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## Discount Rates: IV

Mopping up

# Estimating the Cost of Debt

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- The cost of debt is the rate at which you can borrow at currently, It will reflect not only your default risk but also the level of interest rates in the market.
- The two most widely used approaches to estimating cost of debt are:
  - Looking up the yield to maturity on a straight bond outstanding from the firm. The limitation of this approach is that very few firms have long term straight bonds that are liquid and widely traded
  - Looking up the rating for the firm and estimating a default spread based upon the rating. While this approach is more robust, different bonds from the same firm can have different ratings. You have to use a median rating for the firm
- When in trouble (either because you have no ratings or multiple ratings for a firm), estimate a synthetic rating for your firm and the cost of debt based upon that rating.

# Estimating Synthetic Ratings

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- The rating for a firm can be estimated using the financial characteristics of the firm. In its simplest form, the rating can be estimated from the interest coverage ratio

$$\text{Interest Coverage Ratio} = \text{EBIT} / \text{Interest Expenses}$$

- For Embraer's interest coverage ratio, we used the interest expenses from 2003 and the average EBIT from 2001 to 2003. (The aircraft business was badly affected by 9/11 and its aftermath. In 2002 and 2003, Embraer reported significant drops in operating income)

$$\text{Interest Coverage Ratio} = 462.1 / 129.70 = 3.56$$

# Interest Coverage Ratios, Ratings and Default Spreads: 2003 & 2004

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| If Interest Coverage Ratio is |            | Estimated Bond Rating | Default Spread(2003) | Default Spread(2004) |
|-------------------------------|------------|-----------------------|----------------------|----------------------|
| > 8.50                        | (>12.50)   | AAA                   | 0.75%                | 0.35%                |
| 6.50 - 8.50                   | (9.5-12.5) | AA                    | 1.00%                | 0.50%                |
| 5.50 - 6.50                   | (7.5-9.5)  | A+                    | 1.50%                | 0.70%                |
| 4.25 - 5.50                   | (6-7.5)    | A                     | 1.80%                | 0.85%                |
| 3.00 - 4.25                   | (4.5-6)    | A-                    | 2.00%                | 1.00%                |
| 2.50 - 3.00                   | (4-4.5)    | BBB                   | 2.25%                | 1.50%                |
| 2.25 - 2.50                   | (3.5-4)    | BB+                   | 2.75%                | 2.00%                |
| 2.00 - 2.25                   | ((3-3.5)   | BB                    | 3.50%                | 2.50%                |
| 1.75 - 2.00                   | (2.5-3)    | B+                    | 4.75%                | 3.25%                |
| 1.50 - 1.75                   | (2-2.5)    | B                     | 6.50%                | 4.00%                |
| 1.25 - 1.50                   | (1.5-2)    | B -                   | 8.00%                | 6.00%                |
| 0.80 - 1.25                   | (1.25-1.5) | CCC                   | 10.00%               | 8.00%                |
| 0.65 - 0.80                   | (0.8-1.25) | CC                    | 11.50%               | 10.00%               |
| 0.20 - 0.65                   | (0.5-0.8)  | C                     | 12.70%               | 12.00%               |
| < 0.20                        | (<0.5)     | D                     | 15.00%               | 20.00%               |

- The first number under interest coverage ratios is for larger market cap companies and the second in brackets is for smaller market cap companies. For Embraer, I used the interest coverage ratio table for smaller/riskier firms (the numbers in brackets) which yields a lower rating for the same interest coverage ratio.

# Cost of Debt computations

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- Companies in countries with low bond ratings and high default risk might bear the burden of country default risk, especially if they are smaller or have all of their revenues within the country.
- Larger companies that derive a significant portion of their revenues in global markets may be less exposed to country default risk. In other words, they may be able to borrow at a rate lower than the government.
- The synthetic rating for Embraer is A-. Using the 2004 default spread of 1.00%, we estimate a cost of debt of 9.29% (using a riskfree rate of 4.29% and adding in two thirds of the country default spread of 6.01%):

Cost of debt

$$\begin{aligned} &= \text{Riskfree rate} + 2/3(\text{Brazil country default spread}) + \text{Company default spread} \\ &= 4.29\% + 4.00\% + 1.00\% = 9.29\% \end{aligned}$$

# Synthetic Ratings: Some Caveats

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- The relationship between interest coverage ratios and ratings, developed using US companies, tends to travel well, as long as we are analyzing large manufacturing firms in markets with interest rates close to the US interest rate
- They are more problematic when looking at smaller companies in markets with higher interest rates than the US. One way to adjust for this difference is modify the interest coverage ratio table to reflect interest rate differences (For instances, if interest rates in an emerging market are twice as high as rates in the US, halve the interest coverage ratio.

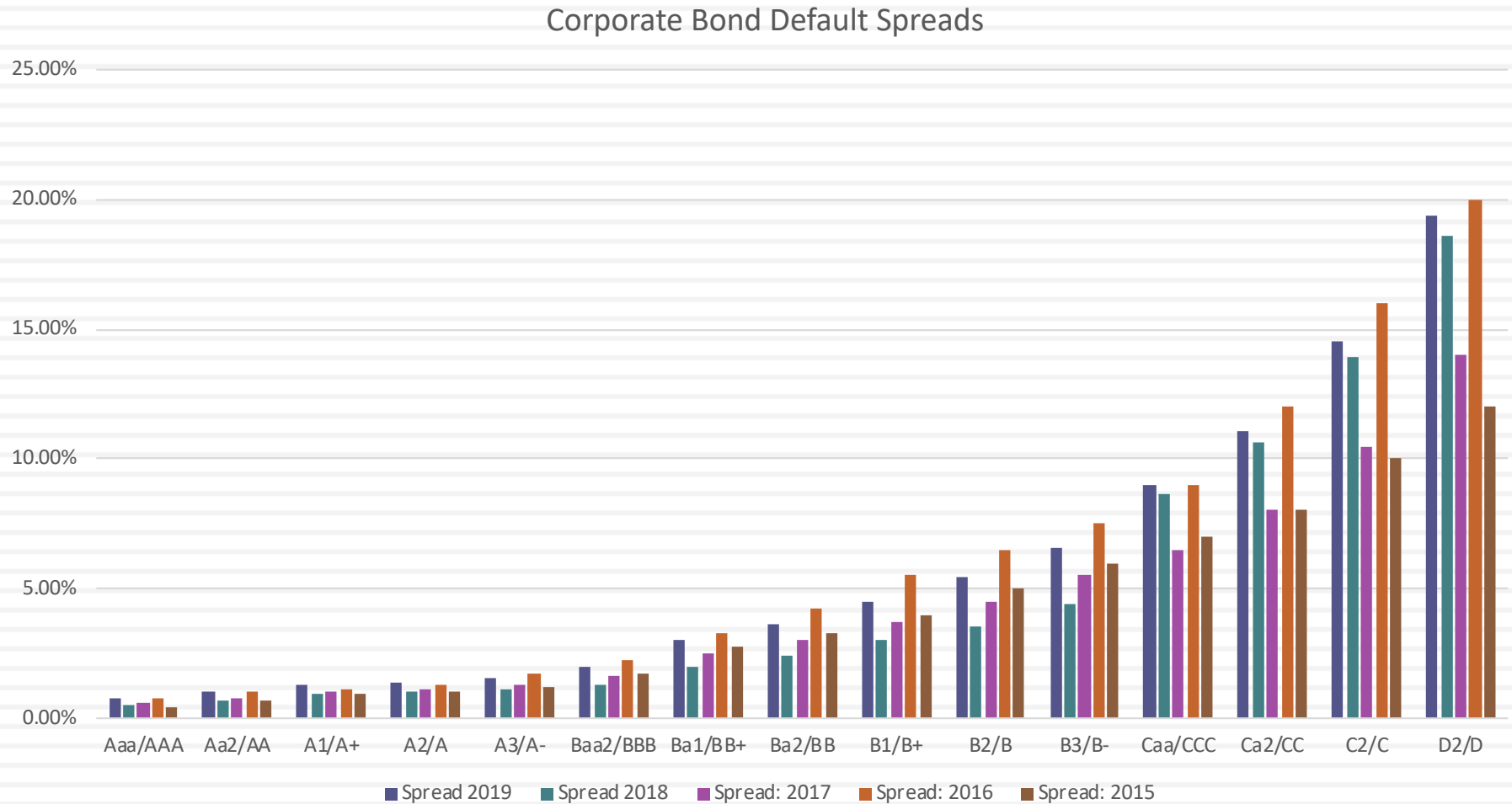
# Default Spreads: The effect of the crisis of 2008.. And the aftermath

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|           | <i>Default spread over treasury</i> |           |           |          |          |          |
|-----------|-------------------------------------|-----------|-----------|----------|----------|----------|
| Rating    | 1-Jan-08                            | 12-Sep-08 | 12-Nov-08 | 1-Jan-09 | 1-Jan-10 | 1-Jan-11 |
| Aaa/AAA   | 0.99%                               | 1.40%     | 2.15%     | 2.00%    | 0.50%    | 0.55%    |
| Aa1/AA+   | 1.15%                               | 1.45%     | 2.30%     | 2.25%    | 0.55%    | 0.60%    |
| Aa2/AA    | 1.25%                               | 1.50%     | 2.55%     | 2.50%    | 0.65%    | 0.65%    |
| Aa3/AA-   | 1.30%                               | 1.65%     | 2.80%     | 2.75%    | 0.70%    | 0.75%    |
| A1/A+     | 1.35%                               | 1.85%     | 3.25%     | 3.25%    | 0.85%    | 0.85%    |
| A2/A      | 1.42%                               | 1.95%     | 3.50%     | 3.50%    | 0.90%    | 0.90%    |
| A3/A-     | 1.48%                               | 2.15%     | 3.75%     | 3.75%    | 1.05%    | 1.00%    |
| Baa1/BBB+ | 1.73%                               | 2.65%     | 4.50%     | 5.25%    | 1.65%    | 1.40%    |
| Baa2/BBB  | 2.02%                               | 2.90%     | 5.00%     | 5.75%    | 1.80%    | 1.60%    |
| Baa3/BBB- | 2.60%                               | 3.20%     | 5.75%     | 7.25%    | 2.25%    | 2.05%    |
| Ba1/BB+   | 3.20%                               | 4.45%     | 7.00%     | 9.50%    | 3.50%    | 2.90%    |
| Ba2/BB    | 3.65%                               | 5.15%     | 8.00%     | 10.50%   | 3.85%    | 3.25%    |
| Ba3/BB-   | 4.00%                               | 5.30%     | 9.00%     | 11.00%   | 4.00%    | 3.50%    |
| B1/B+     | 4.55%                               | 5.85%     | 9.50%     | 11.50%   | 4.25%    | 3.75%    |
| B2/B      | 5.65%                               | 6.10%     | 10.50%    | 12.50%   | 5.25%    | 5.00%    |
| B3/B-     | 6.45%                               | 9.40%     | 13.50%    | 15.50%   | 5.50%    | 6.00%    |
| Caa/CCC+  | 7.15%                               | 9.80%     | 14.00%    | 16.50%   | 7.75%    | 7.75%    |
| ERP       | 4.37%                               | 4.52%     | 6.30%     | 6.43%    | 4.36%    | 5.20%    |

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# Default Spreads – January 2019





# Subsidized Debt: What should we do?

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- Assume that the Brazilian government lends money to Embraer at a subsidized interest rate (say 6% in dollar terms). In computing the cost of capital to value Embraer, should we use the cost of debt based upon default risk or the subsidized cost of debt?
  - a. The subsidized cost of debt (6%). That is what the company is paying.
  - b. The fair cost of debt (9.25%). That is what the company should require its projects to cover.
  - c. A number in the middle.

# Weights for the Cost of Capital Computation

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- In computing the cost of capital for a publicly traded firm, the general rule for computing weights for debt and equity is that you use market value weights (and not book value weights). Why?
  - a. Because the market is usually right
  - b. Because market values are easy to obtain
  - c. Because book values of debt and equity are meaningless
  - d. None of the above

# Estimating Cost of Capital: Embraer in 2004

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## □ Equity

- ▣ Cost of Equity =  $4.29\% + 1.07 (4\%) + 0.27 (7.89\%) = 10.70\%$
- ▣ Market Value of Equity = 11,042 million BR (\$ 3,781 million)

## □ Debt

- ▣ Cost of debt =  $4.29\% + 4.00\% + 1.00\% = 9.29\%$
- ▣ Market Value of Debt = 2,083 million BR (\$713 million)

## □ Cost of Capital

$$\text{Cost of Capital} = 10.70\% (.84) + 9.29\% (1 - .34) (0.16) = 9.97\%$$

- ▣ The book value of equity at Embraer is 3,350 million BR.
- ▣ The book value of debt at Embraer is 1,953 million BR; Interest expense is 222 mil BR; Average maturity of debt = 4 years
- ▣ Estimated market value of debt =  $222 \text{ million (PV of annuity, 4 years, 9.29\%)} + \$1,953 \text{ million} / 1.0929^4 = 2,083 \text{ million BR}$

# If you had to do it....Converting a Dollar Cost of Capital to a Nominal Real Cost of Capital

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- Approach 1: Use a BR riskfree rate in all of the calculations above. For instance, if the BR riskfree rate was 12%, the cost of capital would be computed as follows:
  - ▣ Cost of Equity =  $12\% + 1.07(4\%) + 0.27(7.89\%) = 18.41\%$
  - ▣ Cost of Debt =  $12\% + 1\% = 13\%$
  - ▣ (This assumes the riskfree rate has no country risk premium embedded in it.)
- Approach 2: Use the differential inflation rate to estimate the cost of capital. For instance, if the inflation rate in BR is 8% and the inflation rate in the U.S. is 2%

$$\text{Cost of capital} = (1 + \text{Cost of Capital}_{\$}) \left[ \frac{1 + \text{Inflation}_{\text{BR}}}{1 + \text{Inflation}_{\$}} \right]$$

$$= 1.0997 (1.08/1.02) - 1 = 0.1644 \text{ or } 16.44\%$$

# Dealing with Hybrids and Preferred Stock

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- When dealing with hybrids (convertible bonds, for instance), break the security down into debt and equity and allocate the amounts accordingly. Thus, if a firm has \$ 125 million in convertible debt outstanding, break the \$125 million into straight debt and conversion option components. The conversion option is equity.
- When dealing with preferred stock, it is better to keep it as a separate component. The cost of preferred stock is the preferred dividend yield. (As a rule of thumb, if the preferred stock is less than 5% of the outstanding market value of the firm, lumping it in with debt will make no significant impact on your valuation).

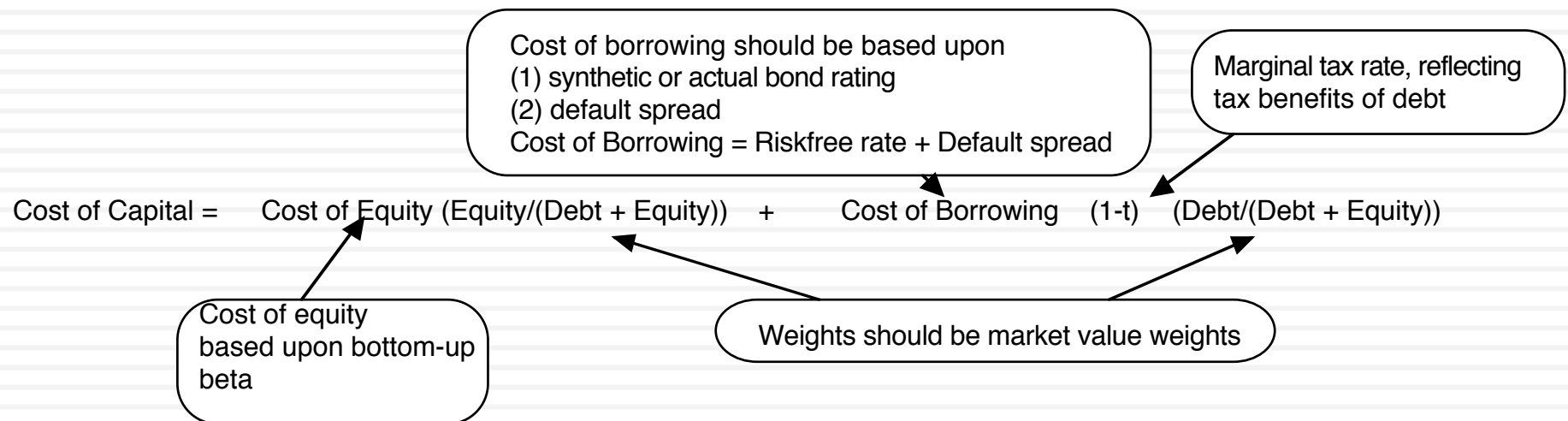
# Decomposing a convertible bond...

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- Assume that the firm that you are analyzing has \$125 million in face value of convertible debt with a stated interest rate of 4%, a 10 year maturity and a market value of \$140 million. If the firm has a bond rating of A and the interest rate on A-rated straight bond is 8%, you can break down the value of the convertible bond into straight debt and equity portions.
  - ▣ Straight debt = (4% of \$125 million) (PV of annuity, 10 years, 8%) + 125 million/1.0810 = \$91.45 million
  - ▣ Equity portion = \$140 million - \$91.45 million = \$48.55 million
- The debt portion (\$91.45 million) gets added to debt and the option portion (\$48.55 million) gets added to the market capitalization to get to the debt and equity weights in the cost of capital.

# Recapping the Cost of Capital

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## ESTIMATING CASH FLOWS

Cash is king...



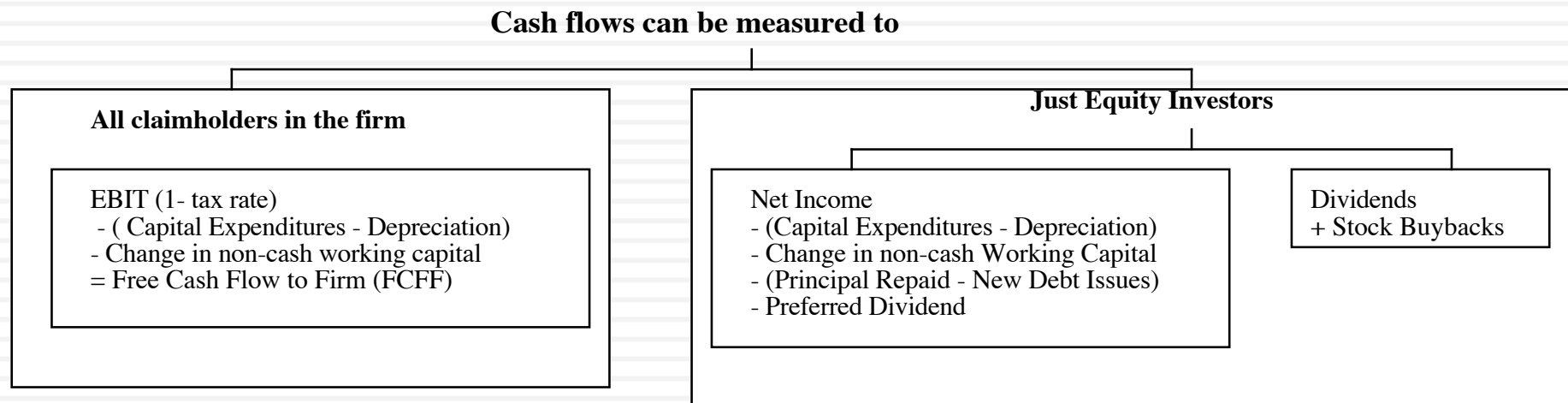
# Steps in Cash Flow Estimation

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- Estimate the current earnings of the firm
  - ▣ If looking at cash flows to equity, look at earnings after interest expenses - i.e. net income
  - ▣ If looking at cash flows to the firm, look at operating earnings after taxes
- Consider how much the firm invested to create future growth
  - ▣ If the investment is not expensed, it will be categorized as capital expenditures. To the extent that depreciation provides a cash flow, it will cover some of these expenditures.
  - ▣ Increasing working capital needs are also investments for future growth
- If looking at cash flows to equity, consider the cash flows from net debt issues (debt issued - debt repaid)

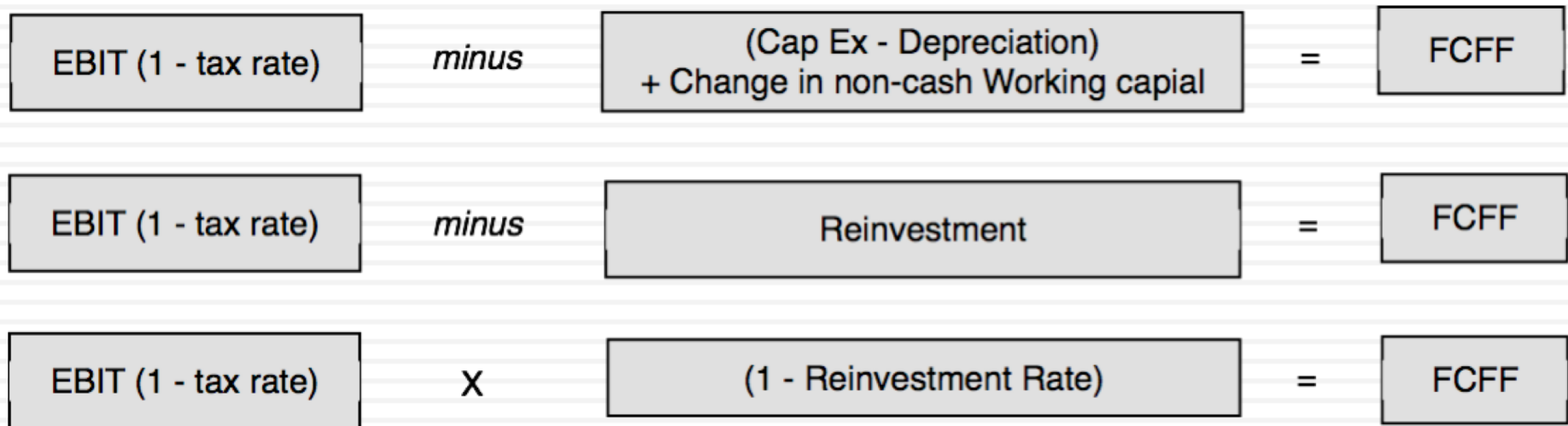
# Measuring Cash Flows

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# Measuring Cash Flow to the Firm: Three pathways to the same end game

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Where are the tax savings from interest expenses?

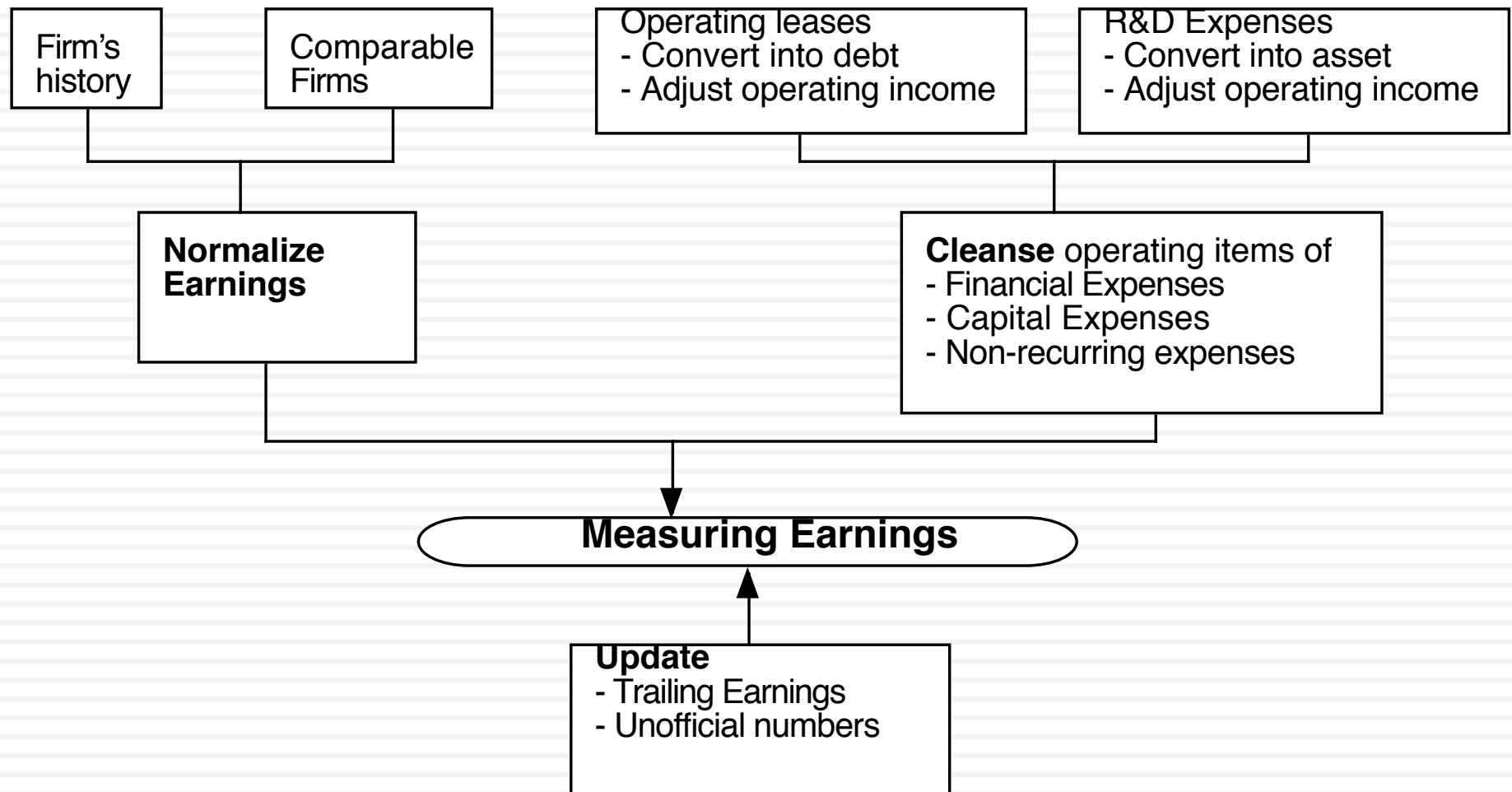
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# Cash Flows I

Accounting Earnings, Flawed but Important

# From Reported to Actual Earnings

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# I. Update Earnings

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- When valuing companies, we often depend upon financial statements for inputs on earnings and assets. Annual reports are often outdated and can be updated by using-
  - ▣ Trailing 12-month data, constructed from quarterly earnings reports.
  - ▣ Informal and unofficial news reports, if quarterly reports are unavailable.
- Updating makes the most difference for smaller and more volatile firms, as well as for firms that have undergone significant restructuring.
- Time saver: To get a trailing 12-month number, all you need is one 10K and one 10Q (example third quarter). Use the Year to date numbers from the 10Q. For example, to get trailing revenues from a third quarter 10Q:
  - ▣  $\text{Trailing 12-month Revenue} = \text{Revenues (in last 10K)} - \text{Revenues from first 3 quarters of last year} + \text{Revenues from first 3 quarters of this year.}$

## II. Correcting Accounting Earnings

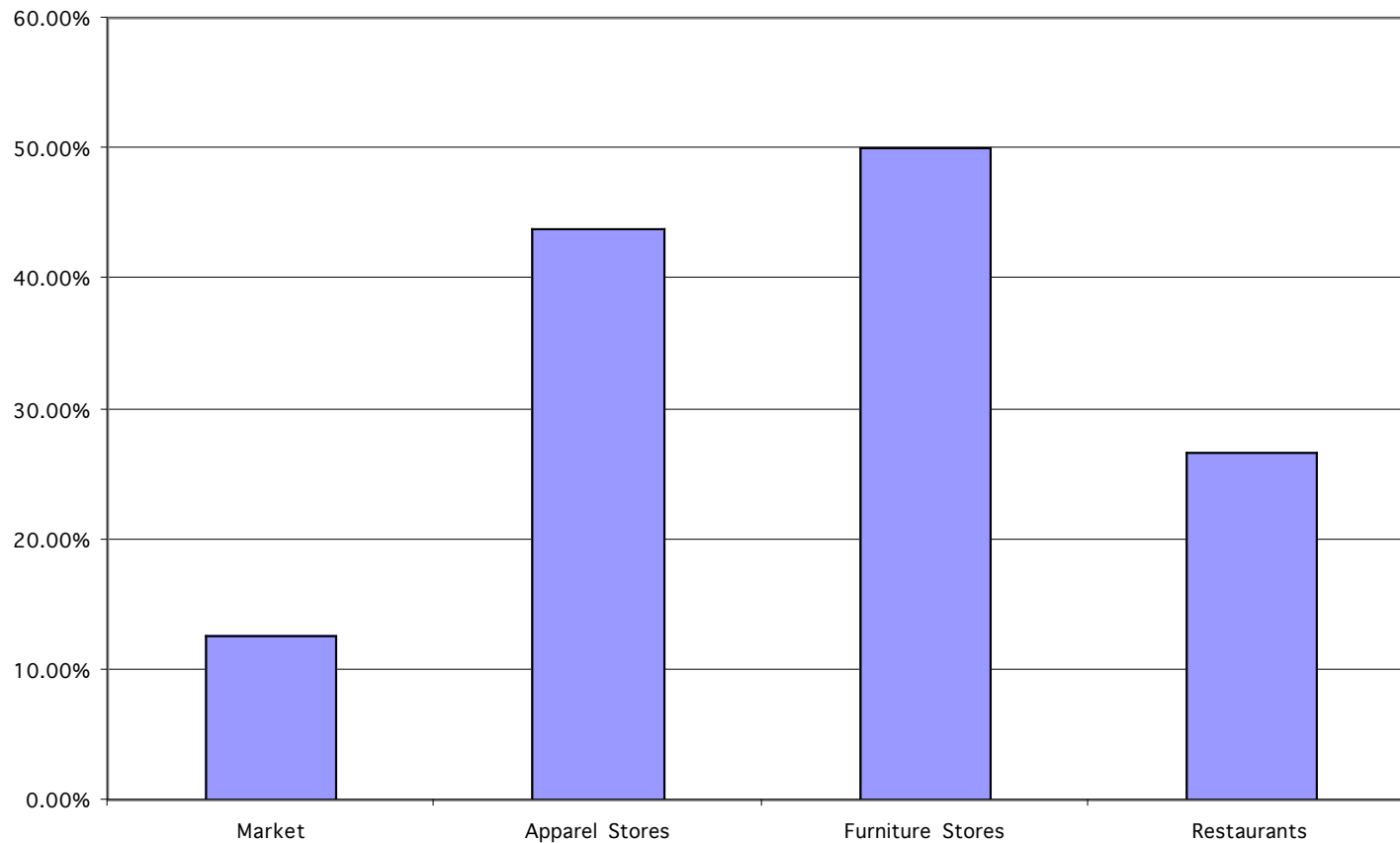
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- Make sure that there are no financial expenses mixed in with operating expenses
  - ▣ Financial expense: Any commitment that is tax deductible that you have to meet no matter what your operating results: Failure to meet it leads to loss of control of the business.
  - ▣ Example: Operating Leases: While accounting convention treats operating leases as operating expenses, they are really financial expenses and need to be reclassified as such. This has no effect on equity earnings but does change the operating earnings
- Make sure that there are no capital expenses mixed in with the operating expenses
  - ▣ Capital expense: Any expense that is expected to generate benefits over multiple periods.
  - ▣ R & D Adjustment: Since R&D is a capital expenditure (rather than an operating expense), the operating income has to be adjusted to reflect its treatment.

# The Magnitude of Operating Leases

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Operating Lease expenses as % of Operating Income





# Dealing with Operating Lease Expenses

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- Operating Lease Expenses are treated as operating expenses in computing operating income. In reality, operating lease expenses should be treated as financing expenses, with the following adjustments to earnings and capital:
- Debt Value of Operating Leases = Present value of Operating Lease Commitments at the pre-tax cost of debt
- When you convert operating leases into debt, you also create an asset to counter it of exactly the same value.
- Adjusted Operating Earnings
  - Adjusted Operating Earnings = Operating Earnings + Operating Lease Expenses - Depreciation on Leased AssetAs an approximation, this works:
  - Adjusted Operating Earnings = Operating Earnings + Pre-tax cost of Debt \* PV of Operating Leases.

# Operating Leases at The Gap in 2003

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- The Gap has conventional debt of about \$ 1.97 billion on its balance sheet and its pre-tax cost of debt is about 6%. Its operating lease payments in the 2003 were \$978 million and its commitments for the future are below:

| Year | Commitment (millions) | Present Value (at 6%) |
|------|-----------------------|-----------------------|
| 1    | \$899.00              | \$848.11              |
| 2    | \$846.00              | \$752.94              |
| 3    | \$738.00              | \$619.64              |
| 4    | \$598.00              | \$473.67              |
| 5    | \$477.00              | \$356.44              |
| 6&7  | \$982.50 each year    | \$1,346.04            |

- Debt Value of leases = \$4,396.85 (Also value of leased asset)
- Debt outstanding at The Gap = \$1,970 m + \$4,397 m = \$6,367 m
- Adjusted Operating Income = Stated OI + OL exp this year - Deprec' n  
= \$1,012 m + 978 m - 4397 m / 7 = \$1,362 million (7 year life for assets)
- Approximate OI = \$1,012 m + \$ 4397 m (.06) = \$1,276 m

# The Collateral Effects of Treating Operating Leases as Debt

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| <i>Conventional Accounting</i>                                                                                                                                                                      | <i>Operating Leases Treated as Debt</i>                                                                                                                                                                                             |       |           |               |              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------|---------------|--------------|
| <p><i>Income Statement</i></p> <p>EBIT&amp; Leases = 1,990</p> <p>- Op Leases = 978</p> <p>EBIT = 1,012</p>                                                                                         | <p><i>Income Statement</i></p> <p>EBIT&amp; Leases = 1,990</p> <p>- Deprecn: OL= 628</p> <p>EBIT = 1,362</p> <p>Interest expense will rise to reflect the conversion of operating leases as debt. Net income should not change.</p> |       |           |               |              |
| <p><i>Balance Sheet</i></p> <p>Off balance sheet (Not shown as debt or as an asset). Only the conventional debt of \$1,970 million shows up on balance sheet</p>                                    | <p><i>Balance Sheet</i></p> <table> <tr> <td>Asset</td><td>Liability</td></tr> <tr> <td>OL Asset 4397</td><td>OL Debt 4397</td></tr> </table> <p>Total debt = 4397 + 1970 = \$6,367 million</p>                                     | Asset | Liability | OL Asset 4397 | OL Debt 4397 |
| Asset                                                                                                                                                                                               | Liability                                                                                                                                                                                                                           |       |           |               |              |
| OL Asset 4397                                                                                                                                                                                       | OL Debt 4397                                                                                                                                                                                                                        |       |           |               |              |
| <p>Cost of capital = <math>8.20\%(7350/9320) + 4\%(1970/9320) = 7.31\%</math></p> <p>Cost of equity for The Gap = 8.20%</p> <p>After-tax cost of debt = 4%</p> <p>Market value of equity = 7350</p> | <p>Cost of capital = <math>8.20\%(7350/13717) + 4\%(6367/13717) = 6.25\%</math></p>                                                                                                                                                 |       |           |               |              |
| <p>Return on capital = <math>1012 (1-.35)/(3130+1970) = 12.90\%</math></p>                                                                                                                          | <p>Return on capital = <math>1362 (1-.35)/(3130+6367) = 9.30\%</math></p>                                                                                                                                                           |       |           |               |              |