40% Debt – Value at 30% Debt = $153,531 m – $147,835 m = $ 5,696 million
- If managers insisted on a AAA rating, the optimal debt ratio would drop to 20% and the cost of the ratings constraint would rise:

  Cost of AAA rating constraint = Value at 40% Debt – Value at 20% Debt = $153,531 m – $141,406 m = $ 12,125 million

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

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

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

Debt Ratio	Beta	Cost of Equity	Bond Rating	Interest rate on debt	Tax Rate	Cost of Debt (after-tax)	WACC	Enterprise Value
0%	0.8601	12.76%	Aaa/AAA	9.22%	32.45%	6.23%	12.76%	1,286,997₹
10%	0.9247	13.22%	Aa2/AA	9.52%	32.45%	6.43%	12.54%	1,333,263₹
20%	1.0054	13.80%	A3/A-	10.12%	32.45%	6.84%	12.41%	1,363,774₹
30%	1.1092	14.55%	B2/B	15.32%	32.45%	10.35%	13.29%	1,185,172₹
40%	1.2475	15.54%	Caa/CCC	17.57%	32.45%	11.87%	14.07%	1,061,143₹
50%	1.4412	16.93%	Ca2/CC	18.32%	32.45%	12.38%	14.65%	984,693₹
60%	1.7610	19.23%	Ca2/CC	18.32%	30.18%	12.79%	15.37%	904,764₹
70%	2.3749	23.65%	C2/C	19.32%	24.53%	14.58%	17.30%	741,800₹
80%	3.5624	32.19%	C2/C	19.32%	21.46%	15.17%	18.58%	663,028₹
90%	7.1247	57.81%	C2/C	19.32%	19.08%	15.63%	19.85%	599,379₹

Tata Motors looks like it is over levered (29% actual versus 20% optimal), perhaps because it is drawing on the debt capacity of other companies in the Tata Group.

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

Debt Ratio	Beta	Cost of Equity	Bond Rating	Interest rate on debt	Tax Rate	Cost of Debt (after-tax)	WACC	Enterprise Value
0%	0.8440	8.97%	Aaa/AAA	5.15%	34.00%	3.40%	8.97%	$98,306
10%	0.9059	9.43%	Aaa/AAA	5.15%	34.00%	3.40%	8.83%	$100,680
20%	0.9833	10.00%	Aaa/AAA	5.15%	34.00%	3.40%	8.68%	$103,171
30%	**1.0827**	**10.74%**	**A1/A+**	**5.60%**	**34.00%**	**3.70%**	**8.62%**	**$104,183**
40%	1.2154	11.71%	A3/A-	6.05%	34.00%	3.99%	8.63%	$104,152
50%	1.4011	13.08%	B1/B+	10.25%	34.00%	6.77%	9.92%	$85,298
60%	1.6796	15.14%	B3/B-	12.00%	34.00%	7.92%	10.81%	$75,951
70%	2.1438	18.56%	B3/B-	12.00%	34.00%	7.92%	11.11%	$73,178
80%	3.0722	25.41%	Ca2/CC	14.25%	34.00%	9.41%	12.61%	$62,090
90%	5.8574	45.95%	Ca2/CC	14.25%	34.00%	9.41%	13.06%	$59,356

	Last 12 months	-1	-2	-3	Average
Revenues	$48,469	$48,058	$61,123	$47,343	$51,248
EBITDA	$19,861	$17,662	$34,183	$26,299	$24,501
EBIT	$15,487	$13,346	$30,206	$23,033	$20,518
Pre-tax operating margin	31.95%	27.77%	49.42%	48.65%	39.45%

Replacing Vale's current operating income with the average over the last three years pushes up the optimal to 50%.

Optimal Debt Ratio for a young, growth firm: Baidu

Debt Ratio	Beta	Cost of Equity	Bond Rating	Interest rate on debt	Tax Rate	Cost of Debt (after-tax)	WACC	Enterprise Value
0%	1.3021	12.54%	Aaa/AAA	4.70%	25.00%	3.53%	12.54%	$337,694
10%	1.4106	13.29%	A3/A-	5.60%	25.00%	4.20%	12.38%	$343,623
20%	1.5463	14.23%	Ca2/CC	13.80%	25.00%	10.35%	13.45%	$306,548
30%	1.7632	15.74%	Caa/CCC	14.80%	17.38%	12.23%	14.68%	$272,853
40%	2.0675	17.85%	D2/D	16.30%	11.83%	14.37%	16.46%	$235,510
50%	2.4810	20.72%	D2/D	16.30%	9.47%	14.76%	17.74%	$214,337
60%	3.1012	25.02%	D2/D	16.30%	7.89%	15.01%	19.02%	$196,657
70%	4.1350	32.20%	D2/D	16.30%	6.76%	15.20%	20.30%	$181,672
80%	6.2024	46.54%	D2/D	16.30%	5.92%	15.34%	21.58%	$168,808
90%	12.4049	89.59%	D2/D	16.30%	5.26%	15.44%	22.86%	$157,646

The optimal debt ratio for Baidu is between 0 and 10%, close to its current debt ratio of 5.23%, and much lower than the optimal debt ratios computed for Disney, Vale and Tata Motors.

Extension to a private business
Optimal Debt Ratio for Bookscape

Debt value of leases = $12,136 million (only debt)
Estimated market value of equity = Net Income * Average PE for Publicly Traded Book Retailers = 1.575 * 20 = $31.5 million
Debt ratio = 12,136/(12,136+31,500) = 27.81%

Debt Ratio	Total Beta	Cost of Equity	Bond Rating	Interest rate on debt	Tax Rate	Cost of Debt (after-tax)	WACC	Enterprise Value
0%	1.3632	10.25%	Aaa/AAA	3.15%	40.00%	1.89%	10.25%	$37,387
10%	1.4540	10.75%	Aaa/AAA	3.15%	40.00%	1.89%	9.86%	$39,416
20%	1.5676	11.37%	A1/A+	3.60%	40.00%	2.16%	9.53%	$41,345
30%	1.7137	12.18%	A3/A-	4.05%	40.00%	2.43%	9.25%	$43,112
40%	1.9084	13.25%	Caa/CCC	11.50%	40.00%	6.90%	10.71%	$35,224
50%	2.2089	14.90%	Ca2/CC	12.25%	37.96%	7.60%	11.25%	$32,979
60%	2.8099	18.20%	C2/C	13.25%	29.25%	9.37%	12.91%	$27,598
70%	3.7466	23.36%	C2/C	13.25%	25.07%	9.93%	13.96%	$25,012
80%	5.6198	33.66%	C2/C	13.25%	21.93%	10.34%	15.01%	$22,869
90%	11.4829	65.91%	D2/D	14.75%	17.51%	12.17%	17.54%	$18,952

The firm value is maximized (and the cost of capital is minimized) at a debt ratio of 30%. At its existing debt ratio of 27.81%, Bookscape is at its optimal.

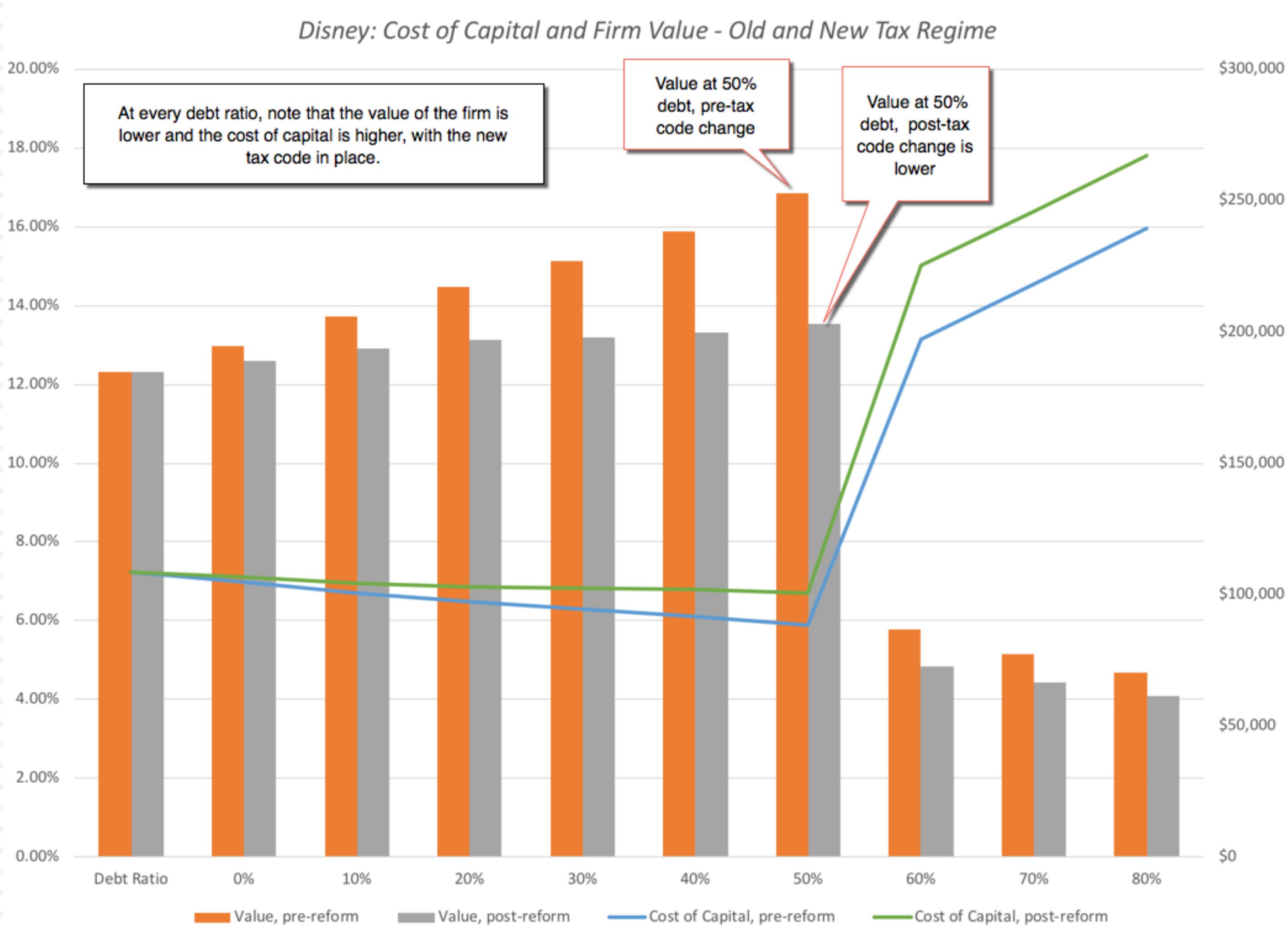
The US Tax Reform Act of 2017: Effects on the Optimal Debt Ratio

- Change in marginal tax rate: The marginal federal tax rate for US companies on US income has been lowered from 35% to 21%. **Holding all else constant, that will lower the optimal debt ratio for all firms.**
- Limits on interest tax deduction: Companies can deduct interest expenses only up to 30% of EBITDA (until 2022) and 30% of EBIT (after 2022). That will add a constraint to the tax savings from debt. In the cost of capital calculation, it will show up in the tax rate that you use to compute your after-tax cost of debt, lowering the tax rate from the marginal if interest expenses> 30% of EBITDA:

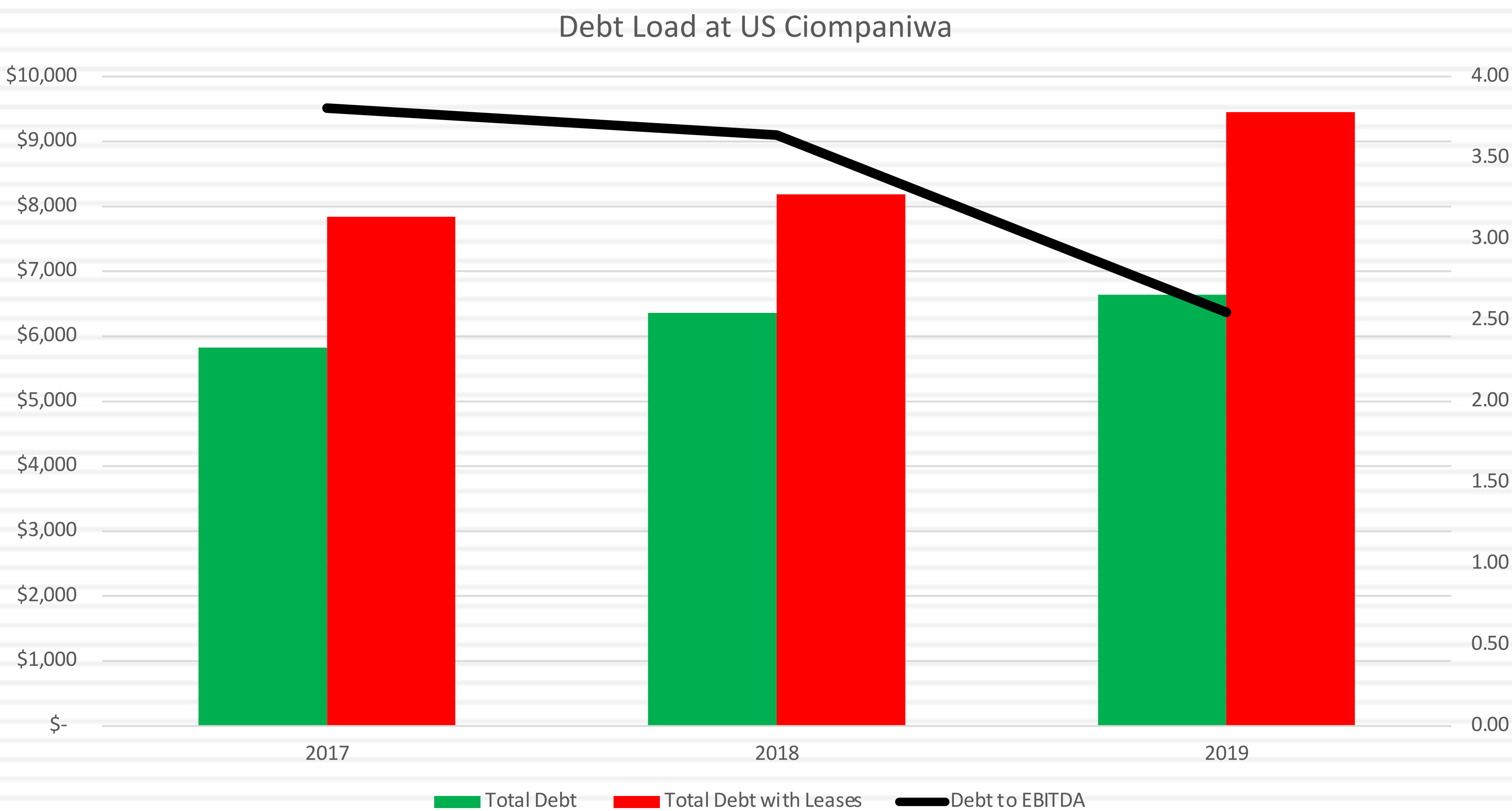
Tax rate if Interest Expense> 30% of EBITDA

= Marginal Tax rate * (.30*EBITDA)/ Interest Expense

Effect on tax code on Debt Impact: Disney in 2018



Are US companies adjusting to the new tax code?



Limitations of the Cost of Capital approach

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

II. Enhanced Cost of Capital Approach

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

Estimating the Distress Effect- Disney

Rating	*Drop in EBITDA (Low)*	*Drop in EBITDA (Medium)*	*Drop in EBITDA (High)*
To A	No effect	No effect	2.00%
To A-	No effect	2.00%	5.00%
To BBB	5.00%	10.00%	15.00%
To BB+	10.00%	20.00%	25.00%
To B-	15.00%	25.00%	30.00%
To C	25.00%	40.00%	50.00%
To D	30.00%	50.00%	100.00%

The Optimal Debt Ratio with Indirect Bankruptcy Costs

Debt Ratio	Beta	Cost of Equity	Bond Rating	Interest rate on debt	Tax Rate	Cost of Debt (after-tax)	WACC	Enterprise Value
0%	0.9239	8.07%	Aaa/AAA	3.15%	36.10%	2.01%	8.07%	$122,633
10%	0.9895	8.45%	Aaa/AAA	3.15%	36.10%	2.01%	7.81%	$134,020
20%	1.0715	8.92%	Aaa/AAA	3.15%	36.10%	2.01%	7.54%	$147,739
30%	1.1769	9.53%	Aa2/AA	3.45%	36.10%	2.20%	7.33%	$160,625
40%	1.3175	10.34%	A2/A	3.75%	36.10%	2.40%	7.16%	$172,933
50%	1.5573	11.72%	C2/C	11.50%	31.44%	7.88%	9.80%	$35,782
60%	1.9946	14.24%	Caa/CCC	13.25%	22.74%	10.24%	11.84%	$25,219
70%	2.6594	18.07%	Caa/CCC	13.25%	19.49%	10.67%	12.89%	$21,886
80%	3.9892	25.73%	Caa/CCC	13.25%	17.05%	10.99%	13.94%	$19,331
90%	7.9783	48.72%	Caa/CCC	13.25%	15.16%	11.24%	14.99%	$17,311

The optimal debt ratio stays at 40% but the cliff becomes much steeper.

Extending this approach to analyzing Financial Service Firms

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

Capital Structure for a bank: A Regulatory Capital Approach

- Consider a bank with $ 100 million in loans outstanding and a book value of equity of $ 6 million. Furthermore, assume that the regulatory requirement is that equity capital be maintained at 5% of loans outstanding. Finally, assume that this bank wants to increase its loan base by $ 50 million to $ 150 million and to augment its equity capital ratio to 7% of loans outstanding.

Loans outstanding after Expansion		= $ 150 million
Equity after expansion	= 7% of $150	= $10.5 million
Existing Equity		= $ 6.0 million
New Equity needed		= $ 4.5 million

- Your need for "external" equity as a bank/financial service company will depend upon
  a. Your growth rate: Higher growth -> More external equity
  b. Existing capitalization vs Target capitalization: Under capitalized -> More external equity
  c. Current earnings: Less earnings -> More external equity
  d. Current dividends: More dividends -> More external equity

Deutsche Bank's Financial Mix

	Current	1	2	3	4	5
Asset Base	439,851 €	453,047 €	466,638 €	480,637 €	495,056 €	509,908 €
Capital ratio	15.13%	15.71%	16.28%	16.85%	17.43%	18.00%
Tier 1 Capital	66,561 €	71,156 €	75,967 €	81,002 €	86,271 €	91,783 €
Change in regulatory capital		4,595 €	4,811 €	5,035 €	5,269 €	5,512 €
Book Equity	76,829 €	81,424 €	86,235 €	91,270 €	96,539 €	102,051 €
ROE	-1.08%	0.74%	2.55%	4.37%	6.18%	8.00%
Net Income	-716 €	602 €	2,203 €	3,988 €	5,971 €	8,164 €
- Investment in Regulatory Capital		4,595 €	4,811 €	5,035 €	5,269 €	5,512 €
FCFE		-3,993 €	-2,608 €	-1,047 €	702 €	2,652 €

The cumulative FCFE over the next 5 years is -€4,294 million. Clearly, it does not make the sense to pay dividends or buy back stock. In fact, to stay viable, Deutsche Bank has to raise about €7 billion in new equity in the next 3 years.

Financing Strategies for a financial institution

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

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

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

Tax Rate	Disney	Vale	Tata Motors	Baidu	Bookscape
0%	0%	0%	0%	0%	0%
10%	20%	0%	0%	0%	10%
20%	40%	0%	10%	10%	30%
30%	40%	30%	20%	10%	30%
40%	40%	40%	20%	10%	30%
50%	40%	40%	20%	10%	30%

2. Pre-tax Cash flow Return

Company	*EBITDA*	*EBIT*	*Enterprise Value*	*EBITDA/EV*	*EBIT/EV*	*Optimal Debt*	*Optimal Debt Ratio*
Disney	$12,517	$10,032	$133,908	9.35%	7.49%	$55,136	40.00%
Vale	$20,167	$15,667	$112,352	17.95%	13.94%	$35,845	30.00%
Tata Motors	250,116₹	166,605₹	1,427,478₹	17.52%	11.67%	325,986₹	20.00%
Baidu	¥13,073	¥10,887	¥342,269	3.82%	3.18%	¥35,280	10.00%
Bookscape	$4,150	$2,536	$42,636	9.73%	5.95%	$13,091	30.00%

Higher cash flows, as a percent of value, give you a higher debt capacity, though less so in emerging markets with substantial country risk.

3. Operating Risk

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

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