Corporate Finance: Capital Structure and Financing Decisions

Aswath Damodaran

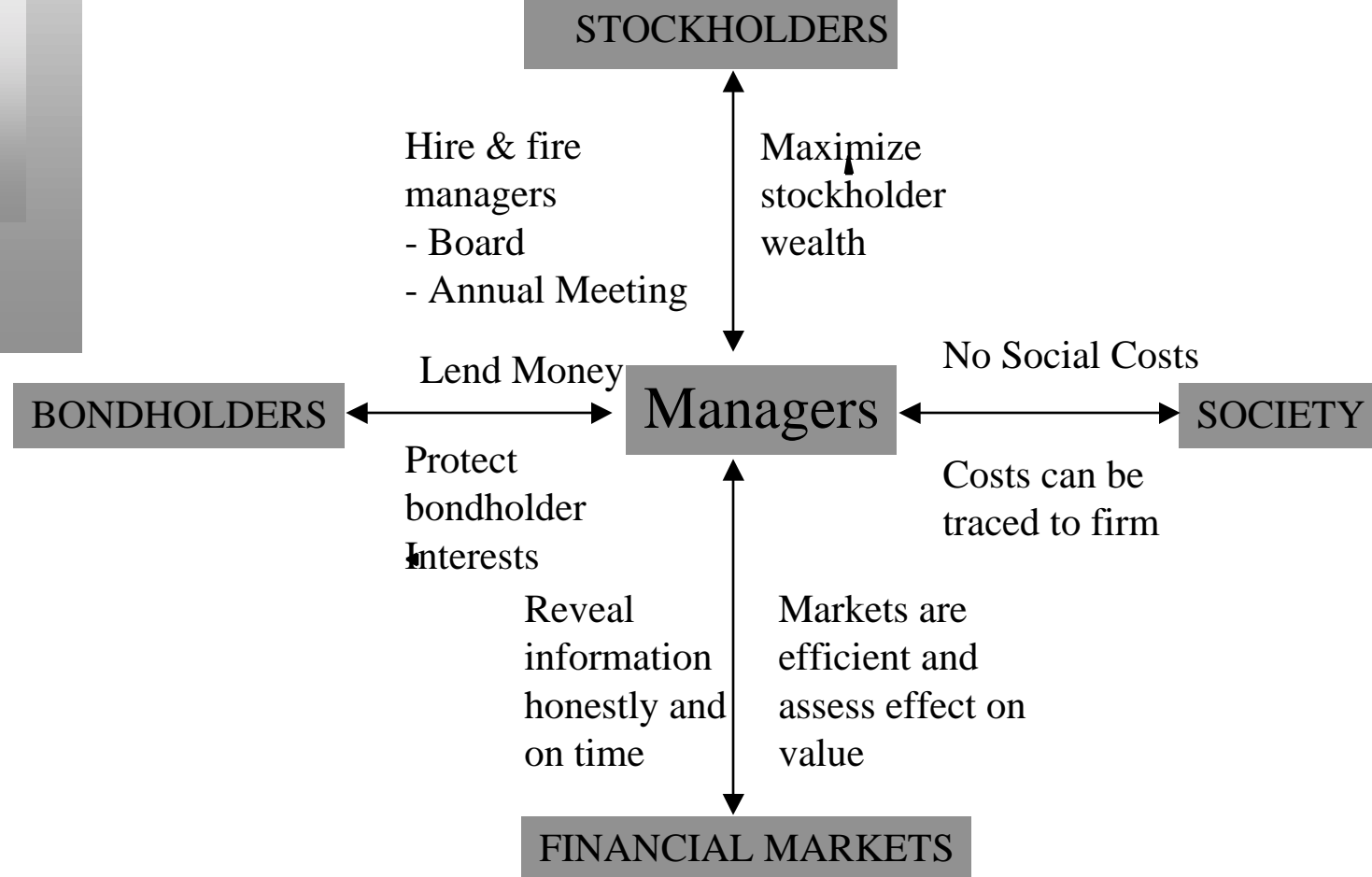Stern School of Business

First Principles

■ Invest in projects that <u>yield a return greater</u> than the <u>minimum acceptable hurdle rate</u>.

- The hurdle rate should be <u>higher for riskier projects</u> and reflect the <u>financing mix</u> used - owners' funds (equity) or borrowed money (debt)
- Returns on projects should be measured based on <u>cash flows</u> generated and the <u>timing</u> of these cash flows; they should also consider both <u>positive and negative side effects</u> of these projects.

■ Choose a <u>financing mix</u> that <u>minimizes the hurdle</u> rate and <u>matches the assets</u> being financed.

■ If there are not enough investments that earn the hurdle rate, <u>return the cash</u> to stockholders.

- The <u>form of returns</u> - dividends and stock buybacks - will depend upon the <u>stockholders' characteristics</u>.

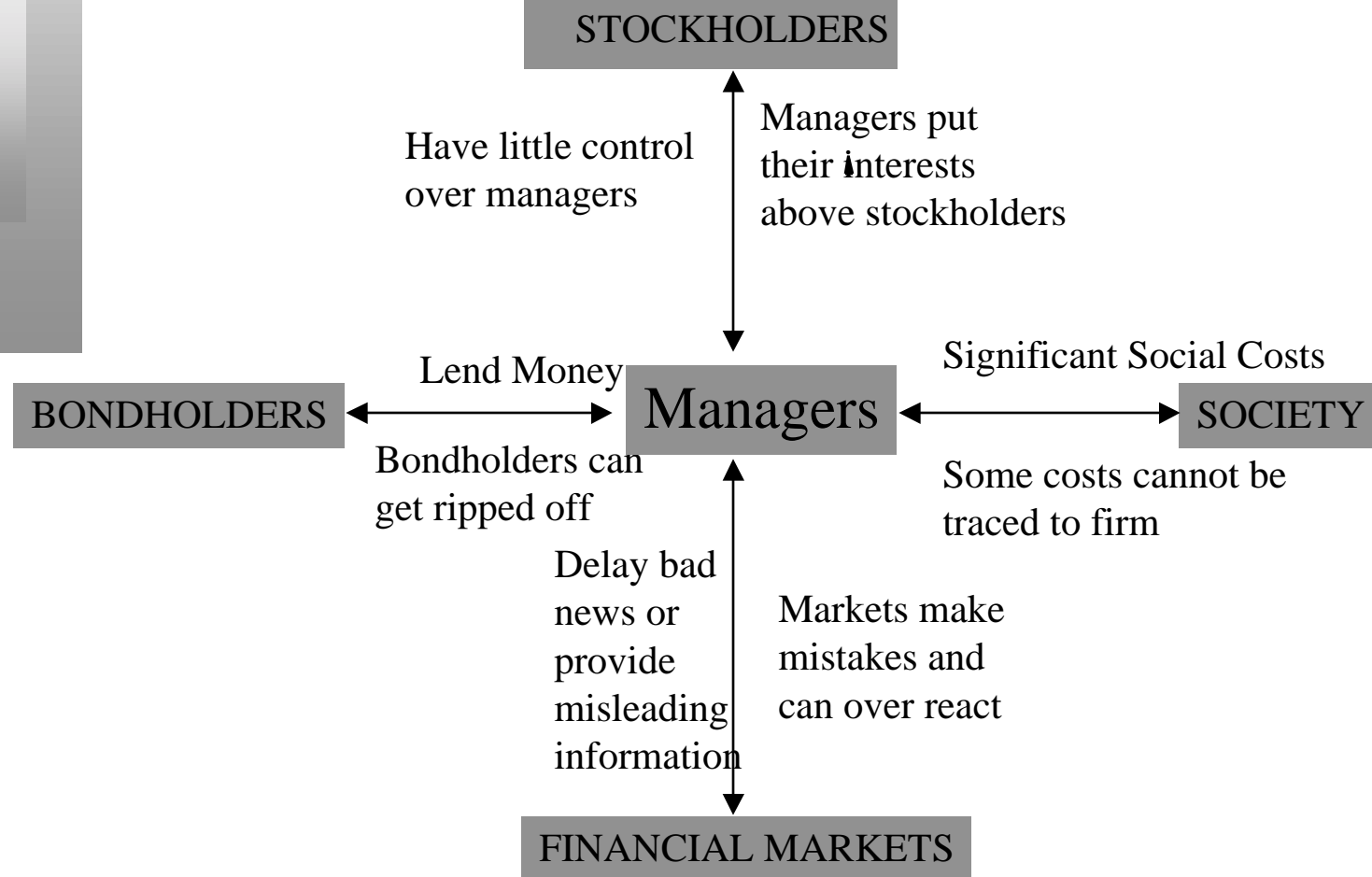**Objective: Maximize the Value of the Firm**

The Objective in Decision Making

■ In traditional corporate finance, the objective in decision making is to maximize the value of the firm.

■ A narrower objective is to maximize stockholder wealth. When the stock is traded and markets are viewed to be efficient, the objective is to maximize the stock price.

■ All other goals of the firm are intermediate ones leading to firm value maximization, or operate as constraints on firm value maximization.

The Classical Objective Function

STOCKHOLDERS

Hire & fire
managers
- Board
- Annual Meeting

Maximize
stockholder
wealth

Lend Money

No Social Costs

BONDHOLDERS ← → Managers ← → SOCIETY

Protect
bondholder
Interests

Costs can be
traced to firm

Reveal
information
honestly and
on time

Markets are
efficient and
assess effect on
value

FINANCIAL MARKETS

What can go wrong?

STOCKHOLDERS

Have little control
over managers

Managers put
their interests
above stockholders

Lend Money

BONDHOLDERS ← → Managers ← → SOCIETY

Significant Social Costs

Bondholders can
get ripped off

Some costs cannot be
traced to firm

Delay bad
news or
provide
misleading
information

Markets make
mistakes and
can over react

FINANCIAL MARKETS

When traditional corporate financial theory breaks down, the solution is:

- ■ To choose a different mechanism for corporate governance
- ■ To choose a <u>different objective</u>
- ■ To maximize stock price, but reduce the potential for conflict and breakdown:
  - Making managers (decision makers) and employees into stockholders
  - By providing information honestly and promptly to financial markets

An Alternative Corporate Governance System

- Germany and Japan developed a different mechanism for corporate governance, based upon corporate cross holdings.
  - In Germany, the banks form the core of this system.
  - In Japan, it is the keiretsus
  - Other Asian countries have modeled their system after Japan, with family companies forming the core of the new corporate families
- At their best, the most efficient firms in the group work at bringing the less efficient firms up to par. They provide a corporate welfare system that makes for a more stable corporate structure
- At their worst, the least efficient and poorly run firms in the group pull down the most efficient and best run firms down. The nature of the cross holdings makes its very difficult for outsiders (including investors in these firms) to figure out how well or badly the group is doing.
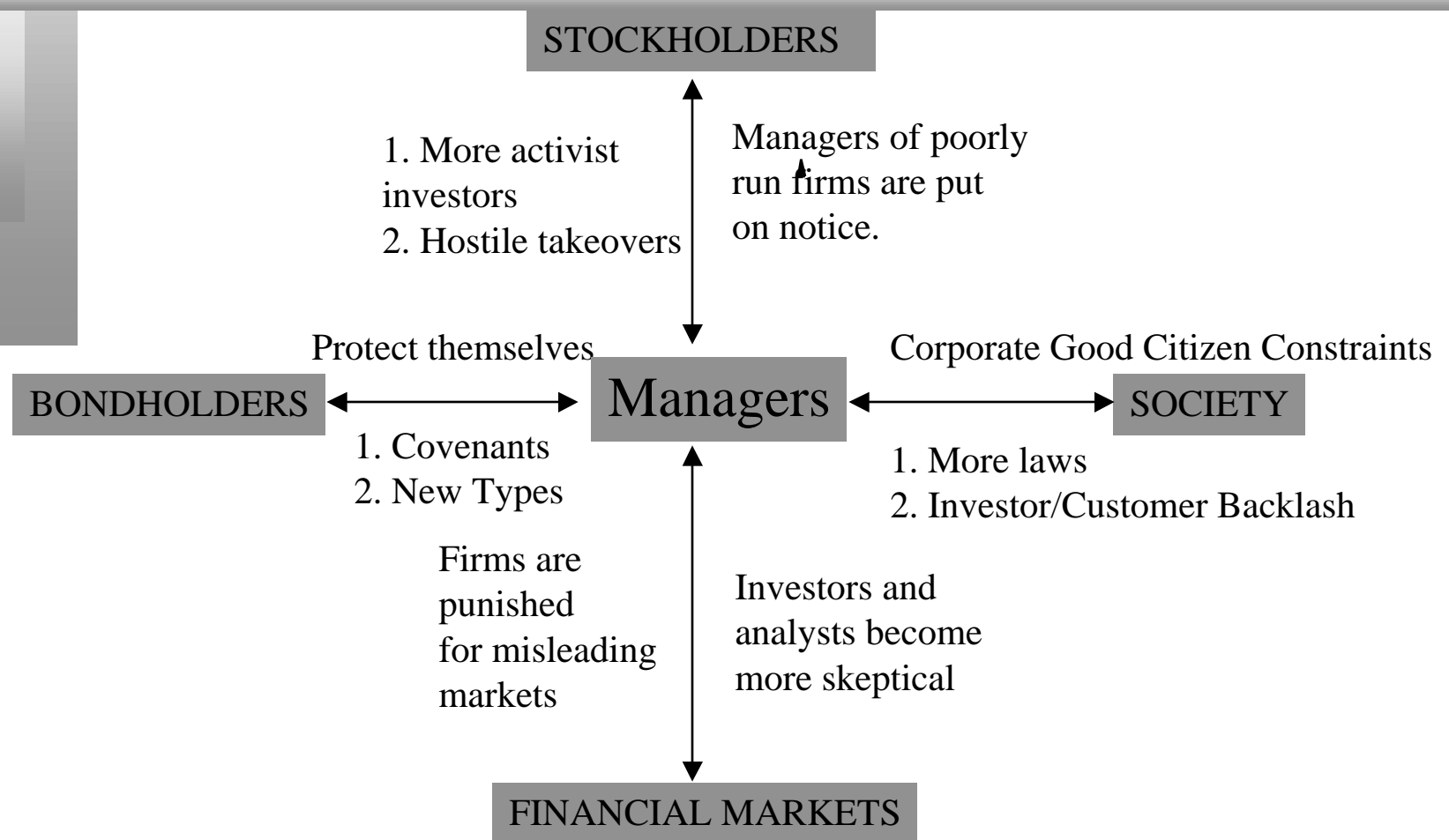
Choose a Different Objective Function

- Firms can always focus on a different objective function. Examples would include
  - maximizing earnings
  - maximizing revenues
  - maximizing firm size
  - maximizing market share
  - maximizing EVA
- The key thing to remember is that these are intermediate objective functions.
  - To the degree that they are correlated with the long term health and value of the company, they work well.
  - To the degree that they do not, the firm can end up with a disaster

Maximize Stock Price, subject to ..

- The strength of the stock price maximization objective function is its internal self correction mechanism. Excesses on any of the linkages lead, if unregulated, to counter actions which reduce or eliminate these excesses

- In the context of our discussion,
  - managers taking advantage of stockholders has lead to a much more active market for corporate control.
  - stockholders taking advantage of bondholders has lead to bondholders protecting themselves at the time of the issue.
  - firms revealing incorrect or delayed information to markets has lead to markets becoming more "skeptical" and "punitive"
  - firms creating social costs has lead to more regulations, as well as investor and customer backlashes.

The Counter Reaction

STOCKHOLDERS

1. More activist investors
2. Hostile takeovers

Managers of poorly run firms are put on notice.

Protect themselves

BONDHOLDERS ← → Managers ← → SOCIETY

Corporate Good Citizen Constraints

1. Covenants
2. New Types

1. More laws
2. Investor/Customer Backlash

Firms are punished for misleading markets

Investors and analysts become more skeptical

FINANCIAL MARKETS

Corporate Governance Tests

- Are there voting and non-voting shares?
  - The existence of shares with different voting rights is a direct strike against stockholder power because it allows power to be weilded disproportionately.
  - If the voting shares are held predominantly by the incumbent managers of the firm or a family the problem is exacerbated.
- Corporate Charter
  - If the corporate charter contains provisions against hostile takeovers, corporate governance will be negatively affected.
- Restrictions imposed by the state
  - If hostile acquisitions are prevented or impeded by state laws and restrictions, stockholder power is diluted.
- Informal constraints
  - If the capital markets and financing systems are not supportive of hostile takeovers, stockholder power will be diluted.

The Financing Decision: Where it fits in the big picture

- Invest in projects that <u>yield a return greater</u> than the <u>minimum acceptable hurdle rate</u>.
    - The hurdle rate should be <u>higher for riskier projects</u> and reflect the <u>financing mix</u> used - owners' funds (equity) or borrowed money (debt)
    - Returns on projects should be measured based on <u>cash flows</u> generated and the <u>timing</u> of these cash flows; they should also consider both <u>positive and negative side effects</u> of these projects.

- **Choose a <u>financing mix</u> that <u>minimizes the hurdle</u> rate and <u>matches the assets</u> being financed.**

- If there are not enough investments that earn the hurdle rate, <u>return the cash</u> to stockholders.
    - The <u>form of returns</u> - dividends and stock buybacks - will depend upon the <u>stockholders' characteristics</u>.

    Objective: Maximize the Value of the Firm

Debt: The Basic Trade Off

Advantages of Borrowing	Disadvantages of Borrowing
1. Tax Benefit:	*1. Bankruptcy Cost:*
Higher tax rates --> Higher tax benefit	Higher business risk --> Higher Cost
2. Added Discipline:	*2. Agency Cost:*
Greater the separation between managers and stockholders --> Greater the benefit	Greater the separation between stock-holders & 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 is 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.

■ Once operating leases are converted into debt, the operating lease expense becomes a financing expense. The adjusted operating income then has to reflect this:

Adjusted Operating Income = Operating Income + PVOL * Cost of debt

    where,

    PVO = Present Value of Operating Leases

Measuring Financial Leverage

■ Two variants of debt ratio

- Debt to Capital Ratio = Debt / (Debt + Equity)
- Debt to Equity Ratio = Debt / Equity

■ The debt can be measured in gross terms or in net terms. If we use net debt (debt - cash & marketable securities), we have to stay consistent with that definition through the entire analysis.

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.

$$WACC = k_e \, (E/(D+E+PS)) + k_d \, (D/(D+E+PS)) + k_{ps} \, (PS/(D+E+PS))$$

Estimating the Cost of Equity

Cost of Equity

Riskfree Rate :
- No default risk
- No reinvestment risk
- In same currency and in same terms (real or nominal as cash flows

+

Beta
- Measures market risk

X

Risk Premium
- Premium for average risk investment

Type of Business

Operating Leverage

Financial Leverage

Base Equity Premium

Country Risk Premium
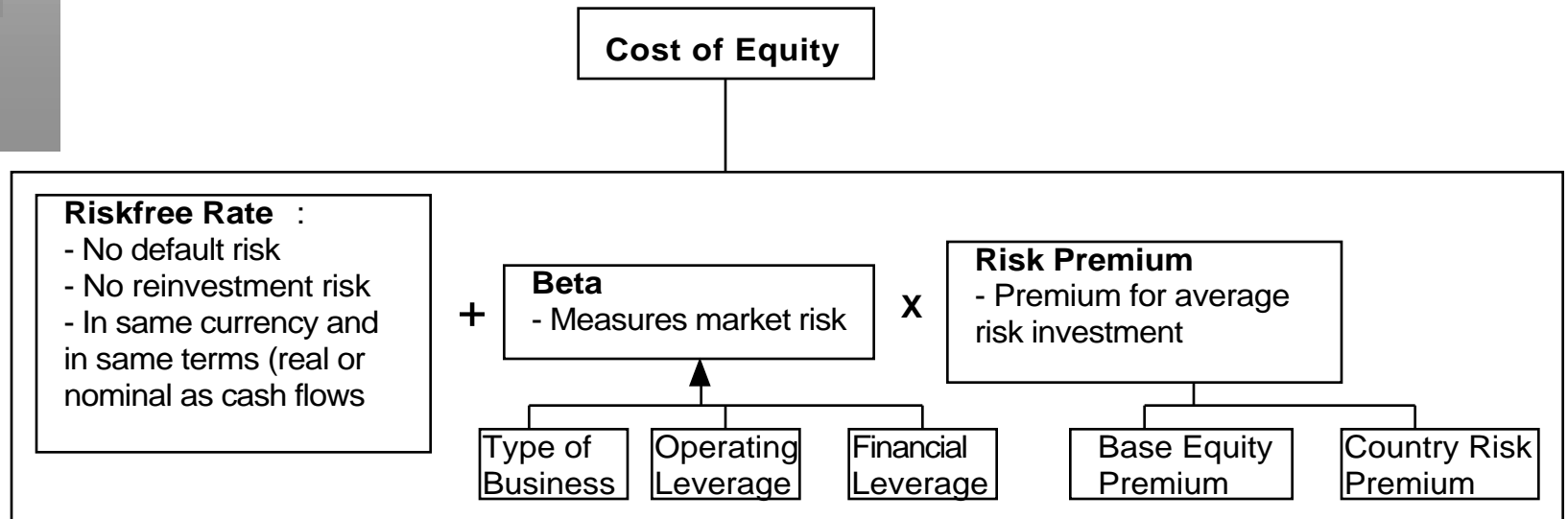
Beta: Top-down versus Bottom-up

Beta of Equity

Top-Down

R_j

R^2: Proportion of risk that is not diversifiable

Slope = Beta

Intercept - R_f (1-Beta) = Jensen's Alpha

R_m

Bottom-up

1. Identify businesses that firm is in.
2. Take weighted average of the unlevered betas of other firms in the business
3. Compute the levered beta using the firm's current debt to equity ratio:

$$\beta_l = \beta_u [1 + (1\text{-tax rate}) (\text{Debt/Equity})]$$
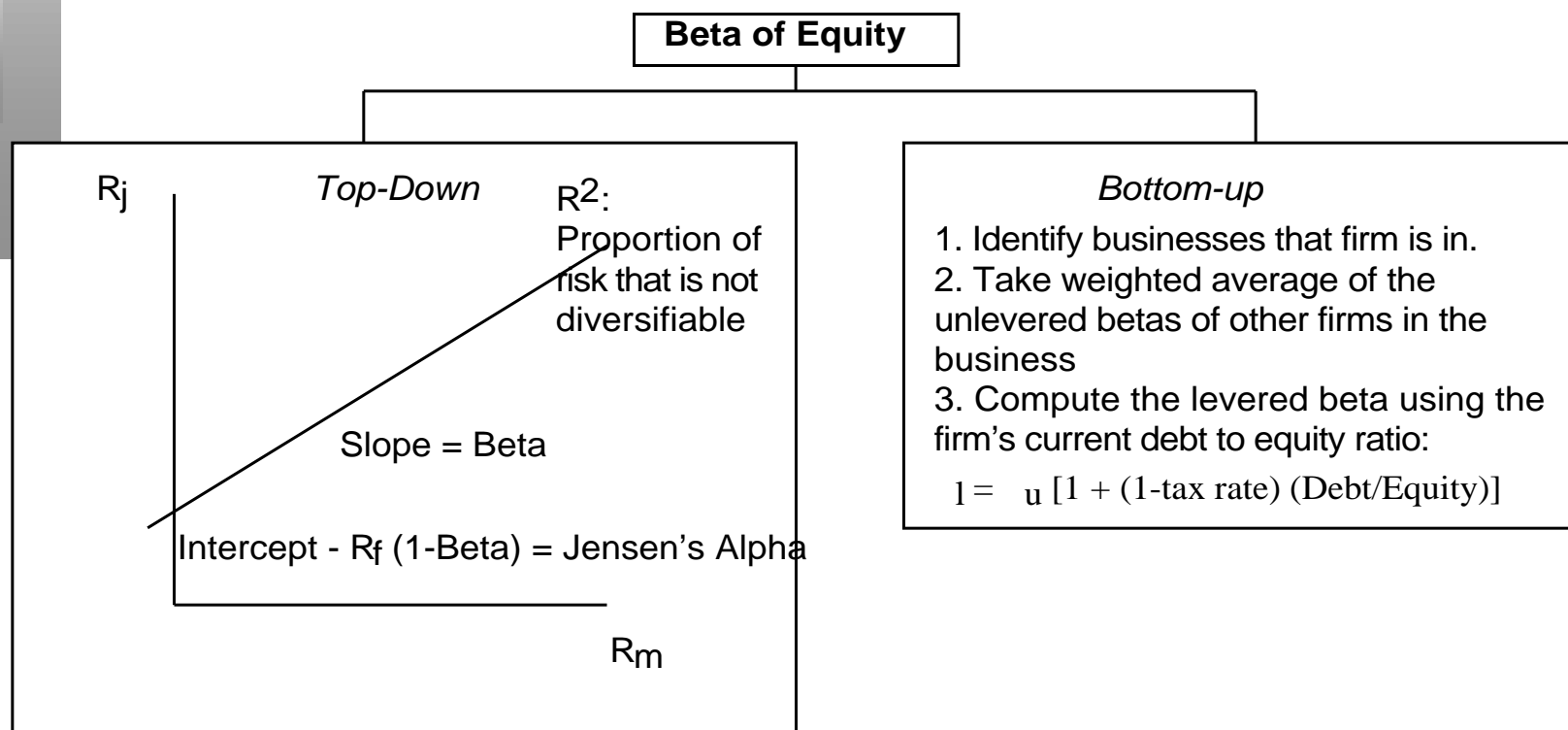
Mature Market Risk Premium

■ The risk premium can be estimated using historical data. If it is, the premium should be estimated

- Over as long a time period as possible
- Using the same riskfree rate that is being used in the model (T.bill or bond)
- Using the compounded return (geometric premium)

1928-2000Geometric Premium for stocks versus bonds: US = 5.59%

■ Alternatively, the risk premium can be estimated from the level of the market today. This is an implied risk premium.

2000 Implied Premium in the US = 2.87%

If you are uncomfortable with the assumption that the market is fairly priced today, you can use an average implied premium over the last 40 years.

Average Implied Premium = 4.00%

Emerging Market Premiums

■ Historical risk premiums are close to useless in emerging markets because there is not much data. There are two alternatives:

- Historical risk premium plus: Take the mature market premium from the previous page and add to it a country risk premium, which can be estimated by

  – Using the default spread on country bonds issued by the country over a riskless rate.

  Brazil default spread = 5.37%

  – Adjusting the default spread for the additional risk of equity markets:

  Country risk premium = Default spread$_{Country}$ * ($_{Country\ equity}$/ $_{Country\ Bond}$)

  Brazil country risk premium = 5.373% * (32.61/17.1%) = 10.24%

- Estimate an implied risk premium by looking at how stocks are priced in that market.

  Brazil implied equity risk premium = 6.66%

Other Issues in estimating cost of equity

■ *Tax deductibility of dividend payments*: If firms are allowed to deduct dividend payments and reduce taxes paid, the cost of equity will be lowered. In particular, the dividend yield portion of the cost of equity will then be stated in after-tax terms.

■ *Voting versus Non-voting shares*: A non-voting share should sell at a lower price than non-voting shares. While we generally lump together voting and non-voting shares in equity and attach one cost of equity to it, we could have two costs of equity - a lower cost of equity for voting shares and a higher cost of equity for non-voting shares.

Embraer: Cost of Equity

- Unlevered beta of other aerospace firms = 0.87

- Current debt to equity ratio = 2.45%

- Levered beta = 0.87 (1 + (1-.33) (.0245)) = 0.88

- Estimating the cost of equity in U.S. dollar terms,
  - Riskfree rate = 5.1%
  - Mature market premium = 4%
  - Brazil country risk premium = 10.24%
  - Cost of equity = 5.1% + 0.88 (4% + 10.24%) = 17.63%

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

Estimating the Default Spread

- The most common approach that is used to estimate the default spread is to use a company's rating and estimate a spread based upon the rating.
- The problems with this approach are three-fold
  - A firm may not be rated
  - A firm's bond offerings might have multiple ratings
  - The bond that is rated might have been structured by the firm to be less risky than the overall firm (It might be backed up with specific assets)
- In these cases, it is better to estimate a synthetic rating for the firm, based upon its financial ratios, and use the synthetic rating to estimate the default spread and cost of debt.
- When estimating the cost of debt for an emerging market company, you may need to adjust the cost of debt for the default spread of the country.

Estimating a Synthetic Rating

■ The synthetic rating for a company can be estimated by using one or a collection of financial ratios. For non-financial service firms, the ratio that seems to work best is the interest coverage ratio.

Interest coverage ratio = EBIT / Interest Expenses

■ Embraer, in 1999, reported earnings before interest and taxes of $ 810 million and <u>net interest expenses</u> of $ 28.2 million. The interest coverage ratio for the firm is

Interest coverage ratio for Embraer = 810/ 28.2 = 28.73

• You could also construct a score, based upon a multitude of financial ratios, such as the Z score. This could be used to estimate a bond rating.

Interest Coverage Ratios and Ratings…

If ICoverage Ratio is	Estimated Bond Rating	Default Spread
> 8.50	**AAA**	**0.20%**
6.50 - 8.50	AA	0.50%
5.50 - 6.50	A+	0.80%
4.25 - 5.50	A	1.00%
3.00 - 4.25	A–	1.25%
2.50 - 3.00	BBB	1.50%
2.00 - 2.50	BB	2.00%
1.75 - 2.00	B+	2.50%
1.50 - 1.75	B	3.25%
1.25 - 1.50	B –	4.25%
0.80 - 1.25	CCC	5.00%
0.65 - 0.80	CC	6.00%
0.20 - 0.65	C	7.50%
< 0.20	D	10.00%

Estimating the Tax Rate

- When the cost of debt is multiplied by (1-tax rate), we are assuming that every additional dollar in interest expenses will save an equivalent amount in taxes.
- This is true only
  - If the firm has enough taxable income to offset the interest expenses
  - The tax rate used is the marginal tax rate
- If a firm has negative operating income, or large net operating losses, there will be no tax benefit associated with debt, and the tax rate used should be zero.

Embraer's Cost of Debt

- Estimating the pre-tax cost of debt
  - Embraer's rating: AAA
  - Estimated Default Spread = 0.2%
  - Riskfree rate (in US $) = 5.1%
  - Default spread for Brazil C-Bond = 5.37%
  - Pre-tax Cost of Debt = 5.1% + 0.2% + 5.37% = 10.67%
- After-tax Cost of Debt
  - Tax rate = 33%
  - After-tax cost of debt = 10.67% (1-.33) = 7.15%

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.

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.

Estimating Market Values

- **Market Value of Equity should include the following**
  - Market Value of Shares outstanding
  - Market Value of Warrants outstanding
  - Market Value of Conversion Option in Convertible Bonds
- **Market Value of Debt is more difficult to estimate because few firms have only publicly traded debt. There are two solutions:**
  - Assume book value of debt is equal to market value
  - Estimate the market value of debt from the book value
    - For Embraer, with book value of $215.5 million, interest expenses of $28.2 million, an average maturity of 2 years and a current cost of borrowing of 10.67% (from its rating)

$$\text{Estimated MV of Embraer Debt} = 28.2 \left[\frac{(1 - \frac{1}{(1.1067)^2})}{.1067} \right] + \frac{215.5}{(1.1067)^2} = \$223$$

What about hybrids?

- Hybrids include securities that are part equity and part debt. A good example would be a convertible bond - which is debt (the straight bond component) and equity (the conversion option)

- When a firm uses hybrids, the cleanest way of dealing with them is to break them up into debt and equity components; add the debt to the other debt of the firm and the equity to the other equity

Breaking down a Convertible Bond

■ Assume that you are analyzing a convertible bond that has

- A five-year maturity
- A coupon rate of 5% on a face value of $1,000
- Issued by a company with a BBB rating (assume that BBB rated straight bonds would carry an 8% interest rate)
- A market value of $ 1,250

■ How much of this bond's value is debt?

■ How much is equity?

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.

■ 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
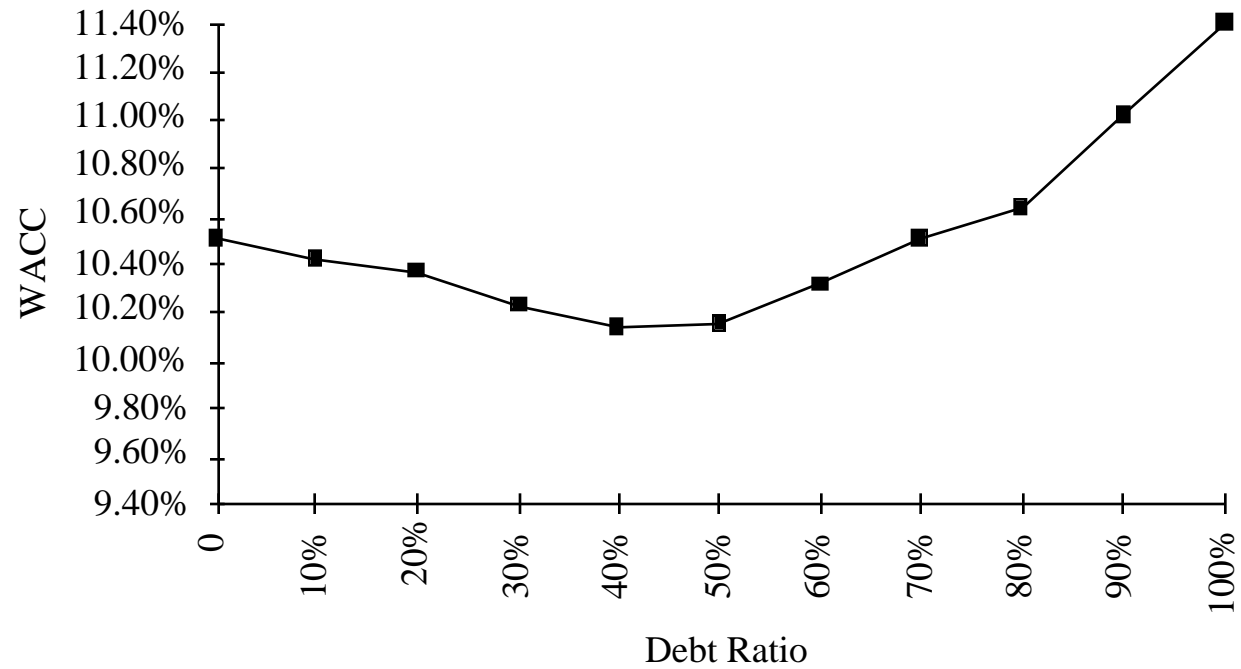
Current Cost of Capital: Embraer

- Equity
  - Cost of Equity = 5.1% + 0.88 (14.24%) =   17.63%
  - Market Value of Equity = 595.69*15.25 $9,084 million
  - Equity/(Debt+Equity) =   97.6%
- Debt
  - After-tax Cost of debt =   10.67% (1-.33) =   7.15%
  - Market Value of Debt = $ 223 million
  - Debt/(Debt +Equity) =   2.4%
- Cost of Capital = 17.63%(.976)+7.15%(.024) = 17.38%

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.

Medians of Key Ratios : 1996-1998

	AAA	AA	A	BBB	BB	B	CCC
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%

Interest Coverage Ratios and Ratings...

If ICoverage Ratio is	Estimated Bond Rating	Default Spread
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0.65 - 0.80	CC	6.00%
0.20 - 0.65	C	7.50%
< 0.20	D	10.00%

Current Income Statement for Embraer: 2000

Revenues	4,560
-Operating Expenses	3,622
EBITDA	938
-Depreciation	128
EBIT	810
Interest Expense	28

- Interest coverage ratio= 810/28 = 28.73

Estimating Cost of Equity

Current Beta = 0.88   Unlevered Beta = 0.87

Market premium = 4%+10.24%   T.Bond Rate = 5.10%   Tax rate=33%

Debt Ratio	Beta	Cost of Equity
0%	0.87	17.43%
10%	0.93	18.34%
20%	1.01	19.49%
30%	1.11	20.97%
40%	1.25	22.93%
50%	1.45	25.69%
60%	1.76	30.15%
70%	2.38	38.96%
80%	3.63	56.79%
90%	7.26	108.50%

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

Cost of Equity and Beta: Debt Ratios

Aswath Damodaran
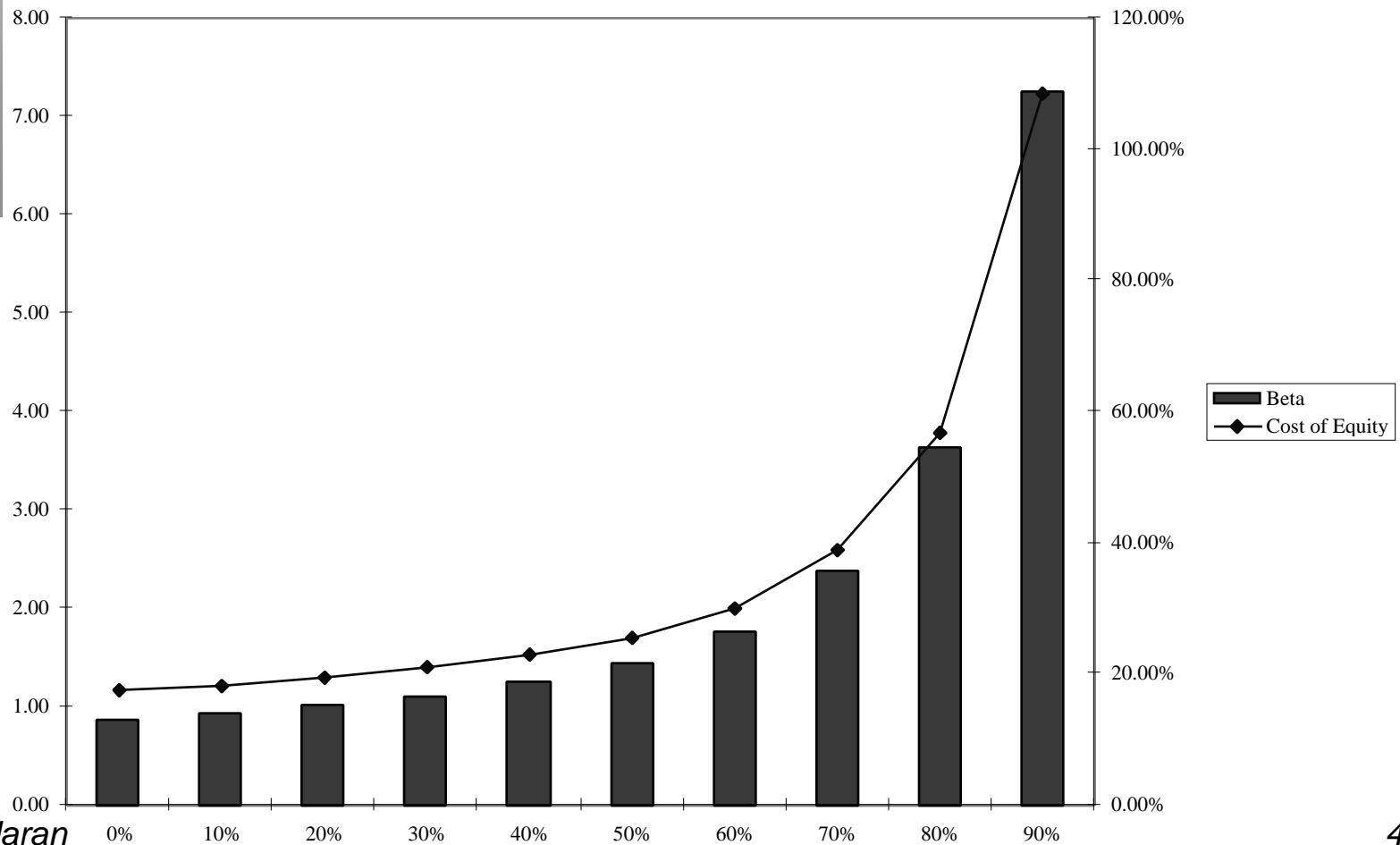
Estimating Cost of Debt

D/(D+E)	0.00%	10.00%	Calculation Details	Step
D/E	0.00%	11.11%		
Debt	$ 0	$931	Debt ratio * Firm value	1
EBITDA	$938	$938		
Depreciation	$128	$128		
EBIT	$810	$810		
Interest	$0	$106	Interest rate * $ Debt	2
Pre-tax Int. cov		7.66	EBIT/ Interest expense	3
Likely Rating	AAA	AA	Based upon interest cov.	4
Pre-tax cost of debt	10.67%	10.97%	Add default spread	5
Eff. Tax Rate	33.00%	33.00%		
After-tax cost	**7.15%**	**7.35%**		

Firm Value = 9,084+223 = $ 9,307

The Ratings Table

If Interest Coverage Ratio is	Estimated Bond Rating	Default Spread
> 8.50	AAA	0.20%
6.50 - 8.50	**AA**	**0.50%**
5.50 - 6.50	A+	0.80%
4.25 - 5.50	A	1.00%
3.00 - 4.25	A–	1.25%
2.50 - 3.00	BBB	1.50%
2.00 - 2.50	BB	2.00%
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1.50 - 1.75	B	3.25%
1.25 - 1.50	B –	4.25%
0.80 - 1.25	CCC	5.00%
0.65 - 0.80	CC	6.00%
0.20 - 0.65	C	7.50%
< 0.20	D	10.00%

A Test: Can you do the 20% level?

D/(D+E)	0.00%	10.00%	20.00%	Second Iteration
D/E	0.00%	11.11%		
Debt	$ 0	$931		
EBITDA	$938	$938		
Depreciation	$128	$128		
EBIT	$810	$810		
Interest	$0	$106		
Pre-tax Int. cov		7.66		
Likely Rating	AAA	AA		
Pre-tax cost	10.67%	10.97%		
Eff. Tax Rate	33.00%	33.00%		
After-tax cost	7.15%	7.35%		

Bond Ratings, Cost of Debt and Debt Ratios

D/(D+E)	0.00%	10.00%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	90.00%
$ Debt	$0	$931	$1,861	$2,792	$3,723	$4,654	$5,584	$6,515	$7,446	$8,376
EBITDA	$938	$938	$938	$938	$938	$938	$938	$938	$938	$938
Depreciation	$128	$128	$128	$128	$128	$128	$128	$128	$128	$128
EBIT	$810	$810	$810	$810	$810	$810	$810	$810	$810	$810
Interest	$0	$106	$220	$349	$543	$714	$858	$1,065	$1,326	$1,493
Pre-tax Int. cov		7.66	3.68	2.32	1.49	1.14	0.94	0.76	0.61	0.54
Likely Rating	AAA	AA	A-	BB	B-	CCC	CCC	CC	C	C
Pre-tax cost of	10.67%	10.97%	11.72%	12.47%	14.72%	15.47%	15.47%	16.47%	17.97%	17.97%
Eff. Tax Rate	33.00%	33.00%	33.00%	33.00%	33.00%	33.00%	31.18%	25.12%	20.16%	17.91%
Cost of debt	7.15%	7.35%	7.85%	8.35%	9.86%	10.36%	10.65%	12.33%	14.35%	14.75%

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Stated versus Effective Tax Rates

- You need taxable income for interest to provide a tax savings
- In the Embraer case, consider the interest expense at 50% and 60%

	50% Debt Ratio	*60% Debt Ratio*
EBIT	$ 810 m	$ 810 m
Interest Expense	$ 714 m	$ 858 m
Tax Savings	$ 236 m	$ 810*.33 = $270million
Effective Tax Rate	33.00%	270/706 = 31.18%

- You can deduct only $810 million of the $ 858 million of the interest expense at 60%. Therefore, only 33% of $ 810 million is considered as the tax savings.

Embraer's Cost of Capital Schedule as a function of Net Debt Ratios

Debt Ratio	Cost of Equity	st of Debt (after-	WACC
0%	17.43%	7.15%	17.43%
10%	18.34%	7.35%	17.24%
20%	19.49%	7.85%	17.16%
30%	20.97%	8.35%	17.18%
40%	22.93%	9.86%	17.70%
50%	25.69%	10.36%	18.02%
60%	30.15%	10.65%	18.45%
70%	38.96%	12.33%	20.32%
80%	56.79%	14.35%	22.84%
90%	108.50%	14.75%	24.13%

Embraer: Cost of Capital and Optimal Net Debt Ratio

Debt Ratio and Cost of Capital
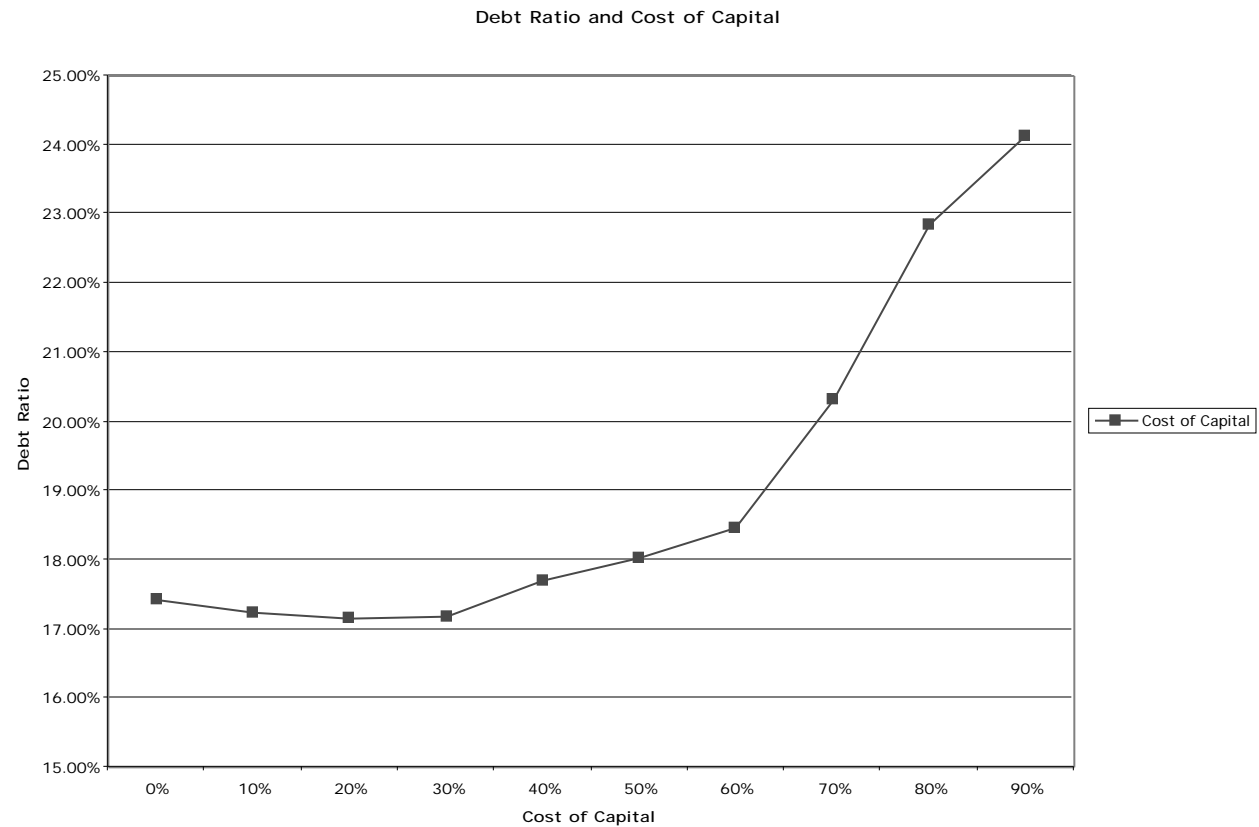
Embraer: The Effect of Removing Country Risk

Debt Ratio and Cost of Capital

Aracruz: Cost of Capital

Debt Ratio and Cost of Capital

Actual Debt Ratio = 15.85%

Optimal Debt Ratio = 10%

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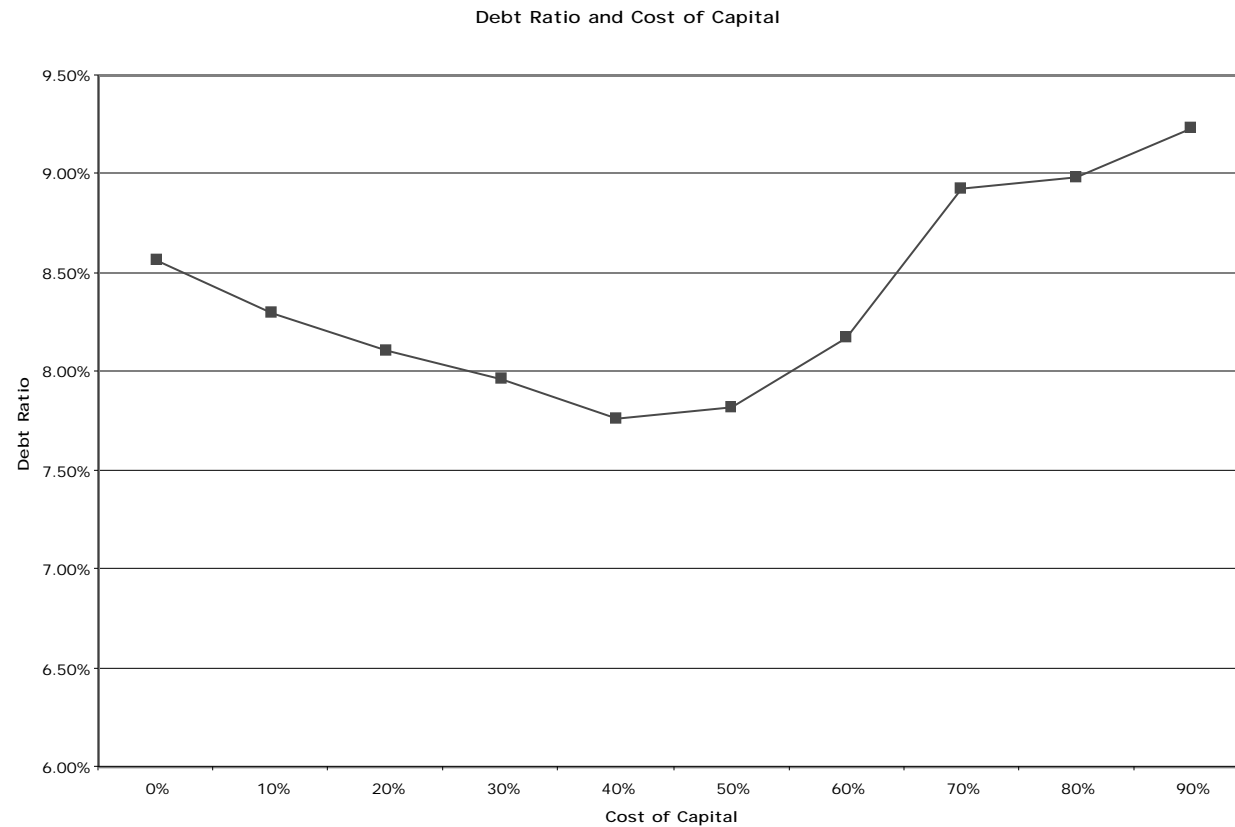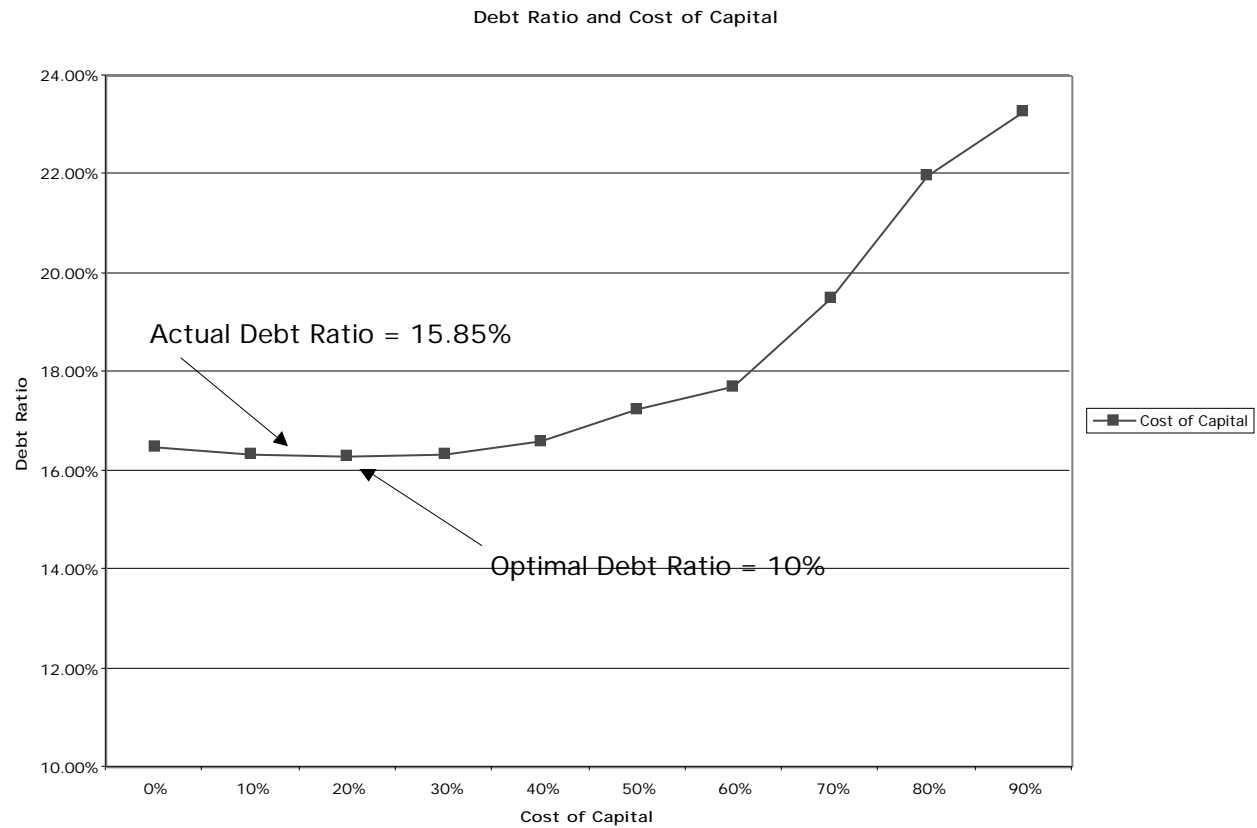
Effect on Firm Value

■ Firm Value before the change = **9,084+ 223= $ 9307**

    $WACC_b$ = 17.38%   Annual Cost = $9307 *17.38%= $ 1,617 million

    $WACC_a$ = 17.16%   Annual Cost = $9307 *17.16% = $1,597 million

    WACC = 0.22%   Change in Annual Cost   = $ 20 million

■ If there is no growth in the firm value, (Conservative Estimate)

  • Increase in firm value = $20 / .1716 = $ 116 million

  • Change in Stock Price = $ 116 /596= $ 0.20 per share

■ If there is growth (of 6%) in firm value over time,

  • Increase in firm value = $ 20 * 1.06 /(.1716-.06) = $ 190

  • Change in Stock Price = $ 190/ 596 = $ 0.32 per share

Implied Growth Rate obtained by

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

$ 9307= $ 475(1+g)/(.1738-g): Solve for g = 11.68%. I used 6%.

A Test: The Repurchase Price

Let us suppose that the CFO of Embraer 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 $ 15.25) Assuming that firm value will grow by 6% 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 $ 15.25?

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

Embraer: Operating Income History

Year	Operating Income	% Change
1999	589	154.98%
1998	231	151.09%
1997	92	21.05%
1996	76	246.15%
1995	-52	71.11%
1994	-180	

Embraer: Analyzing History

■ Embraer has had a very successful 5 years. In particular, the operating income in 2000 represents a high for the firm and it is coming off two years of income doubling. You can look at this in one of two ways:

- The firm is seeing significant momentum in earnings growth because of its position in the market and management quality and this will continue.

- The firm is likely to face a slowing down of growth and may see its operating earnings level off.

- The firm is due for a bad year and operating earnings will drop.

Embraer: The Downside Scenario
Lowering Operating income by 20%

Debt Ratio	Cost of Capital
0%	17.43%
10%	17.26%
20%	17.20% : Optimal stays at 20%
30%	17.28%
40%	17.91%
50%	18.45%
60%	20.19%
70%	22.52%
80%	23.81%
90%	25.10%

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 Embraer

- Assume that Embraer imposes a rating constraint of A or greater.
- The optimal debt ratio for Embraer is then 10% (see next page)
- The cost of imposing this rating constraint can then be calculated as follows:

Value at 20% Debt   = $ 9,497 million

- Value at 10% Debt   = $ 9,424 million

Cost of Rating Constraint   = $ 73 million

Analyzing Rating Constraints…

Debt Ratio	Cost of Capital	Bond Rating
0%	17.43%	AAA
10%	17.24%	AA
20%	17.16%	A-
30%	17.18%	BB
40%	17.70%	B-
50%	18.02%	CCC
60%	18.45%	CCC
70%	20.32%	CC
80%	22.84%	C
90%	24.13%	C

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 and Ratings

If interest coverage ratio is				
greater than	to	Rating is	Spread is	*Drop in EBITDA*
-100000	0.049999	D	10.00%	-50.00%
0.05	0.099999	C	7.50%	-40.00%
0.1	0.199999	CC	6.00%	-40.00%
0.2	0.299999	CCC	5.00%	-40.00%
0.3	0.399999	B-	4.25%	-25.00%
0.4	0.549999	B	3.25%	-20.00%
0.55	0.699999	B+	2.50%	-20.00%
0.7	0.999999	BB	2.00%	-20.00%
1	1.499999	BBB	1.50%	-20.00%
1.5	1.999999	A-	1.25%	-17.50%
2	2.999999	A	1.00%	-15.00%
3	3.999999	A+	0.80%	-10.00%
4	4.999999	AA	0.50%	-5.00%
5	100000	AAA	0.20%	0.00%

Bradesco: Optimal Capital Structure

Debt Ratio	Cost of Equity	Bond Rating	Interest rate on debt	Cost of Debt (after-tax)	WACC	Firm Value (G)
0%	15.73%	AAA	10.67%	7.15%	15.73%	$30,769
10%	16.52%	AAA	10.67%	7.15%	15.58%	$31,224
20%	17.51%	AAA	10.67%	7.15%	15.44%	$31,692
30%	18.78%	AAA	10.67%	7.15%	15.32%	$32,175
40%	20.48%	A+	11.27%	7.55%	15.31%	$28,912
50%	22.85%	A	11.47%	7.68%	15.27%	$27,417
60%	26.41%	A	11.47%	7.68%	15.18%	$27,684
70%	32.35%	A-	11.72%	7.85%	15.20%	$26,799
80%	44.22%	BBB	11.97%	8.02%	15.26%	$25,828
90%	79.83%	BBB	11.97%	8.02%	15.20%	$25,988

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 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 + Imputed Interest on Op. Lease Exp.

            = \$ 2,000,000 + \$ 252,000 = \$ 2,252,000

- ■ 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 22.41 times of net income. This multiple is the average multiple at which comparable firms which are publicly traded are valued.

   Estimated Market Value of Equity = Net Income * Average PE

                = 1,160,000* 22.41 = 26,000,000

- ■ 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

Interest Coverage Ratio	Rating	Spread over T Bond Rate
> 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

The APV Approach to Optimal Capital Structure

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

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

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

Implementing the APV Approach

■ Step 1: Estimate the unlevered firm value. This can be done in one of two ways:

- • Estimating the unlevered beta, a cost of equity based upon the unlevered beta and valuing the firm using this cost of equity (which will also be the cost of capital, with an unlevered firm)
- • Alternatively, Unlevered Firm Value = Current Market Value of Firm - Tax Benefits of Debt (Current) + Expected Bankruptcy cost from Debt

■ Step 2: Estimate the tax benefits at different levels of debt. The simplest assumption to make is that the savings are perpetual, in which case

- • Tax benefits = Dollar Debt * Tax Rate

■ Step 3: Estimate a probability of bankruptcy at each debt level, and multiply by the cost of bankruptcy (including both direct and indirect costs) to estimate the expected bankruptcy cost.

Estimating Expected Bankruptcy Cost

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

Ratings and Default Probabilities

Rating	Default Risk
AAA	0.01%
AA	0.28%
A+	0.40%
A	0.53%
A-	1.41%
BBB	2.30%
BB	12.20%
B+	19.28%
B	26.36%
B-	32.50%
CCC	46.61%
CC	52.50%
C	60%
D	75%

Embraer: Estimating Unlevered Firm Value

Current Value of the Firm =   9,084+ 223   = $ 9,307

 - Tax Benefit on Current Debt = 223 * .33   = $ 74

 + Expected Bankruptcy Cost = 0.01% of .30*(9,307-74)   = $ 2

Unlevered Value of Firm = $ 9,235

Cost of Bankruptcy for Embraer = 40% of firm value

Probability of Bankruptcy = 0.01%, based on firm's current rating

Tax Rate = 33%

Market Value of Equity = $ 9,084

Market Value of Debt = $ 223

Embraer: APV at Debt Ratios

Debt Ratio	$ Debt	Tax Rate	Unlevered Value	Tax Benefit	Bond Rating	Bankruptcy Prob	Cost	Value of Firm
0.00%	$0	33.00%	$9,235	$0	AA	0.28%	$10	$9,225
10.00%	$931	33.00%	$9,235	$307	AA	0.28%	$10	$9,532
20.00%	**$1,862**	**33.00%**	**$9,235**	**$614**	**A-**	**1.41%**	**$53**	**$9,797**
30.00%	$2,793	33.00%	$9,235	$922	BB	12.20%	$454	$9,702
40.00%	$3,723	33.00%	$9,235	$1,229	B	26.36%	$982	$9,482
50.00%	$4,654	33.00%	$9,235	$1,536	CCC	50.00%	$1,862	$8,909
60.00%	$5,585	30.95%	$9,235	$1,729	CCC	50.00%	$1,862	$9,102
70.00%	$6,516	26.53%	$9,235	$1,729	CCC	50.00%	$1,862	$9,102
80.00%	$7,447	21.80%	$9,235	$1,624	CC	65.00%	$2,420	$8,438
90.00%	$8,378	17.76%	$9,235	$1,488	C	80.00%	$2,979	$7,744

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)

Embraer's Comparables

Company	Book Debt Ratio	Market Debt ratio
Saab	49.39%	37.48%
Kongsberg	0.00%	0.00%
Gencorp	36.07%	29.42%
Samsung	68.86%	77.52%
Litton	44.05%	33.54%
Northrop Grumman	40.59%	26.33%
Esterline	36.44%	26.43%
Rolls-Royce	45.79%	37.83%
United Industrial	0.00%	0.00%
Magellan Aerospace	51.46%	40.00%
Herley	27.12%	11.59%
Raytheon	47.13%	49.97%
Teledyne	17.90%	11.81%
Lockheed Martin	65.27%	45.78%
Embraer	65.46%	15.41%
Boeing	37.00%	11.21%
BAE	30.96%	22.26%
Average	39.03%	28.04%

Applying a Regression Methodology:
Aerospace Firms

■ We :

Debt Ratio = -0.2707 +0.0515 ln(MKT CAP) + 0.99 EBITDA/Value

$\qquad$ (1.21) $\quad$ (2.60) $\qquad\qquad\qquad$ (1.01)

■ The R squared of the regression is 35%. This regression can be used to arrive at a predicted value for Embraer of:

$\qquad$ Predicted Debt Ratio = -0.2707 +0.0515 ln(MKT CAP) + 0.99

$\qquad\qquad\qquad$ EBITDA/Value = 27.54%

■ Based upon the capital structure of other firms in the entertainment industry, Embraer should have a market value debt ratio of 27.54%.

Cross Sectional Regression: 1998 Data for the U.S.

■ Using 1998 data for 3000 firms listed on the NYSE, AMEX and NASDAQ data bases, we categorized firms by SIC code. The regression across these sectors provides the following results –

DFR = 0.1608- 0.3411 OISTD +.2153 CLSH - 0.3159 CPXFR + 1.4185 E/V

(26.41[a]) (3.15[a])   (1.95[b])   (1.68[b])   (8.21[a])

    where,

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

        OISTD = Standard Deviation in Operating Income (previous 5 years)

        CLSH   = Closely held shares as a percent of outstanding shares

        CPXFR = Capital Expenditures / Total Assets

        E/V   = EBITDA / Firm Value

■ The R squared of the regression is 57%.

Applying the Market Regression

	Boeing	Embraer
Standard Deviation in Operating Income	25.35%	38.13%
Insider Holdings as percent of outstanding stock	1%	15%
Capital Expenditures/Total Assets	4.32%	3.51%
EBITDA/ Firm Value	7.94%	10%
Predicted Debt Ratio	17.55%	19.38%

A Framework for Getting to the Optimal

Is the actual debt ratio greater than or lesser than the optimal debt ratio?

Actual > Optimal
Overlevered

Actual < Optimal
Underlevered

Is the firm under bankruptcy threat?

Is the firm a takeover target?

Yes

No

Yes

No

Reduce Debt quickly
1. Equity for Debt swap
2. Sell Assets; use cash to pay off debt
3. Renegotiate with lenders

Does the firm have good projects?
ROE > Cost of Equity
ROC > Cost of Capital

Increase leverage quickly
1. Debt/Equity swaps
2. Borrow money& buy shares.

Does the firm have good projects?
ROE > Cost of Equity
ROC > Cost of Capital

Yes

Take good projects with new equity or with retained earnings.

No

1. Pay off debt with retained earnings.
2. Reduce or eliminate dividends.
3. Issue new equity and pay off debt.

Yes

Take good projects with debt.

No

Do your stockholders like dividends?

Yes
Pay Dividends

No
Buy back stock

Embraer: Applying the Framework

Is the actual debt ratio greater than or lesser than the optimal debt ratio?

Actual > Optimal Overlevered	**Actual < Optimal Underlevered**

Is the firm under bankruptcy threat?

Is the firm a takeover target?

Yes

No

Yes

No

Reduce Debt quickly
1. Equity for Debt swap
2. Sell Assets; use cash to pay off debt
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ROE > Cost of Equity
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1. Pay off debt with retained earnings.
2. Reduce or eliminate dividends.
3. Issue new equity and pay off debt.

Yes

Take good projects with debt.

No

Do your stockholders like dividends?

Yes
Pay Dividends

No
Buy back stock

Aswath Damodaran

# Designing Debt: The Fundamental Principle

■ The objective in designing debt is to make the cash flows on debt issues match up as closely as possible with the cash flows that the firm makes on its assets.

■ By doing so, we reduce our risk of default, increase debt capacity and increase firm value.

Firm with mismatched debt

Firm Value

Value of Debt
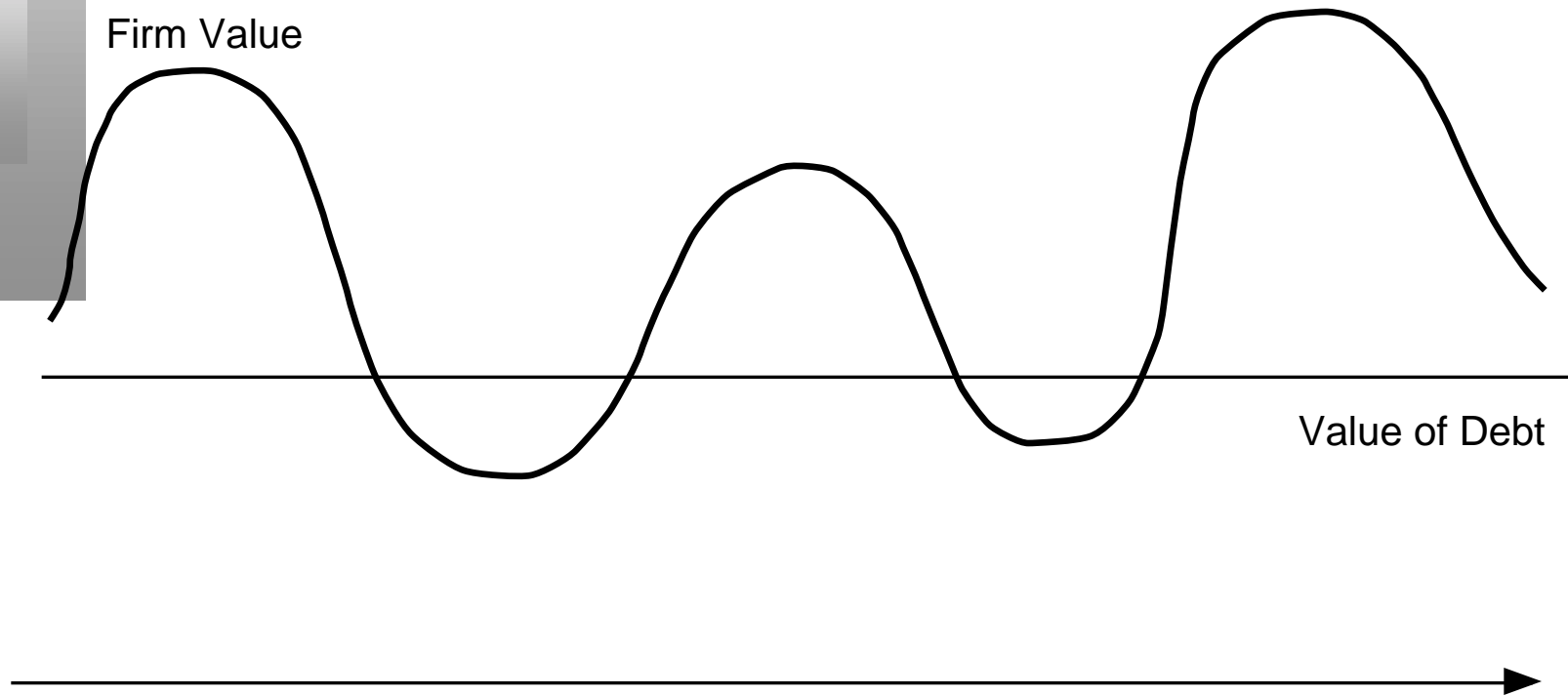
Firm with matched Debt

Firm Value

Value of Debt
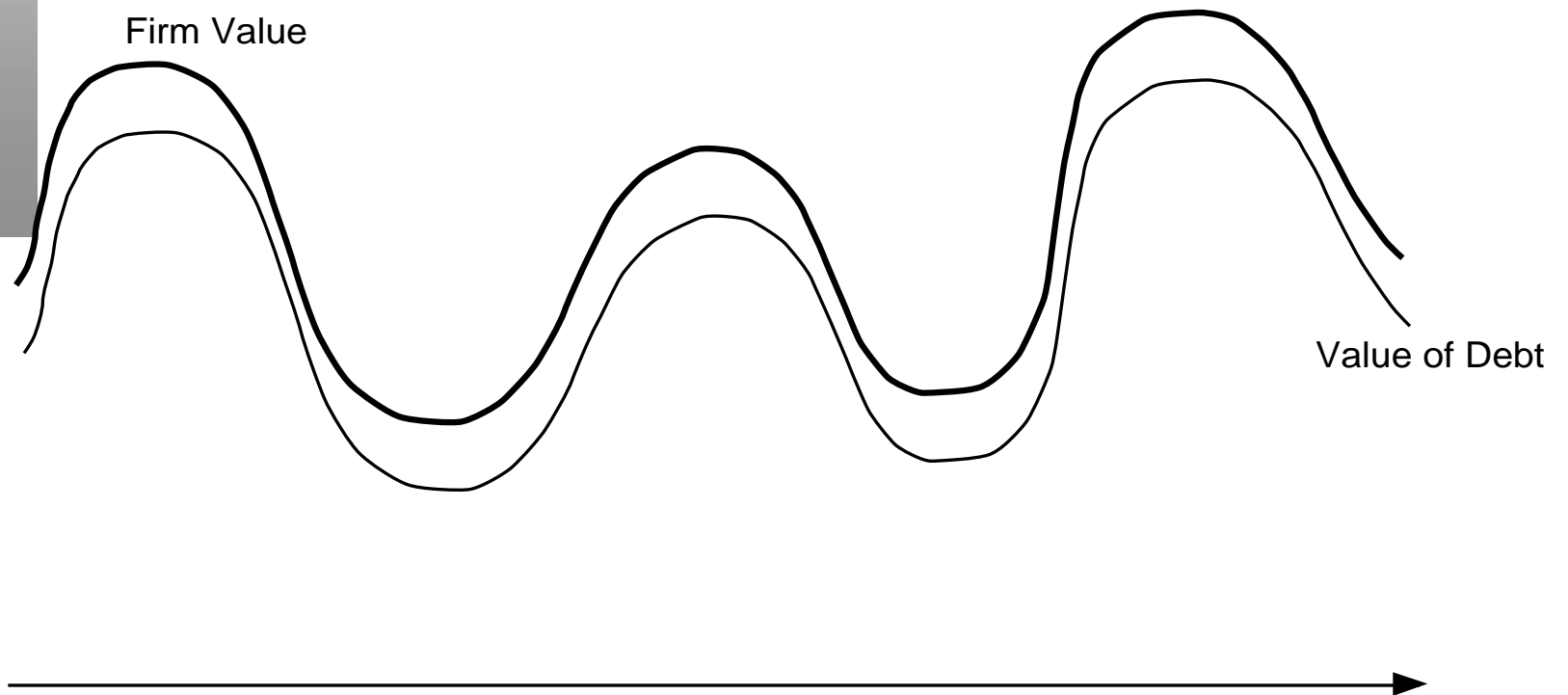
Design the perfect financing instrument

■ The perfect financing instrument will
  - Have all of the tax advantages of debt
  - While preserving the flexibility offered by equity

Start with the Cash Flows on Assets/ Projects

Duration	Currency	Effect of Inflation Uncertainty about Future	Growth Patterns	Cyclicality & Other Effects

Define Debt Characteristics

Duration/ Maturity	Currency Mix	Fixed vs. Floating Rate * More floating rate - if CF move with inflation - with greater uncertainty on future	Straight versus Convertible - Convertible if cash flows low now but high exp. growth	Special Features on Debt - Options to make cash flows on debt match cash flows on assets

Commodity Bonds
Catastrophe Notes

Design debt to have cash flows that match up to cash flows on the assets financed

Ensuring that you have not crossed the line drawn by the tax code

■ All of this design work is lost, however, if the security that you have designed does not deliver the tax benefits.

■ In addition, there may be a trade off between mismatching debt and getting greater tax benefits.

Overlay tax preferences

| Deductibility of cash flows for tax purposes | Differences in tax rates across different locales | Zero Coupons |

If tax advantages are large enough, you might override results of previous step
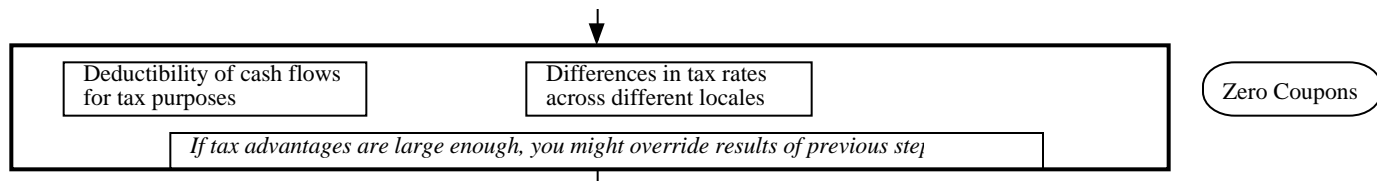
While keeping equity research analysts, ratings agencies and regulators applauding

■ Ratings agencies want companies to issue equity, since it makes them safer. Equity research analysts want them not to issue equity because it dilutes earnings per share. Regulatory authorities want to ensure that you meet their requirements in terms of capital ratios (usually book value). Financing that leaves all three groups happy is nirvana.

Consider ratings agency & analyst concerns

Analyst Concerns	Ratings Agency	Regulatory Concerns	Operating Leases
- Effect on EPS	- Effect on Ratios	- Measures used	MIPs
- Value relative to comparables	- Ratios relative to comparables		Surplus Notes

Can securities be designed that can make these different entities happy
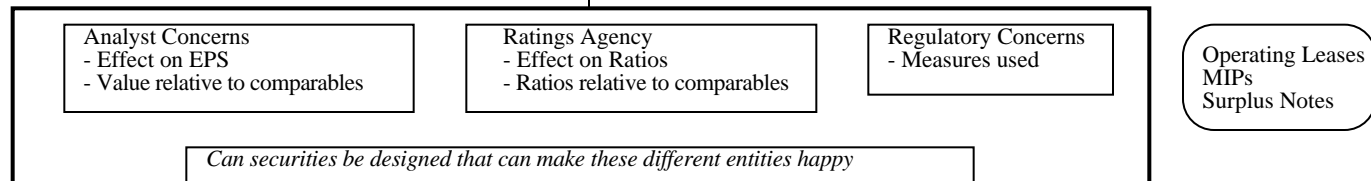
Debt or Equity: The Strange Case of Trust Preferred

- Trust preferred stock has
  - A fixed dividend payment, specified at the time of the issue
  - That is tax deductible
  - And failing to make the payment can cause ? (Can it cause default?)
- When trust preferred was first created, ratings agencies treated it as equity. As they have become more savvy, ratings agencies have started giving firms only partial equity credit for trust preferred.

Debt, Equity and Quasi Equity

■ Assuming that preferred stock gets treated as equity by ratings agencies, which of the following firms is the most appropriate firm to be issuing it?

❏ A firm that is under levered, but has a rating constraint that would be violated if it moved to its optimal

❏ A firm that is over levered that is unable to issue debt because of the rating agency concerns.

Soothe bondholder fears

■ There are some firms that face skepticism from bondholders when they go out to raise debt, because

- Of their past history of defaults or other actions
- They are small firms without any borrowing history

■ Bondholders tend to demand much higher interest rates from these firms to reflect these concerns.

Factor in agency conflicts between stock and bond holders

Observability of Cash Flows by Lenders - Less observable cash flows lead to more conflicts	Type of Assets financed - Tangible and liquid assets create less agency problems	Existing Debt covenants - Restrictions on Financing

If agency problems are substantial, consider issuing convertible bonds

Convertibiles
Puttable Bonds
Rating Sensitive
Notes
LYONs

And do not lock in market mistakes that work against you

■ Ratings agencies can sometimes under rate a firm, and markets can under price a firm's stock or bonds. If this occurs, firms should not lock in these mistakes by issuing securities for the long term. In particular,

- Issuing equity or equity based products (including convertibles), when equity is under priced transfers wealth from existing stockholders to the new stockholders

- Issuing long term debt when a firm is under rated locks in rates at levels that are far too high, given the firm's default risk.

■ What is the solution

- If you need to use equity?

- If you need to use debt?

Designing Debt: Bringing it all together

Start with the Cash Flows on Assets/ Projects	Duration	Currency	Effect of Inflation Uncertainty about Future	Growth Patterns	Cyclicality & Other Effects

Define Debt Characteristics	Duration/ Maturity	Currency Mix	*Fixed vs. Floating Rate* * More floating rate - if CF move with inflation - with greater uncertainty on future	*Straight versus Convertible* - Convertible if cash flows low now but high exp. growth	*Special Features on Debt* - Options to make cash flows on debt match cash flows on assets	Commodity Bonds Catastrophe Notes

Design debt to have cash flows that match up to cash flows on the assets financed

Overlay tax preferences	Deductibility of cash flows for tax purposes	Differences in tax rates across different locales	Zero Coupons

If tax advantages are large enough, you might override results of previous step

Consider ratings agency & analyst concerns	Analyst Concerns - Effect on EPS - Value relative to comparables	Ratings Agency - Effect on Ratios - Ratios relative to comparables	Regulatory Concerns - Measures used	Operating Leases MIPs Surplus Notes

Can securities be designed that can make these different entities happy?

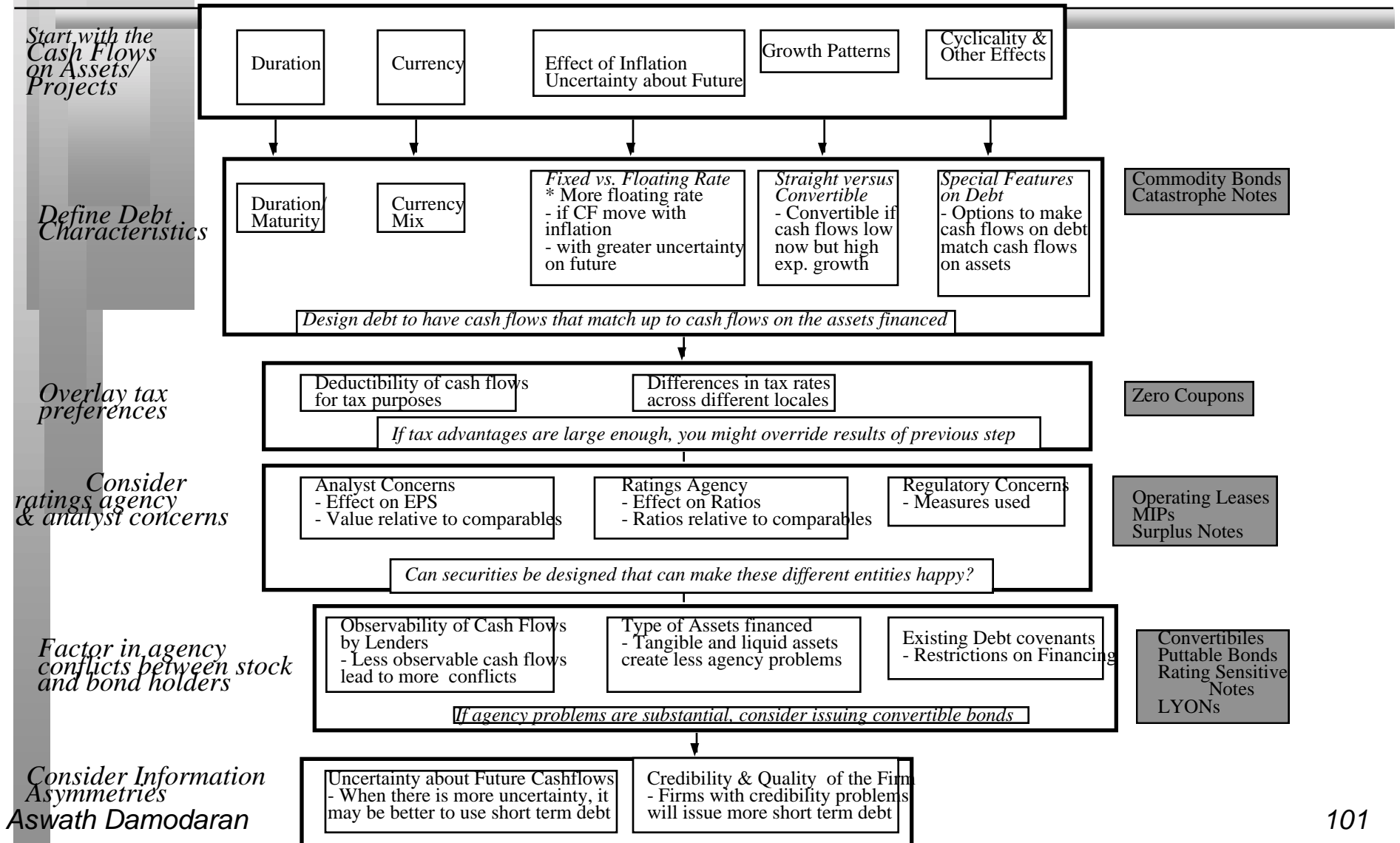|				
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Consider Information Asymmetries	Uncertainty about Future Cashflows - When there is more uncertainty, it may be better to use short term debt	Credibility & Quality of the Firm - Firms with credibility problems will issue more short term debt

Aswath Damodaran

Approaches for evaluating Asset Cash Flows

- 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?
- Quantitative Approach\
  - For firms with substantial operating histories, you could estimate how sensitive firm value and operating income have been to changes in macro economic variables such as inflation, interest rates and exchange rates.

Analyzing Embraer's investments

■ Embraer's typical projects are very long term. They require significant investments up front and generate larger cash flows later in the project life.

■ Embraer gets less than 5% of its revenues domestically. 95% of its revenues are from overseas and denominated in dollars.

■ Embraer has relatively few customers - each customer accounts for a significant portion of the revenues. Moreover, the customers are either airlines or governments.

■ The prices for the planes are set in U.S. dollar terms at the time the initial contract is signed. It will be difficult to pass unexpected inflation into prices.

Recommendations for debt

- Embraer's perfect debt would be
  - Long term
  - Fixed rate
  - Dollar

- If you were able to add special features to the debt, you would like to tie the interest expenses on the debt to how well or badly the airlines are doing. (How about an option on an index that tracks the stock prices of airlines?)

- Embraer's actual debt is dollar-denominated but short term. This may reflect the constraints that it faces in issuing long term debt. If this constraint eases, the firm should replace its short term debt with longer terms debt.

Quantitative Approach

■ In a quantitative approach, you could regress changes in operating income and firm value against changes in macro economic variables. In particular,

- Regressing firm value (operating income) against changes in interest rates should give you a measure of the duration of a firm's assets, which should be equal to the duration of its debt.

- Regressing firm value (operating income) against real GNP should give you a measure of cyclicality.

- Regressing firm value (operating income) against inflation should provide a sense of whether the firm can pass inflation through and whether it should be issuing floating or fixed rate debt.

■ While firm-specific regressions have low R-squared and high standard errors, you could compute the average of these regression coefficients across all firms in an industry and compute bottom-up estimates.

Analyzing Boeing's existing debt

	Existing Debt	*Optimal*
Duration	7.55	9.05
Floating Rate Component	12%	Low
Foreign Currency Debt	8%	47.24%
Convertible Debt	0%	0%

Boeing should increase its proportion of foreign currency debt and increase the maturity of its debt shortly.

The optimal debt ratios were estimated based upon bottom-up estimates for the aerospace and defense businesses.

First Principles

■ Invest in projects that <u>yield a return greater</u> than the <u>minimum acceptable hurdle rate</u>.

  • The hurdle rate should be <u>higher for riskier projects</u> and reflect the <u>financing mix</u> used - owners' funds (equity) or borrowed money (debt)

  • Returns on projects should be measured based on <u>cash flows</u> generated and the <u>timing</u> of these cash flows; they should also consider both <u>positive and negative side effects</u> of these projects.

■ Choose a <u>financing mix</u> that <u>minimizes the hurdle</u> rate and <u>matches the assets</u> being financed.

■ If there are not enough investments that earn the hurdle rate, <u>return the cash</u> to stockholders.

  • The <u>form of returns</u> - dividends and stock buybacks - will depend upon the <u>stockholders' characteristics</u>.

Objective: Maximize the Value of the Firm