



SESSION 3: DISCOUNT RATE
BASICS
THE RISK FREE RATE

Estimating Inputs: Discount Rates

2

- Critical ingredient in discounted cashflow valuation. Errors in estimating the discount rate or mismatching cashflows and discount rates can lead to serious errors in valuation.
- At an intuitive level, the discount rate used should be consistent with both the riskiness and the type of cashflow being discounted.
 - Equity versus Firm: If the cash flows being discounted are cash flows to equity, the appropriate discount rate is a cost of equity. If the cash flows are cash flows to the firm, the appropriate discount rate is the cost of capital.
 - Currency: The currency in which the cash flows are estimated should also be the currency in which the discount rate is estimated.
 - Nominal versus Real: If the cash flows being discounted are nominal cash flows (i.e., reflect expected inflation), the discount rate should be nominal

Cost of Equity

3

- The cost of equity should be higher for riskier investments and lower for safer investments
- While risk is usually defined in terms of the variance of actual returns around an expected return, risk and return models in finance assume that the risk that should be rewarded (and thus built into the discount rate) in valuation should be the risk perceived by the marginal investor in the investment
- Most risk and return models in finance also assume that the marginal investor is well diversified, and that the only risk that he or she perceives in an investment is risk that cannot be diversified away (i.e., market or non-diversifiable risk)

The Cost of Equity: Competing Models

4

Model	Expected Return	Inputs Needed
CAPM	$E(R) = R_f + \beta (R_m - R_f)$	Riskfree Rate Beta relative to market portfolio Market Risk Premium
APM Factors;	$E(R) = R_f + \sum \beta_j (R_j - R_f)$	Riskfree Rate; # of Betas relative to each factor Factor risk premiums
Multi factors factor	$E(R) = R_f + \sum \beta_j (R_j - R_f)$	Riskfree Rate; Macro Betas relative to macro factors Macro economic risk premiums
Proxy	$E(R) = a + \sum b_j Y_j$	Proxies Regression coefficients

The CAPM: Cost of Equity

5

- While the CAPM (and the CAPM beta) has come in for well-justified criticism over the last four decades (for making unrealistic assumptions, for having parameters that are tough to estimate and for not working well), it remains the most-widely used model in practice.
- In the CAPM, the cost of equity is a function of three inputs
$$\text{Cost of Equity} = \text{Riskfree Rate} + \text{Equity Beta} * (\text{Equity Risk Premium})$$
- In practice,
 - Government security rates are used as risk free rates
 - Historical risk premiums are used for the risk premium
 - Betas are estimated by regressing stock returns against market returns

A Riskfree Rate

6

- On a riskfree asset, the actual return is equal to the expected return. Therefore, there is no variance around the expected return.
- For an investment to be riskfree, then, it has to have
 - ▣ No default risk
 - ▣ No reinvestment risk
- 1. Time horizon matters: Thus, the riskfree rates in valuation will depend upon when the cash flow is expected to occur and will vary across time. If your cash flows stretch out over the long term, your risk free rate has to be a long term risk free rate.
- 2. Not all government securities are riskfree: Some governments face default risk and the rates on bonds issued by them will not be riskfree.

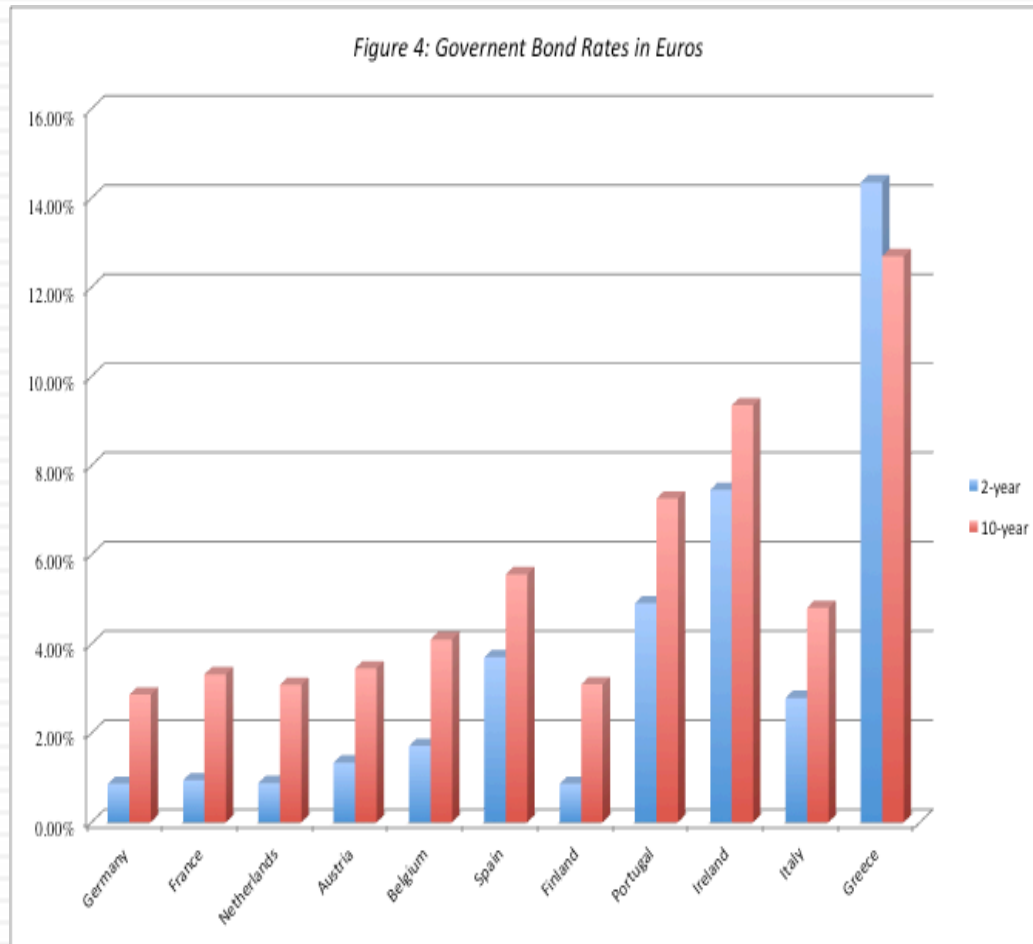
Let's start easy

A riskfree rate in US dollars!

7

- If you are valuing a company in US dollars, you need a US dollar risk free rate.
- In practice, we have tended to use US treasury rates as risk free rates, but that is built on the presumption that the US treasury is default free.
 - If you accept the premise that the US treasury is default free, you still have several choices, since the US treasury issues securities with differing maturities (ranging from 3 months to 30 years) as well in real or nominal terms (Inflation protected treasuries (TIPs) or nominal treasuries)
 - In valuation, we estimate cash flows forever (or at least for very long time periods) and in nominal terms. The correct risk free rate to use should therefore be a long term, nominal rate. The thirty-year treasury bond rate is the longest term rate that you can find and there is a good case to be made that it should be the risk free rate. However, given how difficult it is to get the other inputs for the discount rate (default spreads & equity risk premium) over thirty year periods, you should consider using the ten-year US treasury bond rate as your risk free rate for US dollar valuations.

A Riskfree Rate in Euros



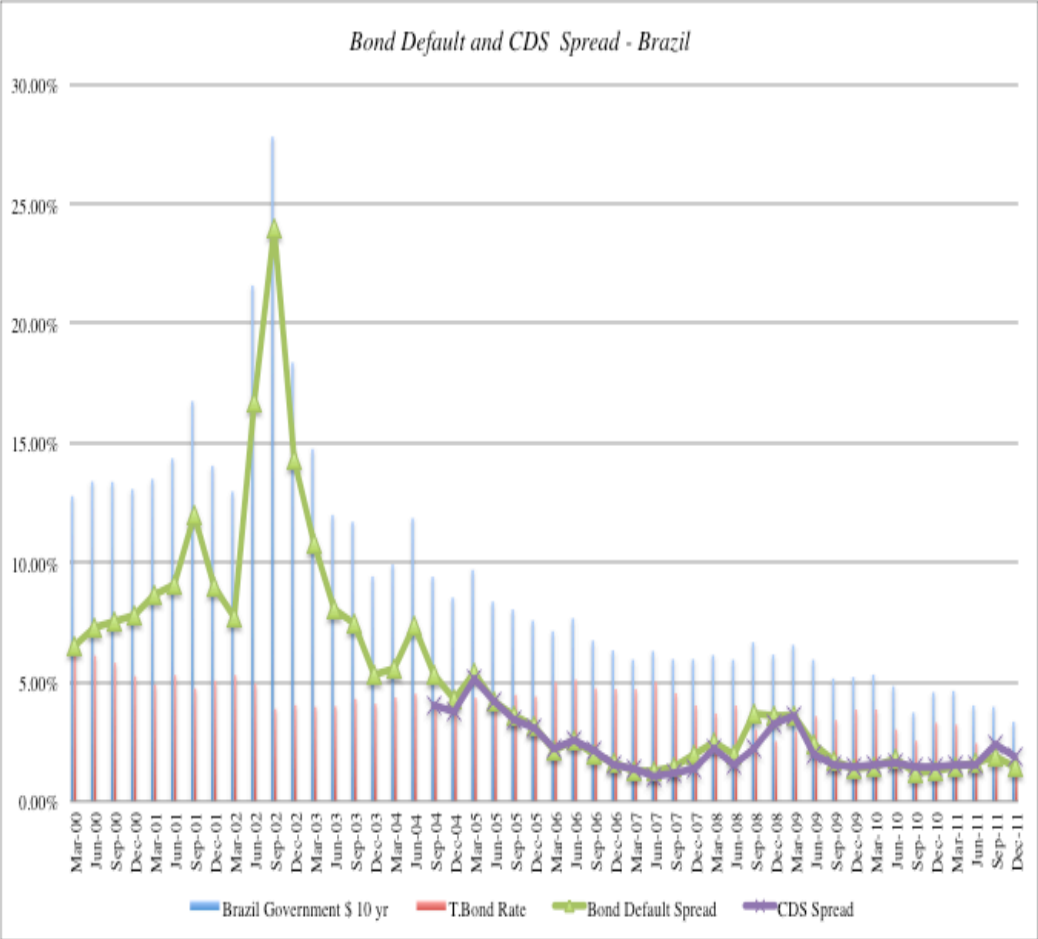
A Riskfree Rate in nominal Reais

9

- The Brazilian government had 10-year BR\$ denominated bonds outstanding in January 2013, with an interest rate of 9%.
- In January 2013, the Brazilian government had a local currency sovereign rating of Baa2. The typical default spread (over a default free rate) for Baa2 rated country bonds in January 2013 was 1.75%. The risk free rate in nominal reais is therefore:

$$\begin{aligned}\text{Riskfree rate in Reais} &= \text{Nominal 10-year BR\$ rate} - \text{Default spread} \\ &= 9\% - 1.75\% = 7.25\%\end{aligned}$$

Sovereign Default Spreads: Two paths to the same destination...



And a third – Average Default Spreads: January 2013

11

<i>Rating</i>	<i>Default spread in basis points</i>
Aaa	0
Aa1	25
Aa2	50
Aa3	70
A1	85
A2	100
A3	115
Baa1	150
Baa2	175
Baa3	200
Ba1	240
Ba2	275
Ba3	325
B1	400
B2	500
B3	600
Caa1	700
Caa2	850
Caa3	1000

Risk free rates in different currencies: January 2013

12

