Chp 6. EQUITY VALUATION
RETURN CONCEPTS

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Ranking 2020

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1 Cost of Equity

EQUITY VALUATION

COST OF EQUITY

CAPM Model

$$\mathbf{r_i = RFR + \beta_i^{mkt} MRP} \quad , \quad \text{in which } \mathrm{MRP} = \mathrm{E(R_m)} - \mathrm{RFR}$$

Assumptions:

- Investors are risk averse
- Investment is based on mean-variance optimization
- Relevant risk is systematic

Include a CRP (**country risk premium**)? It is no longer a 'pure' CAPM model!

$$\mathrm{r_i} = \mathrm{RFR} + \mathbf{CRP} + \beta_i^{\mathrm{mkt}}(\mathrm{MRP})$$

or

$$\mathrm{r_i} = \mathrm{RFR} + \beta_i^{\mathrm{mkt}}(\mathrm{MRP} + \mathbf{CRP})$$

COST OF EQUITY

CAPM Model

Which RFR?

(US, Germany, Portugal, etc.)

How to estimate the β?

Sources of data?

How to estimate the MRP / ERP?

Sources of data?

Different MRP for different segments?

	EU E&C	EU E&S
COST OF EQUITY		
Risk Free Rate	4.05%	4.12%
Beta (β)	1.46	1.35
MRP	7.42%	7.43%
Re	**14.87%**	**14.13%**
COST OF DEBT		
Cost of Debt	6.82%	6.82%
Tax Rate	30.00%	30.00%
After-tax Rd	**4.77%**	**4.77%**

	Africa	LATAM
COST OF EQUITY		
Risk Free Rate	10.00%	7.50%
Beta (β)	2.12	1.85
MRP	6.31%	5.84%
Re	**23.40%**	**18.29%**
COST OF DEBT		
Cost of Debt	6.82%	6.82%
Tax Rate	30.00%	30.00%
After-tax Rd	**4.77%**	**4.77%**

COST OF EQUITY

CAPM Model

Data requirements	Considerations
Risk-free rate (R_f)	Use **long-term** default-free government denominated bonds in the same currency as cash flows.
Company's beta (β)	Use **market data** or lever the **company's industry beta** to company's target D/V ratio.
Market risk premium ($R_m - R_f$)	The market risk premium is difficult to measure. Various models point to a risk premium between 4.5% and 5.5%, but varies significantly per country.

COST OF EQUITY

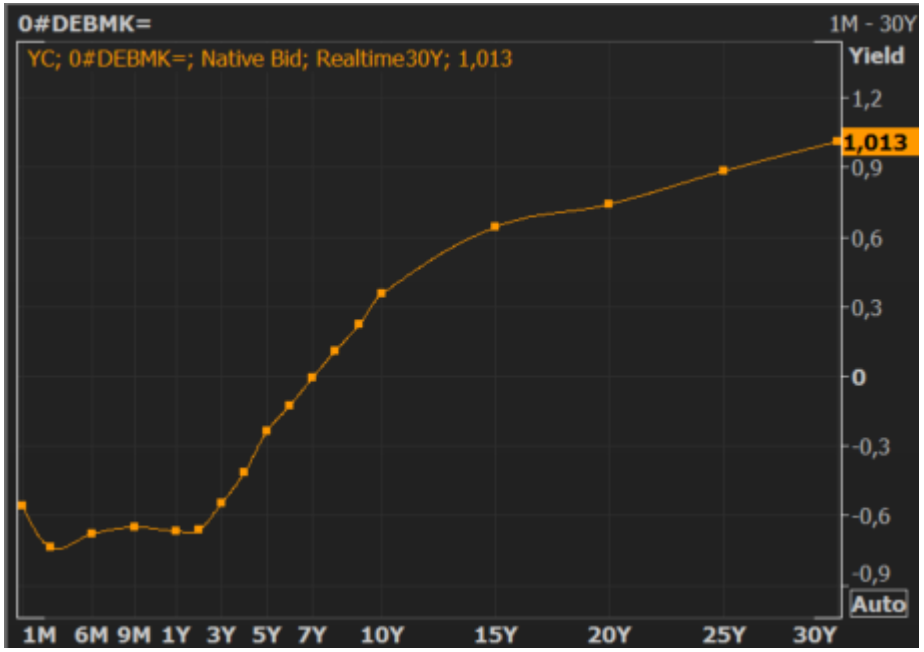
CAPM Model

Estimating the Risk-Free Rate

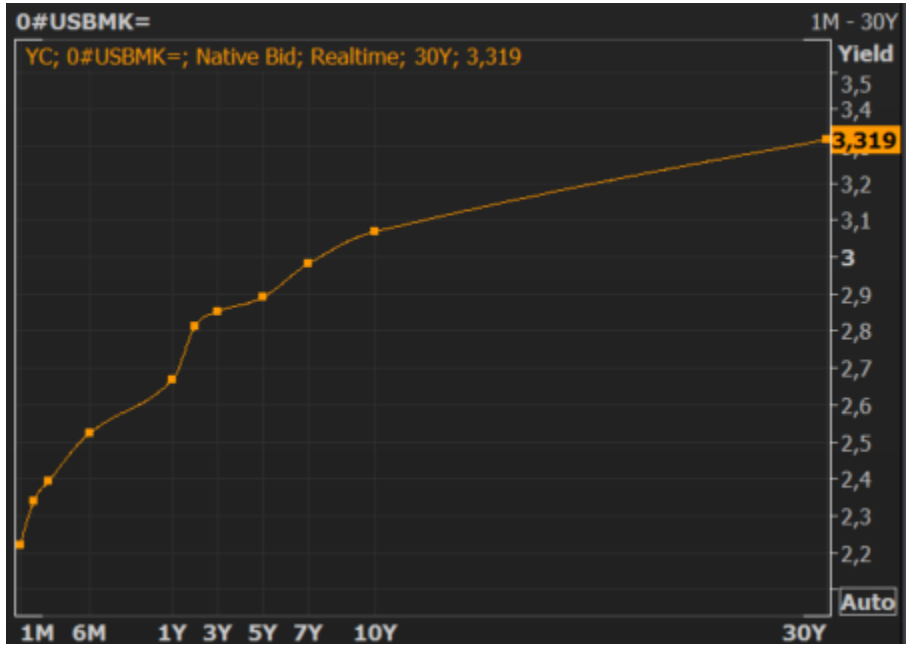
Ideally, discount each cash flow using a government bond with the same maturity.

For simplicity, the 10-year government bonds can be used.

German Government Benchmark Yield Curve



United States Government Benchmark Yield Curve



COST OF EQUITY

CAPM Model

Risk Free Rate Use yields on long-term riskless bonds

Benchmark: **German Bund (10y)**

The yield curve has been reshaping recently, thus yields on 10y Bonds are not appropriate

(**-0.707%** - August 31st, 2019)

Normalize the data using the 10-year monthly average (**1.209%**)

Source: Thomson Reuters Eikon (historical monthly yield of German Bund 10y)

COST OF EQUITY

CAPM Model

Risk Free Rate

The benchmark for the 30y German Bund is also negative

(**-0.218%** - August 31st, 2019)

Source: Thomson Reuters Eikon (historical monthly yield of German Bund 30y)

COST OF EQUITY

CAPM Model

Estimating the Beta

Method A)

Pure-play method: especially for thinly traded stocks or for non-public companies.

$$\beta_L = \beta_U \times \left[1 + \frac{D}{E} \times (1 - t)\right]$$

Exercise: Estimate the β_L for BWM AG

- Data from peers (e.g., Bloomberg, Reuters)
- Data from the industry (e.g., Damodaran http://pages.stern.nyu.edu/~adamodar/)

COST OF EQUITY

CAPM Model

Estimating the Beta

Identifier	Company Name	Beta	Total Debt (2017YE, usd)	Company Market Cap (usd)	WACC Tax Rate, (%) - for Rd	Effective Tax Rate, (%) (2017YE)	β_U
BMWG.DE	Bayerische Motoren Werke AG	1.31	113,539,904,751.62	54,936,363,926.35	30.7%	18.3%	0.54
7203.T	Toyota Motor Corp	1.14	182,077,583,286.28	194,753,457,915.09	29.4%	19.2%	0.69
VOWG_p.DE	Volkswagen AG	1.49	196,101,294,370.27	82,197,444,066.00	25.7%	16.4%	0.54
DAIGn.DE	Daimler AG	1.43	152,498,170,607.36	60,983,760,390.78	28.3%	24.0%	0.51
TSLA.OQ	Tesla Inc	0.58	10,314,938,000.00	59,675,421,984.75	28.9%		0.51
7267.T	Honda Motor Co Ltd	1.27	64,549,360,060.23	50,959,502,482.50	30.3%	-1.2%	0.67
GM.N	General Motors Co	1.27	94,219,000,000.00	49,526,153,481.97	28.9%	35.7%	0.54
F.N	Ford Motor Co	0.71	154,287,000,000.00	36,039,804,668.10	22.3%	11.3%	0.16
7201.T	Nissan Motor Co Ltd	1.15	72,824,731,789.95	35,655,179,109.46	27.9%	-7.4%	0.46
FCHA.MI	Fiat Chrysler Automobiles NV	1.44	21,558,042,729.81	24,842,903,042.52	21.7%	43.0%	0.86
7269.T	Suzuki Motor Corp	1.04	5,438,641,069.08	23,256,546,143.59	34.0%	28.3%	0.90
005380.KS	Hyundai Motor Co	1.25	67,519,275,673.55	22,068,618,691.49	23.4%	-2.4%	0.37
PEUP.PA	Peugeot SA	1.64	9,252,528,160.65	20,064,352,442.77	25.5%	24.6%	1.22
RENA.PA	Renault SA	1.48	59,849,330,022.43	19,762,452,901.37	20.2%	14.6%	0.43
7270.T	Subaru Corp	1.30	811,236,589.50	17,435,291,025.62	29.5%	25.4%	1.25
000270.KS	Kia Motors Corp	1.18	8,208,196,029.52	10,196,958,916.37	20.0%	15.1%	0.72
						Mean	0.66
						Median	**0.54**

$$\beta_L = 0.54 \times \left[1 + \frac{113{,}540}{54{,}936} \times (1 - 0.307)\right] = \mathbf{1.309}$$

COST OF EQUITY

CAPM Model

Estimating the Beta

Industry Name	Number of firms	Beta	D/E Ratio	Effective Tax rate	Unlevered beta	Cash/Firm value	Unlevered beta corrected for cash	HiLo Risk	Standard deviation of equity	Standard deviation in operating income (last 10 years)
Auto & Truck	18	1.2	148.09%	8.15%	0.56	4.88%	0.59	0.6051	38.59%	209.62%

Last Updated in January 2018

By Aswath Damodaran

Damodaran's approach corrects for cash:

$$\beta_{U\,\text{cash adj.}} = \frac{\beta_U}{\left(1 - \frac{\text{Cash}}{\text{Firm Value}}\right)} = \frac{0.56}{(1 - 0.0488)} = 0.59$$

The intuition is that cash has no risk, therefore the beta for the cash is zero

$$\beta_L = 0.59 \times \left[1 + \frac{113{,}540}{54{,}936} \times (1 - 0.307)\right] = \mathbf{1.441}$$

COST OF EQUITY

CAPM Model

Estimating the Beta

Method B)

Regression: return of a stock on the return of the market.

$$R_i = \alpha + \beta \times R_m + \varepsilon$$

The "raw" β may be adjusted for "drift" (Blume adjustment):

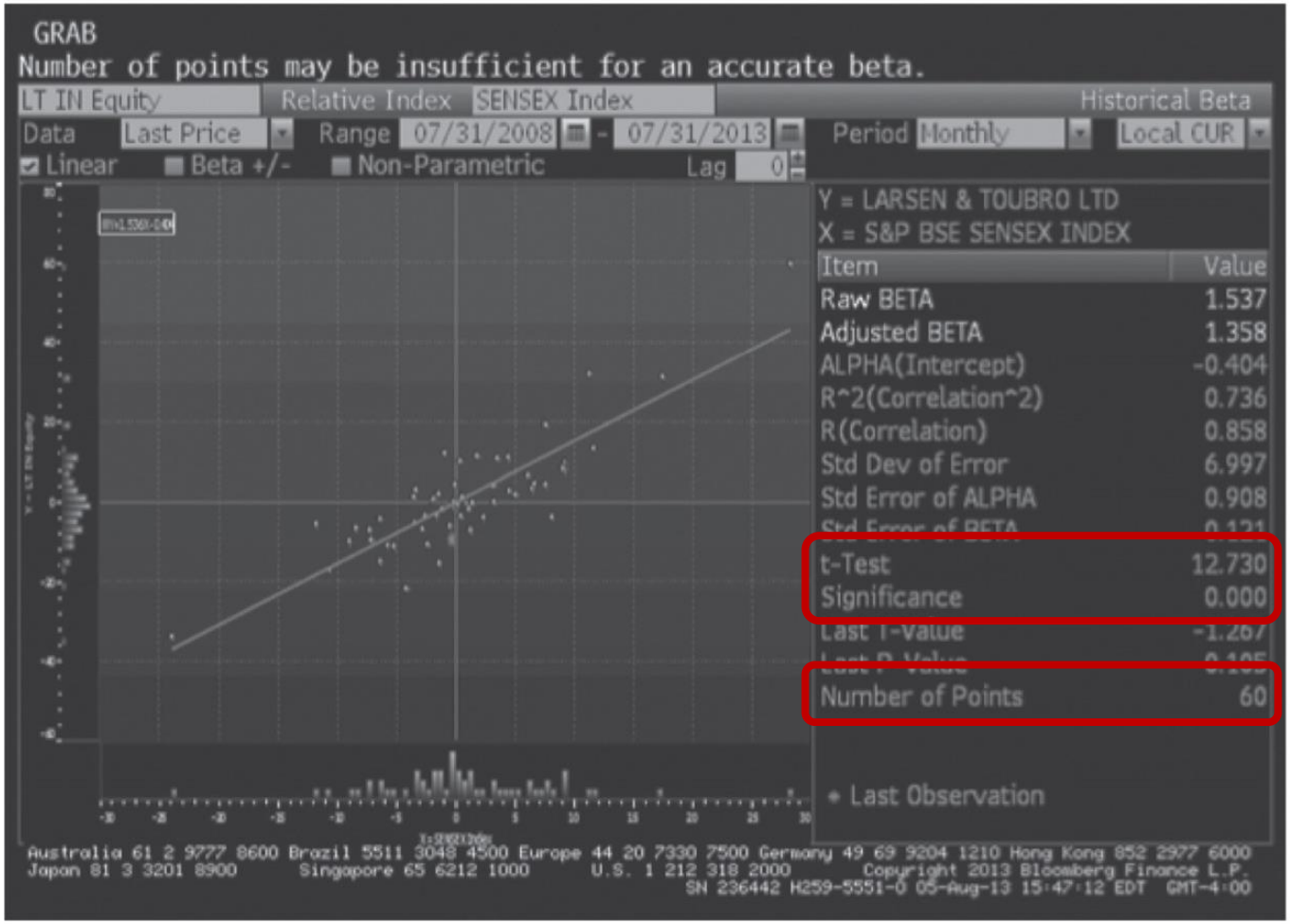
$$\beta_{adj} = \beta_{raw} \times (2/3) + 1.0 \times (1/3)$$

- Choice of **index**
- Choice of **length of data** period and **frequency of observations**: monthly data for 5 years (60 observations)

COST OF EQUITY

CAPM Model

Estimating the Beta



COST OF EQUITY

CAPM Model

Estimating the Beta

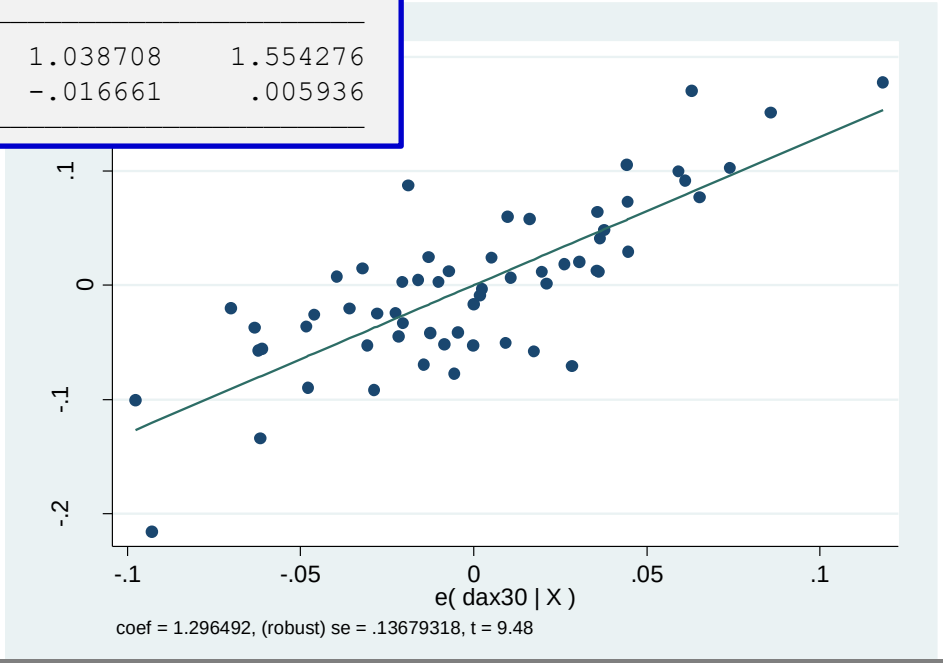
```
. reg bmw dax30

      Source |       SS           df       MS      Number of obs   =        60
-------------+----------------------------------   F(1, 58)        =    101.35
       Model |  .191322886         1  .191322886   Prob > F        =    0.0000
    Residual |  .109486776        58  .001887703   R-squared       =    0.6360
-------------+----------------------------------   Adj R-squared   =    0.6298
       Total |  .300809662        59  .005098469   Root MSE        =    .04345

------------------------------------------------------------------------------
         bmw |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       dax30 |    1.296492   .1287814    10.07   0.000     1.038708    1.554276
       _cons |   -.0053625   .0056444    -0.95   0.346     -.016661     .005936
------------------------------------------------------------------------------
```

$$\beta_{adj} = 1.29649 \times (2/3) + (1/3)$$

$$\beta_{adj} = \mathbf{1.198}$$



COST OF EQUITY

CAPM Model

Estimating MRP or ERP

Method A)

Survey: ask analysts, executives, regulators, etc.

Fernandez et al. (2019). *Market Risk Premium and Risk-Free Rate used for 69 Countries in 2019: A Survey.* (https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3358901)

Portugal = 7.5%

Germany = 5.7%

US = 5.6%

Method B)

Extrapolate from the past:

$$R_m = \frac{R_i - RFR}{\beta_i^{mkt}} + RFR$$

COST OF EQUITY

CAPM Model

Estimating MRP or ERP

Method C)

Supply side model: $(R_m - RFR)$

Estimate these parameters from historical data

- Use the **longest period** possible (e.g., 10 years);
- May be adjusted for **survivorship bias**;
- **Long-term government bond rate** (instead of short-term) is preferred as proxy for the RFR;
- **Geometric mean** (takes into account the compounding effect) is preferred to arithmetic mean.

COST OF EQUITY

CAPM Model

Estimating MRP or ERP

Method D)

Current financial ratios (regression) – dividend yield:

$$\mathbf{R_m} - \mathbf{R}_f = \alpha + \beta \ln\left(\frac{\mathbf{Dividend}}{\mathbf{Price}}\right) + \varepsilon$$

http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datacurrent.html

COST OF EQUITY

CAPM Model

Estimating MRP or ERP

Method E)

Macroeconomic Model (Ibbotson and Chen)**:**

$$\mathbf{ERP} = \left\{\left[(\mathbf{1} + \mathbf{E_{INF}})\left(\mathbf{1} + \mathbf{E_{g\ EPS}}\right)\left(\mathbf{1} + \mathbf{E_{g\ P/E}}\right) - \mathbf{1.0}\right] + \mathbf{E_{INC}}\right\} - \mathbf{E_{RFR}}$$

$$\text{ERP} = \{[(1 + \text{Inflation})(1 + \text{Growth EPS})(1 + \text{Growth P/E}) - 1] + \text{Increase in Earnings}\} - \text{RFR}$$

COST OF EQUITY

CAPM Model

Estimating MRP or ERP

Method F)

Gordon Growth Model for ERP:

$$\mathbf{ERP} = \mathbf{D}_{\mathbf{yield}_{\mathbf{F}}} + \mathbf{E}_{\mathbf{growth}_{\mathbf{F}}} - \mathbf{Bond}_{\mathbf{yield}_{\mathbf{0}}}$$

$\mathrm{D}_{\mathrm{yield}_{\mathrm{F}}}$: forecasted dividend on a market index

$\mathrm{E}_{\mathrm{growth}_{\mathrm{F}}}$: consensus long-term earnings growth

$\mathrm{Bond}_{\mathrm{yield}_{0}}$: long-term government bond yield

COST OF EQUITY

CAPM Model

Estimating the CRP

(weighted by 2018 sales: Germany 66%; France 23%; Spain 4%; Portugal 3%; Others 4%)

Method A) Historical adjusted default spread from Damodaran

Average CRP = **0.37%**

Method B) 10y Bond Yield in the last 5 years (monthly average)

Source: Thomson Reuters

Average Yield = 0.68% Benchmark (Germany) = 0.31%

Average CRP = **0.37%** (over benchmark)

COST OF EQUITY

Multifactor Models **(Alternative to the CAPM)**

Generally have higher explanatory power but are more complex and costly to implement

The Fama-French Model with Three-Factors (extension to the CAPM):

$$r_i = RFR + \beta_i^{mkt} MRP + \boldsymbol{\beta_i^{size}} \mathbf{SMB} + \boldsymbol{\beta_i^{value}} \mathbf{HML}$$

(based on portfolios)

β_i^{size}: the sensitivity of security i to movements in small stocks

SMB: the return to small stocks minus the return to large stocks

β_i^{value}: the sensitivity of security i to movements in value stocks

HML: the return to value stocks minus the return to growth stocks

http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/f-f_factors.html

COST OF EQUITY

Multifactor Models **(Alternative to the CAPM)**

The Pastor-Stambaugh Model (extension to the Fama-French Model):

$$r_i = RFR + \beta_i^{mkt} MRP + \beta_i^{size} SMB + \beta_i^{value} HML + \boldsymbol{\beta_i^{liquidity}} \mathbf{LIQ}$$

$\beta_i^{liquidity}$: the sensitivity of security i to movements in illiquid stocks

LIQ: the return to illiquid stocks minus the return to liquid stocks

The Carhart Four-Factor Model (extension to the Fama-French Model):

$$r_i = RFR + \beta_i^{mkt} MRP + \beta_i^{size} SMB + \beta_i^{value} HML + \boldsymbol{\beta_i^{momentum}} \mathbf{UMD}$$

$\beta_i^{liquidity}$: the sensitivity of security i to momentum

UMD: monthly premium on winners minus losers (momentum factor) – over 2-12 months

COST OF EQUITY

The Build-up Method (Alternative to the CAPM)

Very simple and can be applied to **privately held companies**, although it uses historical estimates, and these estimates may no longer be relevant

$$\text{Required Return} = \text{RFR} + (\text{Risk premium})_1 + (\text{Risk premium})_2 + \cdots + (\text{Risk premium})_k$$

Starts with RFR and adds premiums for different risks, but **does not use betas to adjust factor risk premiums**

$$r_i = \text{RFR} + \mathbf{ERP} + \mathbf{FSP} + \mathbf{IRP} + \mathbf{CSR}$$

FSP: firm size risk premium (proxy for bankruptcy risk)

IRP: industry risk premium (operational risk) – see Duff & Phelps (2017) in the syllabus.

CSR: firm-specific premium (e.g., dependence on a major customer – Porter's Five Forces)

Can include:

RRP (regulatory risk premiums), amongst others

COST OF EQUITY

The Build-up Method (Alternative to the CAPM)

Bond-yield plus risk premium approach:

$$\textbf{BYPRP}\ \text{cost of equity} = \text{YTM on company's long term debt} + \text{Risk premium}$$

Suitable if the company has publicly traded debt.

YTM already reflects:

(i) real interest rates;

(ii) inflation, and;

(iii) risk of default on debt.

COST OF EQUITY

Modigliani & Miller **(Alternative to the CAPM)**

M&M proposition II with taxes:

$$r_e = r_u + (r_u - r_d)\left(\frac{D}{E}\right)(1 - T_c)$$

Cost of equity increases with the level of risk, while the business risk (r_u) remains constant.

CAPM is an extension of the portfolio theory based n portfolio diversification and idiosyncratic risk minimization/elimination, while M&M is based on capital structure decisions/optimization.

We need the cost of a all-equity financed company (r_u) for the APV method.

COST OF EQUITY

Discounted Cash Flow Model **(Alternative to the CAPM)**

Gordon Growth Model for the r_e: rearranging the dividend discount model

$$r_e = \frac{\text{Dividend}}{\text{Price}} + g$$

$$r_e = \frac{\text{Earnings}\left(1 - \frac{g}{\text{ROE}}\right)}{\text{Price}} + g$$

Because CF to Equity (CF_e):

$$CF_e = \text{Earnings}\left(1 - \frac{g}{\text{ROE}}\right)$$

Limitation: do not account for share repurchases

COST OF EQUITY

Grinold Kroner Model (Alternative to the CAPM)

Grinold Kroner Model: is a restatement of the Gordon growth model that takes explicit account of repurchases

$$r_i = \underbrace{\frac{Div_1}{P_0} - \Delta S}_{\text{income return}} + \underbrace{i + g}_{\text{nominal earnings growth return}} + \underbrace{\Delta\left(\frac{P}{E}\right)}_{\text{repricing return}}$$

Div_1/P_0: the expected dividend yield

i: the expected inflation rate

g: the expected real total earnings growth rate (not identical do EPS)

ΔS: the expected percentage change in the number of shares outstanding

$\Delta P/E$: the per period percent change in the P/E multiple

2 Cost of Debt

EQUITY VALUATION

COST OF DEBT

Estimating the cost of debt

Look at the: $$\text{Interest Coverage Ratio} = \frac{\text{Operating Income}}{\text{Interest Expense}}$$

The ratio can be used to estimate synthetic ratings

(http://www.stern.nyu.edu/~adamodar/pc/ratings.xls)

Method A)

Interest rate: rate that the bank charges the firm, or:

$$r_d = \frac{\text{Interest Expense}}{\text{Debt}}$$

Method B)

YTM: yield to maturity of current debt

$$\text{Price} = \frac{\text{Coupon}_1}{(1+\text{YTM})^1} + \frac{\text{Coupon}_2}{(1+\text{YTM})^2} + \cdots + \frac{\text{Face} + \text{Coupon}_n}{(1+\text{YTM})^N}$$

COST OF DEBT

Estimating the cost of debt

Method C)

Credit spread:

$$r_d = \text{RFR} + \text{Credit Spread}$$

$$r_d = \text{Market yield on government bonds} + \text{Credit risk spread}$$

May extend to:

$$r_d = \text{RFR} + \text{Default Spread}_{\text{Country}} + \text{Default Spread}_{\text{Company}}$$

COST OF DEBT

Estimating the cost of debt

Method D)

Cost of net debt:

$$r_{d\ (net\ debt)} = \frac{r_{d_{gross\ debt}} \times Debt_{gross} - r_f \times Cash}{Debt_{gross} - Cash}$$

$$r_{d\ (net\ debt)} = \frac{7\% \times 800 - 3\% \times 200}{800 - 200} = 8.33\%$$

Debt = 800

Cash = 200

RFR = 3.0%

Rd = 7.0%

The 8.33% should be used in the valuation as the cost of debt.

Lenders will account for the firm's cash holdings when setting the cost of debt.

3 WACC

EQUITY VALUATION

WACC

WACC: Weighted Average Cost of Capital

$$D + E + PS = V$$

$$WACC = \frac{E}{V} \times r_e + \frac{D}{V} \times r_d \times (1 - T_c) + \frac{PS}{V} \times r_{ps}$$

Most companies only have common equity (E), although some may also issue preferred shares (PS)

Simplifying, the WACC represents the expected return on an *alternative* investment with identical risk.

Debt: use market values (e.g., traded bonds) when available and include all interest-bearing obligations (short-term as well as long-term).

WACC

WACC: Weighted Average Cost of Capital

Use **gross debt** or **net debt**? There is **no consensus**…different rationales apply.

Caveats of using net debt:

- Excess cash not used to pay debt (e.g., technological companies);
- Risk and yield for cash is different than for the debt;
- Taxes on interest paid are the same as taxes on interest received?;
- Cash holdings are volatile from one period to the other (e.g., changes in CAPEX);
- How to adjust from EV to P?
- Net debt can be negative (if so, use net debt = 0, and consider de excess cash as you would in using gross debt);
- Requires that cash balances increases as the firm value increases (maintain D/V).

Want to use gross Debt? Can account for CF's generated by cash & equivalents.

WACC

WACC: Weighted Average Cost of Capital

Use **gross debt** or **net debt**? There is **no consensus**…different rationales apply.

Options	Gross Debt	Net Debt
β_L	Unlevered beta is levered using **Gross D/E**	Unlevered beta is levered using **Net Debt/E**
Cost of Capital	D/V used is based on Gross Debt	D/V is used is based on Net Debt
Treatment of Cash and Debt	Cash is **added** to value of operating assets and Gross Debt is subtracted to get to equity value	Cash is **not added back** to operating assets and Gross Debt is subtracted to get to equity value

WACC

WACC: Weighted Average Cost of Capital

Tax rate: if the estimated effective tax rate is not sustainable and is instable, use the company's marginal income tax rate.

Weights: use market values and target weights (terminal period), instead of book value-weights for equity and debt.

Options	Forecasted Period	Terminal Period
Option A)	Target weights	Target weights
Option B)	Market values moving backwards	Target weights

WACC

WACC: Weighted Average Cost of Capital

Weights: use market values and target weights (terminal period), instead of book value-weights for equity and debt.

		2018	2019	2020	2021	2022	2023	2024
	FCFF	40,381	47,701	56,348	66,562	78,627	92,880	Terminal
	Re	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	
	Rd(1-t)	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
	EV	1,535,806	1,600,612	1,660,972	1,717,160	1,766,613	1,806,938	1,714,058
Forecasts:	**MV Debt**	907,869	949,506	1,010,337	1,025,759	1,049,865	1,067,166	
		59.1%	59.3%	60.8%	59.7%	59.4%	59.1%	
	WACC	7.04%	7.03%	6.96%	7.01%	7.03%	7.05%	
	Cash	76,806						
				# Shares	100,000			
	Equity	704,742		**Price**	7.05			

EV 2023

Move Backwards

Using target D/V

D/V target	60.0%
WACC target	7.00%
g	1.50%

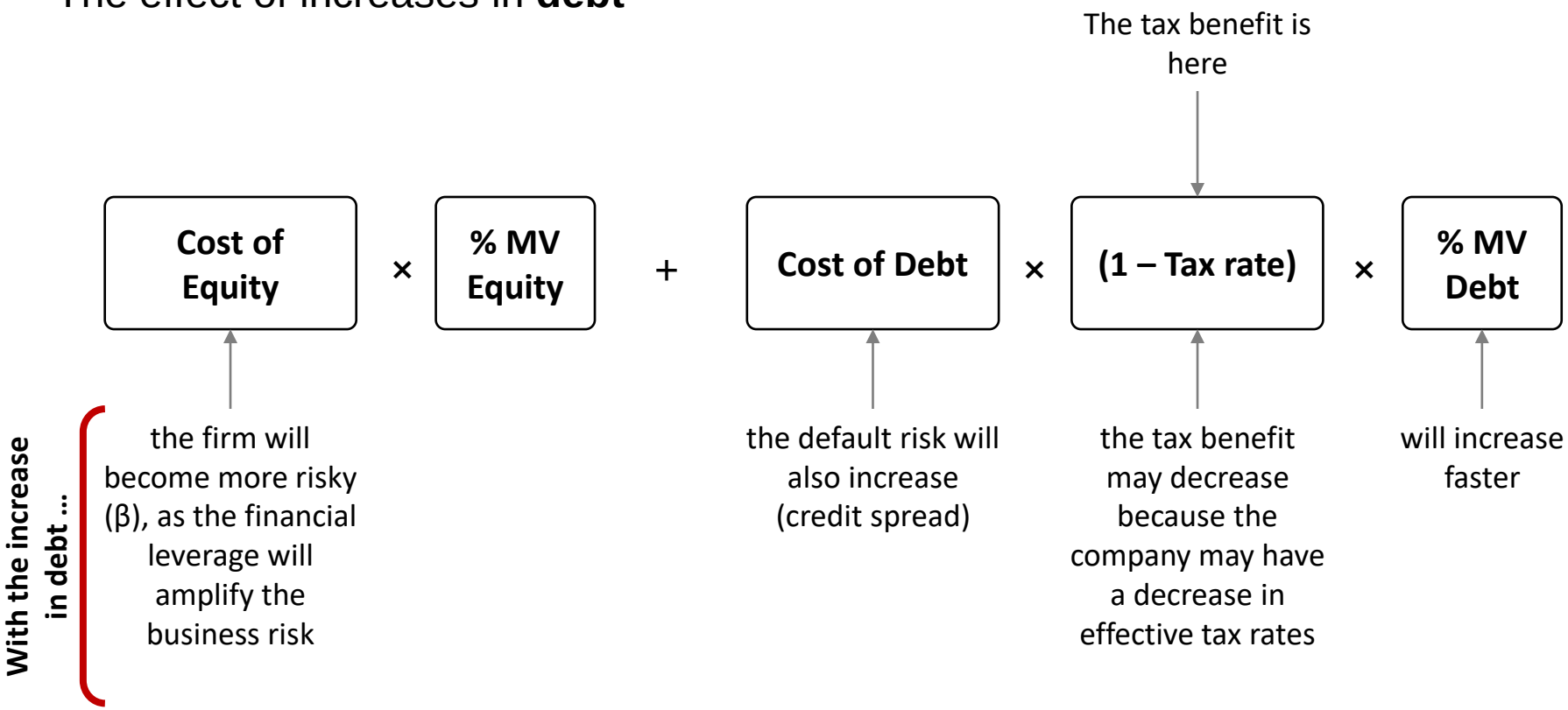
$$EV_{23} = FCFF_{23} + \frac{FCFF_{23}(1+g)}{WACC_{target} - g}$$

Estimated considering EV by 2023

Price is for 2017YE. We assume that reported net debt as of 2017YE are the same as for 2018YE.

WACC: Weighted Average Cost of Capital

The effect of increases in **debt**



WACC: Weighted Average Cost of Capital

The effect of **dividends**