



# The Cost of Capital of a Firm

Gestão Financeira II  
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**LISBOA**  
**SCHOOL OF**  
**ECONOMICS &**  
**MANAGEMENT**

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# Outline

- Cost of Equity ( $r_E$ )
- Cost of Debt ( $r_D$ )
- Weighted Average Cost of Capital ( $r_{wacc}$ )

# The Equity Cost of Capital ( $r_E$ )

- The **CAPM** is a practical way to estimate the

Cost of Equity: 
$$r_E = r_f + \beta_E \left[ E(R_M) - r_f \right]$$

Risk Premium for the  
shares of the firm

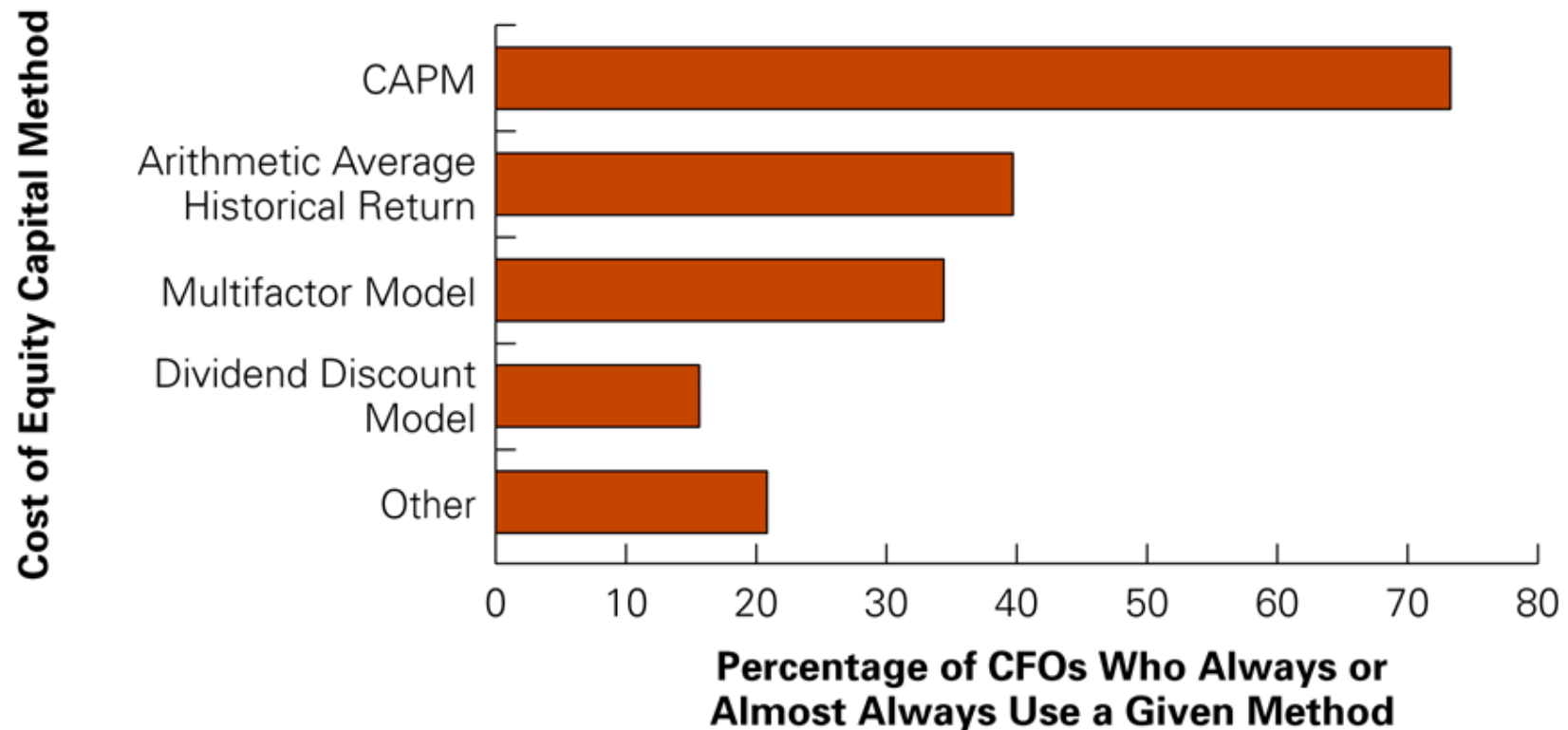
- Example:**
  - Suppose you estimate that Google's stock has a volatility of 26% and a beta of 1.45.
  - The risk-free interest rate is 3% and you estimate the market's expected return to be 8%.
  - Google's cost of equity capital would be:

$$r_E^{Google} = 3\% + 1.45 \times (8\% - 3\%) = 10.25\%$$

# The Equity Cost of Capital ( $r_E$ )

- For firms that are not listed in a stock exchange there is no direct way of estimating their stock beta.
- In those cases, it is common to use a comparables method, estimating an average or industry beta that is then adjusted for the reality of the privately held firm.

# The Equity Cost of Capital ( $r_E$ )



Source: J. R. Graham and C. R. Harvey, "The Theory and Practice of Corporate Finance: Evidence from the Field," *Journal of Financial Economics* 60 (2001): 187–243.

# The Debt Cost of Capital ( $r_D$ )

- The most common way of estimating the **Cost of Debt** is using **Debt Yields**:
  - **Yield to maturity** is the IRR an investor will earn from holding the bond to maturity and receiving its promised payments.
  - *If there is significant **risk of default**, yield to maturity will overstate investors' expected return.*
    - In that case we must **adjust for** the *truly expected return* for the firm's creditors, taking into account the **probability of default and** the amount of **expected loss** in case of default.



# The Debt Cost of Capital ( $r_D$ )

- Consider a one-year bond with **YTM of  $y$** . For each \$1 invested in the bond today, the issuer promises to pay  **$\$(1+y)$  in one year**.
- Suppose the bond will **default with probability  $p$** , in which case bond holders receive only  **$\$(1+y-L)$** , where  **$L$  is the expected loss** per \$1 of debt in the event of default.
- So the **expected return of the bond** is:

$$r_D = (1-p)y + p(y-L) = y - pL =$$

*=Yield to Maturity – Prob(default) X Expected Loss Rate*

# The Debt Cost of Capital ( $r_D$ )

- Annual **Default Rates by Debt Rating** (1920–2011):

Rating:	AAA	AA	A	BBB	BB	B	CCC	CC-C
Default Rate:								
Average	0.0%	0.1%	0.2%	0.5%	2.2%	5.5%	12.2%	14.1%
In Recessions	0.0%	1.0%	3.0%	3.0%	8.0%	16.0%	48.0%	79.0%

*Source: "Corporate Defaults and Recovery Rates, 1920–2011," Moody's Global Credit Policy, February 2012.*

- The **average loss rate for unsecured debt is 60%**.
- Example:** The expected return to B-rated bondholders during average times is  $0.055 \times 0.60 = 3.3\%$  below the bond's quoted yield.



# The Debt Cost of Capital ( $r_D$ )

- Another way of estimating the **Cost of Debt** would be using the **CAPM** and **Debt Betas**.
  - Debt betas are difficult to estimate because corporate bonds are traded infrequently.
  - One approximation is to use estimates of betas of bond indices by rating category.

<b>By Rating</b>	<i>A and above</i>	<i>BBB</i>	<i>BB</i>	<i>B</i>	<i>CCC</i>
Avg. Beta	< 0.05	0.10	0.17	0.26	0.31
<b>By Maturity</b>	(BBB and above)	<i>1–5 Year</i>	<i>5–10 Year</i>	<i>10–15 Year</i>	<i>&gt; 15 Year</i>
Avg. Beta		0.01	0.06	0.07	0.14

*Source: S. Schaefer and I. Strebulaev, "Risk in Capital Structure Arbitrage," Stanford GSB working paper, 2009.*

# The Debt Cost of Capital ( $r_D$ )

- **Example:**

- In mid-2012, homebuilder KB Home had outstanding 6-year bonds with a **YTM of 6.0%** and a **B** rating.

- Consider that the corresponding **risk-free rate was 1%**, and the market risk premium is 5%.

- KB Home's **Cost of Debt** was:

- Using the YTM, the probability of default of B rating bonds, and the expected loss in default of 60%:

$$r_D^{KBHome} = 6.0\% - 5.5\% \times 0.6 = 2.7\%$$

- Using the Debt Beta of a BB rating bond, and CAPM:

$$r_D^{KBHome} = 1\% + 0.26 \times 5\% = 2.3\%$$

# The Cost of Capital of a Firm

- It is common to compute the weighted average of the costs of equity and debt. This rate is known as the **WACC** (weighted average cost of capital).
- (In the absence of corporate taxes) the **pre-tax WACC** is computed as:
- In the presence of corporate taxes, due to the more favorable tax treatment given to debt financing, the **WACC** is computed as:

$$r_{wacc} = \frac{E}{E + D} r_E + \frac{D}{E + D} r_D$$

$$r_{wacc} = \frac{E}{E + D} r_E + \frac{D}{E + D} r_D (1 - T_C)$$

- Note: The value of Debt considered here can be understood as “Net Debt”
  - by this we mean debt net of excess cash that the firm might hold. The denominator is the Enterprise Value.