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## Valuation: Intrinsic value or fundamental value

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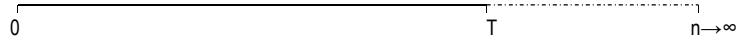
### Intrinsic value or fundamental value

- actual value of a company or an asset based on an underlying perception of its true value including all aspects of the business, in terms of both tangible and intangible factors.
- This value may or may not be the same as the current market value
- It is ordinarily calculated by the present value of the future income generated by the asset/company

## Discounted Cash Flow Valuation

### General formula

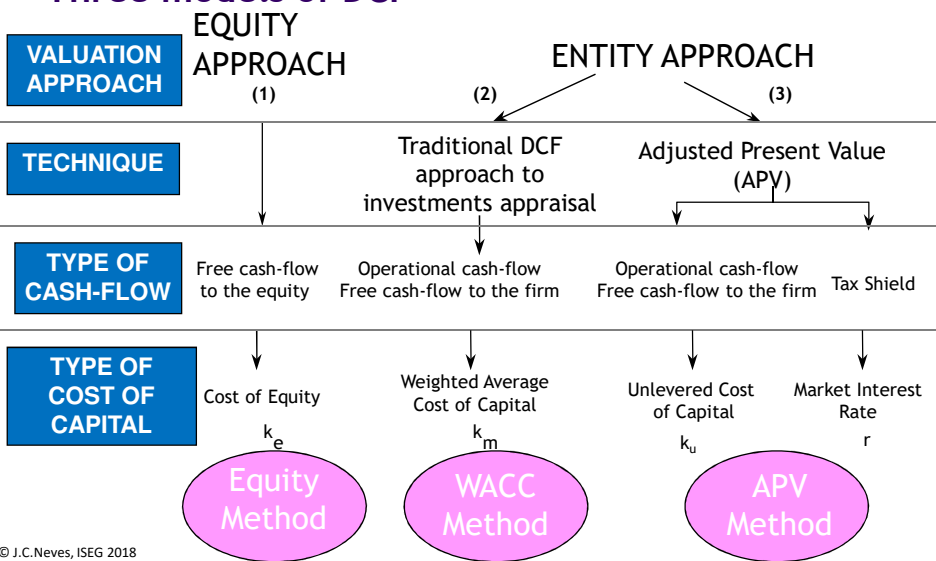
$$V_0 = \sum_{i=0}^n \frac{CF_i}{(1+k)^i} = \sum_{i=0}^T \frac{CF_i}{(1+k)^i} + \frac{TV_T}{(1+k)^T}$$



- $V_0$  – Present value of future cash flows
- $CF_i$  – cash flow for year  $i$  (**definition of cash flow?**)
- $k$  – Cost of capital adjusted to risk (**definition of cost of capital?**)
- $TV_T$  – Terminal value, (residual or de continuing) at year  $T$
- $T$  – Last year of annual forecast

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## Three models of DCF



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## Agenda for learning about DCF valuations

- Cost of capital
  - Cost of equity
  - Cost of debt
  - Cost of preferred equity
  - Weighted average cost of capital (WACC)
  - Unlevered cost of capital
- Types of cash flow
  - Free cash flow to the equity
  - Free cash flow to the firm (Net operational cash flow)
- Terminal value approaches
- DCF methods
  - The equity method
  - WACC method
  - APV method
- Other complex situations

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## 1. Cost of capital

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## Types of cost of capital

- Cost of equity ( $k_e$ )
- Cost of debt ( $k_d$ )
- Cost of preferred capital ( $k_p$ )
- WACC ( $k_m$ )
- Unlevered cost of capital ( $k_u$ )



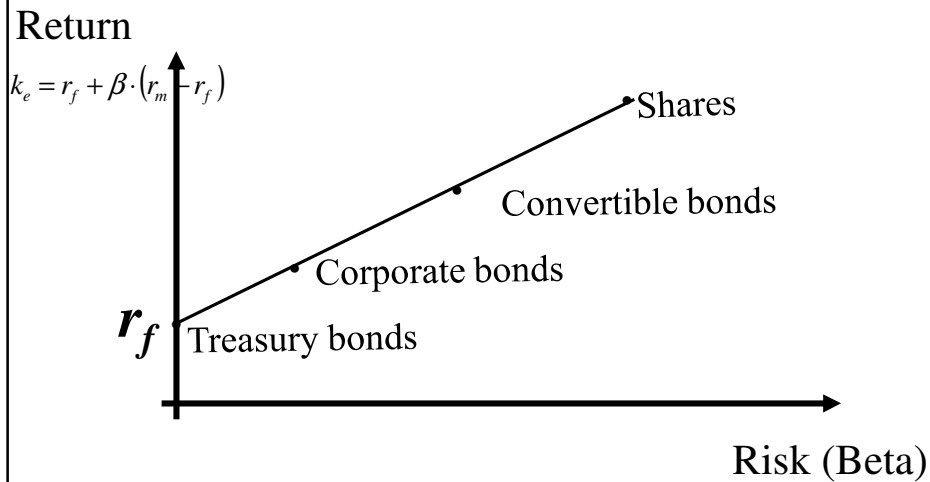
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### i. Cost of equity ( $k_e$ )

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## Financial markets (CAPM - Capital Asset Pricing Model)



## Models to estimate the cost of equity

- **Historical based**
  - CAPM
  - CAPM 2º moment
  - D-CAPM
  - Merton
  - APM - Arbitrage Pricing Model
  - Multifactors (Fama e French)
  - Regression
- **Accounting Approach**
  - Modigliani e Miller
  - Covariance of operational income
  - Covariance of sales
- **Implicit prices using options models**
  - Shares (Hsia)
  - Options on shares (McNulty)
- **Implicit prices using discounting models**
  - Models of Gordon, Malkiel, H
  - EVA Model
  - DCF
- **Compound betas**
  - Leverage effect
  - Conservation of risk
  - Simultaneous equations
  - Regression of Business Units

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## Most commonly used models to estimate the cost of equity (ke)

\* CAPM

$$k_e = r_f + \beta(r_m - r_f)$$

$r_f$  = Risk free rate of return  
 $\beta$  = Beta  
 $r_m$  = Market return  
 $r_m - r_f$  = Market risk premium

\* THE GORDON MODEL

$$k_e = \frac{d_1}{P_0} + g$$

$d_1$  = Dividend per share year 1  
 $P_0$  = Share price year 0  
 $g$  = Growth rate in the long term

\* THE MODIGLIANI & MILLER (M&M) MODEL

$$k_e = k_u + (k_u - k_d) \times \frac{D}{E} \times (1 - t)$$

$k_u$  - Unlevered cost of capital  
 $D$  - Debt  
 $E$  - Equity  
 $t$  - Corporate income tax rate

\* INTUITIVE MODELS

$$k_e = k_d + \rho$$

$k_d$  = Cost of debt

$$k_e = r_f + \eta$$

$\rho$  = Risk premium over debt

$\eta$  = Risk premium over Treasury Bonds

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## CAPM - A standard in the market

$$r_e = r_f + \beta(r_m - r_f)$$

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## Choosing the CAPM variables!

- Risk free rate
  - Which rate to choose?
  - Stationary or variable?
- Market risk premium
  - Stationary or variable?
- Betas
  - Raw data, adjusted for market conditions, adjusted for trends?
- Cost of equity
  - Stationary or variable?
  - Nominal terms or real terms (constant)?

$$r_e = r_f + \beta \cdot (r_m - r_f)$$

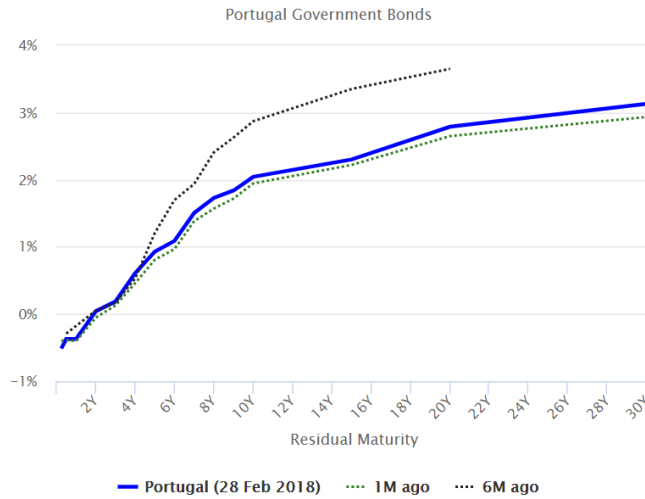
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## Risk free rate

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## Yield Curve (Treasury Bonds Portuguese Government)



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Source: <http://www.worldgovernmentbonds.com/country/portugal/>

## Yield curve (Treasury Bonds) Portugal

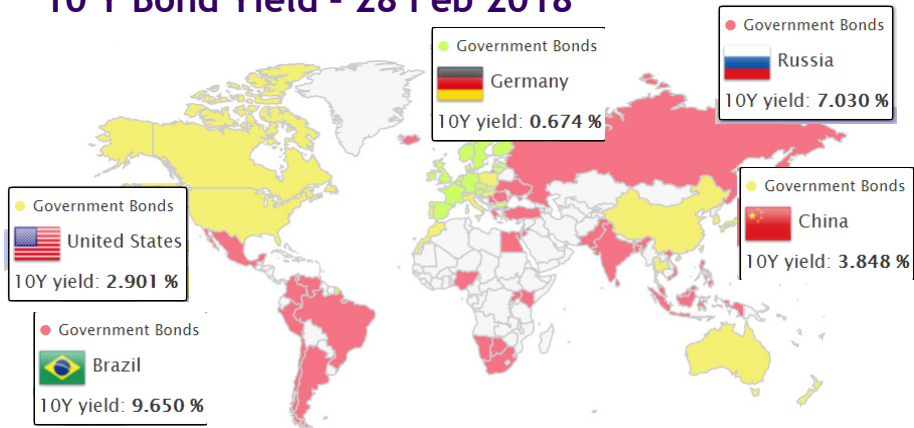


Source: Reuters - Euribor until 1 yr maturity; Portuguese Treasury Bonds for longer maturities

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## 10 Y Bond Yield - 28 Feb 2018



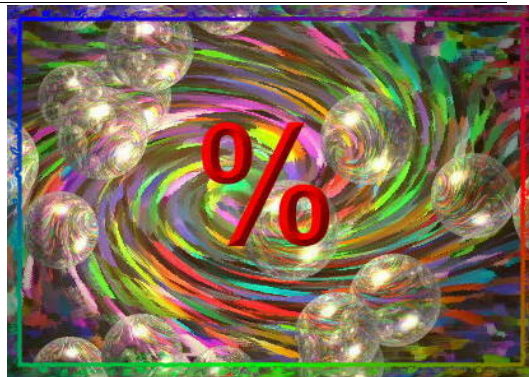
<http://www.worldgovernmentbonds.com/>

null © Natural Earth

Last Update: 28 Feb 2018 6:15 GMT+2

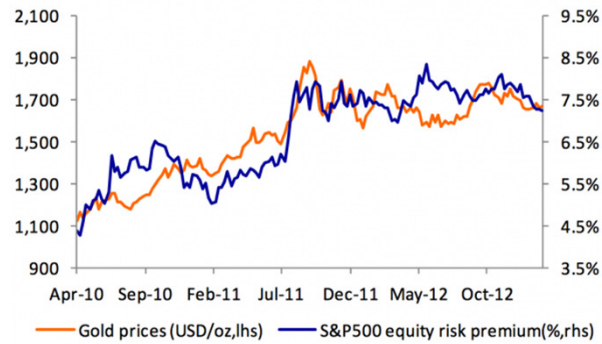
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## Market risk premium ( $R_m - R_f$ )



## Historical (naïve) equity risk premium is non-stationary

**Figure 1: Gold price vs US equity risk premium**



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## Historical Risk Premium (USA)

Period	Market Return	10 Y Gbonds	Risk Premium
1928-2017	9,65%	4,88%	4,77%
1968-2017	10,05%	6,76%	3,29%
2008-2017	8,42%	3,86%	4,56%

Source: Reuters

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## Standard error of equity risk premium against the number of years

<i>Estimation Period</i>	<i>Standard Error of Risk Premium Estimate</i>
5 years	$20\% / \sqrt{5} = 8.94\%$
10 years	$20\% / \sqrt{10} = 6.32\%$
25 years	$20\% / \sqrt{25} = 4.00\%$
50 years	$20\% / \sqrt{50} = 2.83\%$
80 years	$20\% / \sqrt{80} = 2.23\%$

The longer the series is, the smaller the standard error

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## Equity risk premium varies across countries

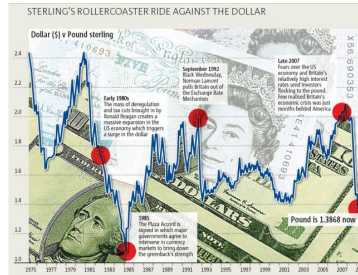
**TABLE 3**  
Equity Premium for Selected Countries

Country	Period	Mean real return		
		Market index (%)	Relatively riskless security (%)	Equity premium (%)
United Kingdom	1900-2005	7.4	1.3	6.1
Japan	1900-2005	9.3	-0.5	9.8
Germany	1900-2005	8.2	-0.9	9.1
France	1900-2005	6.1	-3.2	9.3
Sweden	1900-2005	10.1	2.1	8.0
Australia	1900-2005	9.2	0.7	8.5
India	1991-2004	12.6	1.3	11.3

Source: Dimson et al. (2002) and Mehra (2007) for India.

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# The country risk affects the equity risk premium



## How to measure country risk: 1 - Sovereign ratings

### Long-term sovereign debt ratings

Outlook: p= positive; s= stable; n= negative;  
CWn= credit watch negative

Country	Ratings Agency						Investment Grade Ratings
	Moody's		S&P		Fitch		
Britain	Aa1	s	AAA	s	AAA	n	Aaa/AAA Minimal risk
U.S.A.	Aaa	n	AA+	n	AAA	n	
Japan	Aa3	s	AA-	n	A+	n	
<b>Euro zone</b>							
Finland	Aaa	s	AAA	s	AAA	s	Aa/AA Very low
Germany	Aaa	n	AAA	s	AAA	s	
Luxembourg	Aaa	n	AAA	s	AAA	s	A/A Low risk
Netherlands	Aaa	n	AAA	n	AAA	s	
Austria	Aaa	n	AA+	s	AAA	s	Baa/BBB Moderate risk
France	Aa1	n	AA+	n	AAA	n	
Belgium	Aa3	n	AA	n	AA	s	
Estonia	A1	s	AA-	s	A+	s	Ba/BB Substantial risk
Slovakia	A2	s	A	s	A+	s	
Malta	A3	s	BBB+	s	A+	s	
Slovenia	Baa2	s	A	CWn	A-	n	B/B High risk
Italy	Baa2	n	BBB+	n	A-	n	
Spain	Baa3	n	BBB-	n	BBB	n	Caa/CCC Very high
Ireland	Ba1	n	BBB+	n	BBB+	s	
Portugal	Ba3	n	BB	n	BB+	n	SD/RD Selective Default Restricted Default
Cyprus	Caa3	n	CCC+	n	B	n	
Greece	C	s	B-	s	CCC	s	

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Sources: Moody's, Standard & Poor's, Fitch

Staff: 24.07.2013

BEUTERS

## How to measure country risk: 2 - Country Risk Scores (0 a 100)

- The PRS Group
  - Political Risk Services
- ICRG
  - International Country Risk Guide
- The Economist

**Economist.com rankings**

**Country risk**  
Selected countries and territories, July 2008 (except where noted)

Least risky		Most risky	
Rank	Score*	Rank	Score
1	Switzerland †	120	Zimbabwe
2	Finland	119	Iraq
	Norway	118	Sudan
	Sweden **	117	Myanmar
5	Austria ††	116	Jamaica
6	Canada	115	Nicaragua
	Denmark †	114	Cuba
8	Germany **		Kenya
	Netherlands §	112	Cambodia
10	France **		Ecuador
11	Belgium **	110	Vietnam
	Singapore	109	Côte d'Ivoire
13	Hong Kong		Syria
	Japan	107	Lebanon
	Britain #		Venezuela

\*Out of 100, with higher numbers indicating more risk. Scores are based on indicators from three categories: currency risk, sovereign debt risk and banking risk.  
 † May 2008; \*\* June 2008; †† January 2008; § February 2008; # March 2008  
 Source: Economist Intelligence Unit

PS: Scores are not linear

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## How to measure country risk: 3 - Market data

- Bond default spread
  - Treasury bond of emergent country - Treasury bond of stable country
- Credit Default Swap Spreads
  - A credit default swap (CDS) is a financial swap agreement that the seller of the CDS will compensate the buyer in the event of a loan default or other credit event.
- Relative volatility of markets
  - volatilidade of emergent country / volatilidade of stable country

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## Risk premium based on “Bond Default Spread”

Equity risk premium = Equity risk premium in USA + Emergent country risk premium  
(4,79%) ( ? )

$$CRP = CDS \frac{\sigma_e}{\sigma_T}$$

CRP= Country Risk Premium  
CDS = Country Default Spread  
= Treasury Yield of Emergent Country – USA Treasury Yield  
 $\sigma_e$  = Standard deviation of shares  
 $\sigma_T$  = Standard deviation of Treasury Bonds

**India Example from Damodaran, The Dark Side of Valuation, p. 68:**

$$CRP = 3\% \times \frac{31,82\%}{14,90\%} = 6,43\%$$

$$ERP = ERP_{USA} + CRP_{Emergent} = 4,79\% + 6,43\% = 11,22\%$$

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## Equity risk premium based on “relative volatility of markets”

$$ERP_{Emergent} = ERP_{USA} \frac{\sigma_{Emergent}}{\sigma_{USA}}$$

$ERP_{Emergent}$  = Equity risk premium of emergent market  
 $ERP_{USA}$  = Equity risk premium of USA  
 $\sigma_{Emergent}$  = Standard deviation of shares in the emergent country  
 $\sigma_{USA}$  = Standard deviation of shares in USA or equivalent country

**Brasil example:**

$$ERP_{Brasil} = 4,79\% \times \frac{25,83\%}{15,27\%} = 8,1\%$$

$$CRP = 8,1\% - 4,79\% = 3,31\%$$

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## Betas

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### CAPM and Market Model

- CAPM

$$r_e = r_f + \beta \cdot (r_m - r_f)$$

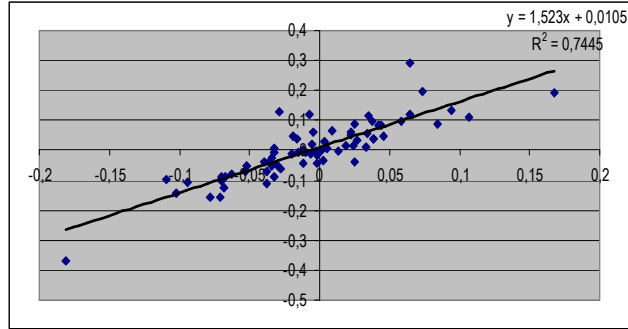
$$r_e - r_f = \beta \cdot (r_m - r_f)$$

- Market Model (used by Bloomberg)

$$r_e = a + b \cdot r_m$$

- Bloomberg, Datastream, Reuters, etc.

## Market model applied to Portugal Telecom



Regression Statistics	
Multiple R	0,8628
R Square	0,7445
Adjusted R Square	0,74073
Standard Error	0,049797
Observations	70

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	0,491323	0,491323	198,132	7,91E-22
Residual	68	0,168625	0,00248		
Total	69	0,659947			

	Coefficient	Standard Err.	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0,0105	0,005988	1,759343	0,083017	0,001414	0,022483098
X Variable 1	1,523	0,108201	14,07594	7,91E-22	1,307118	1,73894096

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## Levered betas and unlevered betas

$$\beta_E = \beta_u \left( 1 + \frac{D}{E}(1-t) \right)$$

Industry	Number of firms	Beta	Market D/E	Tax rate	Unlevered Beta
Advertising	38	1,02	69,06%	30,60%	0,69
Aerospace and Defense	27	1,02	36,89%	20,49%	0,79
Agricultural Products	33	0,82	63,38%	15,71%	0,53
...	...	...	...	...	...
Tires and Rubber	5	1,37	147,21%	32,84%	0,69
Tobacco	4	0,58	53,27%	24,63%	0,41
Trading Companies and Distributors	49	1,19	158,87%	25,88%	0,55
Trucking	16	0,93	142,43%	17,08%	0,43
Water Utilities	12	0,60	137,38%	39,13%	0,33
Wireless Telecommunication Services	11	1,00	45,26%	25,30%	0,75
<b>Grand Total</b>	<b>4167</b>	<b>1,04</b>	<b>85,33%</b>	<b>20,93%</b>	<b>0,80</b>

Source: <http://pages.stern.nyu.edu/~adamodar/>

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## ii. Cost of debt (kd)

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### Cost of debt Ranked by best practice

- The company has bonds quoted:
  - Use the yield to maturity
- The company has a rating but no bond is quoted:
  - Use yield to maturity of identical risk bonds
- No bonds are quoted and no rating:
  - Interest rate of next loan
  - Interest rate of most recent loan
  - Estimate a synthetic rating base on Times interest earning
  - Average cost of debt

## Reuters corporate default spreads 2013

Rating	1 yr	2 yr	3 yr	5 yr	7 yr	10 yr	30 yr
Aaa/AAA	14	16	27	40	56	68	90
Aa1/AA+	22	30	31	48	64	77	99
Aa2/AA	24	37	39	54	67	80	103
Aa3/AA-	25	39	40	58	71	81	109
A1/A+	43	48	52	65	79	93	117
A2/A	46	51	54	67	81	95	121
A3/A-	50	54	57	72	84	98	124
Baa1/BBB+	62	72	80	92	121	141	170
Baa2/BBB	65	80	88	97	128	151	177
Baa3/BBB-	72	85	90	102	134	159	183
Ba1/BB+	185	195	205	215	235	255	275
Ba2/BB	195	205	215	225	245	265	285
Ba3/BB-	205	215	225	235	255	275	295
B1/B+	265	275	285	315	355	395	445
B2/B	275	285	295	325	365	405	455
B3/B-	285	295	305	335	375	415	465
Caa/CCC+	450	460	470	495	505	515	545
US Treasury Yield	4.74	4.71	4.68	4.63	4.60	4.59	4.56

Spread values represent basis points (bps) over a US Treasury security of the same maturity, or the closest matching maturity.

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## Rating and interest coverage ratio

For smaller non-financial service companies  
(market cap < \$ 5 billion)

<i>If interest coverage ratio is</i>			
<b>greater than</b>	<b>≤ to</b>	<b>Rating is</b>	<b>Spread is</b>
12.5	100000	Aaa/AAA	0.75%
9.5	12.499999	Aa2/AA	1.00%
7.5	9.499999	A1/A+	1.10%
6	7.499999	A2/A	1.25%
4.5	5.999999	A3/A-	1.75%
4	4.499999	Baa2/BBB	2.25%
3.5	3.999999	Ba1/BB+	3.25%
3	3.499999	Ba2/BB	4.25%
2.5	2.999999	B1/B+	5.50%
2	2.499999	B2/B	6.50%
1.5	1.999999	B3/B-	7.50%
1.25	1.499999	Caa/CCC	9.00%
0.8	1.249999	Ca2/CC	12.00%
0.5	0.799999	C2/C	16.00%
-100000	0.499999	D2/D	20.00%

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Source: Damodaran, 2016

### iii. Cost of preferred equity (kp)

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#### Cost of preferred shares

- No growth of dividends:
  - = dividends/Price
- Constant growth of dividends:
  - = (Dividends/Price) + g
- If there are special rights
  - Use the options theory

## Hibrid securities

- Decompose the security into equity and debt

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## iv. Weighed average cost of capital (km)

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## Weighted average cost of capital ( $k_m$ )

$$k_m = k_c \frac{E}{C} + k_p \frac{E_p}{C} + k_d \frac{D}{C} (1-t)$$

$$k_m = k_u \cdot \left(1 - t \frac{D}{C}\right)$$

E – Equity based on ordinary shares  
E<sub>p</sub> – Equity based on preferred shares  
D – Debt  
C = Invested Capital = E+E<sub>p</sub>+D  
t = Tax rate

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## v. Unlevered cost of capital ( $k_u$ )

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## Unlevered cost of capital (k<sub>u</sub>)

- CAPM

$$k_u = r_f + \beta_u (r_m - r_f)$$

- MODIGLIANI & MILLER

$$k_u = \frac{k_m}{1 - t \times \frac{D}{D + E}}$$

Hamada Formula:

$$\beta_u = \frac{\beta_e + \beta_D \left(\frac{D}{E}\right)}{1 + \frac{D}{E}(1-t)}$$

Hamada Formula Simplified:

$$\beta_u = \frac{\beta_E}{1 + \frac{D}{E}(1-t)}$$

$$k_u = \frac{k_e + \frac{D}{E} k_d (1-t)}{1 + \frac{D}{E}(1-t)}$$

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## 2. Types of cash flows

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## Free cash flow ou Free cash flow to the equity

- + Net profit
- + Amortizations & Depretiations
- + Provisions
- + Impairments
- +/- Regularizations
- Increase of working capital requirements
- Capex
- + New loans
- Payment of loans

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## Operational cash flow or Free cash flow to the firm

- + Operational income
- Tax on operational income
- = NOPAT (Net Operating Profit After Taxes)
- + Amortization and depreciation
- + Provisions
- + Impairment
- +/- Regularizations
- Increase of working capital requirements
- Capex

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### 3. Methods to estimate terminal value

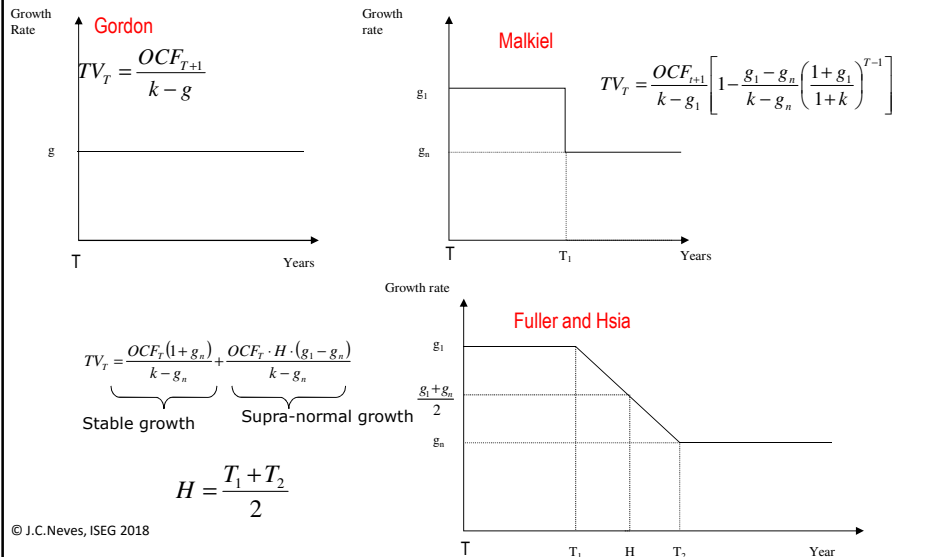
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#### Methods to estimate terminal value

- Discounted cash flow models
  - No growth model
  - Constant growth model (Gordon)
  - Two phases of constant growth model (Malkiel)
  - Three phases of constant growth model (H of Fuller and Hsia)
- Relative valuation
- Cost approach



## Terminal value: DCF Models



## Cautions

- Terminal may represent 60% to 80% of company value or more
- Failure to estimate terminal value implies incorrect valuation
- Cash flows for terminal value valuation must be normalized;
- Careful with the estimation of working capital requirements (WCR) and Capex in the cash flow of the perpetuity;
- Growth rate: Real growth + inflation for nominal cash flows
- Se  $g > \text{inflation}$  implies a continuing investment in capex and WCR

## 4. DCF Methods

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### i. Equity method

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## Equity method

$$V_E = \sum_{i=1}^n \frac{FCFE_i}{(1+k_e)^i} = \sum_{i=1}^T \frac{FCFE_i}{(1+k_e)^i} + \frac{TV_T}{(1+k_e)^T}$$

$V_E$  – Equity Value

$FCFE_i$  – Free cash flow to Equity for year i

$k_e$  – Cost of equity

$TV_T$  – Terminal value in year T

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## ii. WACC method

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## WACC method

$$V_E = \sum_{i=1}^T \frac{FCFF_i}{(1+k_m)^i} + \frac{TV_T}{(1+k_m)^T} + VNOA - D_0$$

FCFF<sub>i</sub> – Free cash flow to the firm in year i

k<sub>m</sub> - WACC

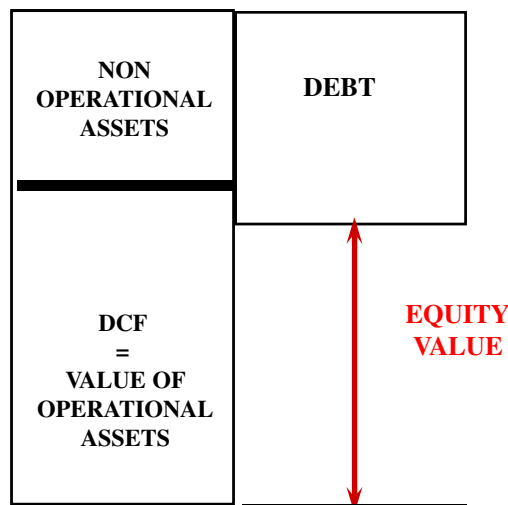
D<sub>0</sub> - Debt in year 0

TV<sub>T</sub> – Terminal value in year T

VNOA – Value of non operational assets (cash & others)

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## WACC method



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### iii. APV - Adjusted Present Value

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#### Adjusted Present Value

$$V_E = \sum_{i=1}^T \frac{FCFF_i}{(1+k_u)^i} + \frac{TV_T}{(1+k_u)^T} + VCD + VNOA - D_0$$

$FCFF_i$  – Free cash flow to the firm in year  $i$

$k_u$  – Unlevered cost of capital

$TV_T$  – Terminal value in year  $T$

$VCD$  – Value created by Debt

$VNOA$  – Value of non operational assets

$D_0$  – Debt at present

## Value created by debt

GERAL FORMULA:

$$VCD = L_0 - \sum_{i=1}^n \frac{FE_i(1-t) + LP_i}{(1+r)^i}$$

IF  $k_d=r$  :

$$VCD = \sum_{i=1}^n \frac{FE_i \times t}{(1+r)^i} = \sum_{i=1}^T \frac{FE_i \times t}{(1+r)^i} + \frac{TVCD_T}{(1+r)^T}$$

VCD - Value created by debt

$FE_i$  - Financial expenses in year  $i$

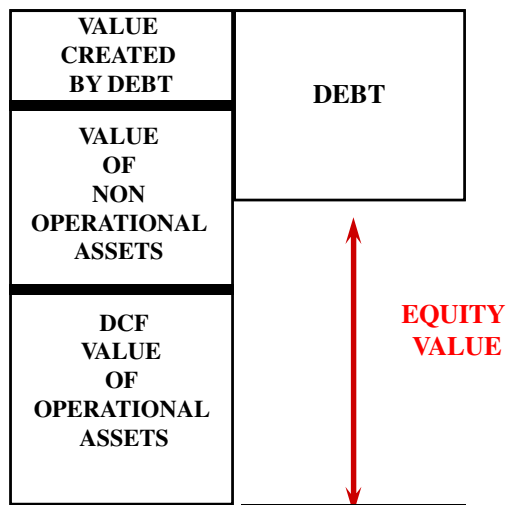
$t$  - tax rate

$r$  - market interest rate

$k_d$  - Company interest rate

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## APV method



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## 5. More complex cases

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### More complex cases

- Large variance in the capital structure
- Continuing negative cash flows
- Assets that do not generate cash flows
- Banruptcy risk
- High correlation with the economic cycle
- Existence of options

## One example

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See the example in the platform

## Working Groups

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**Case study:**

Valuation of a Company

**Steps to conduct the valuation project:**

- 1) Industry analysis and competitiveness
- 2) Financial statement analysis
- 3) Assumptions for future
- 4) Forecast of financial statements and cash flow
- 5) Apply a DCF model and estimate intrinsic value
- 6) Develop a sensitivity analysis
- 7) Use relative valuation
- 8) Conclusion