Lisbon School of Economics & Management

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FT MASTERS IN FINANCE 2022 RANKING

University Affiliation Program CFA Institute®

Chp 6.
EQUITY VALUATION
VALUATION METHODS

Equity Research

Masters in Finance

2022/2023

Victor Barros, CFA, PhD

CONTENT

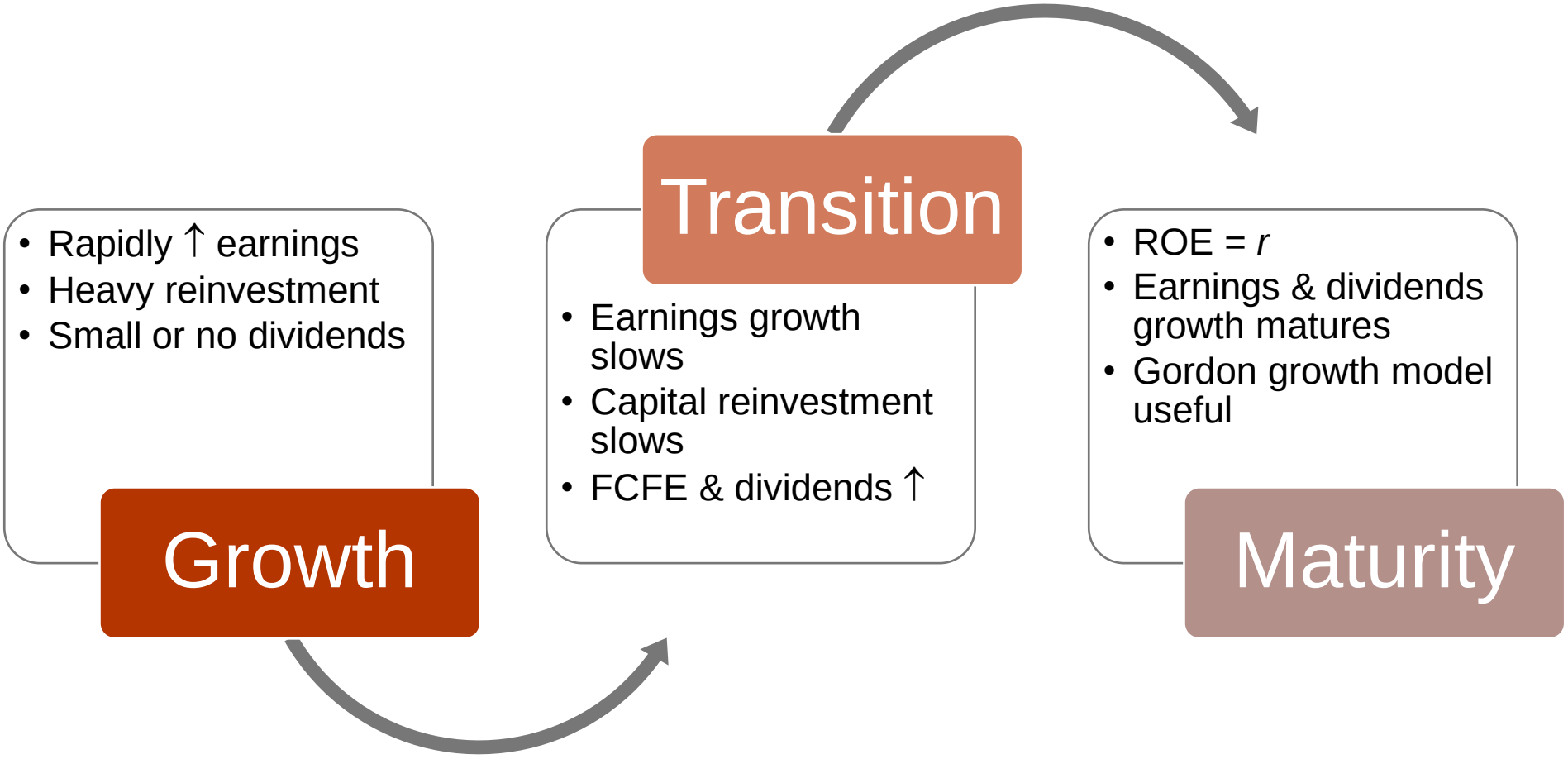
Valuation Methods

1. **Dividend Discount Model (DDM)**
2. **Discounted Cash Flow Models (DCF)**
3. **Market-Based Valuation**
4. **Residual Income Valuation**
5. **Moving from EV to P**

CHOICE OF DISCOUNTED CASH FLOW MODELS

Dividend Discount Models	• History of dividend payments • Dividends related to earnings • Noncontrolling perspective
Free Cash Flow Models	• Small or zero dividends • Positive cash flow related to earnings • Controlling perspective
Residual Income Models	• Small or zero dividends • Negative free cash flows • High-quality accounting disclosures

CHOICE OF DISCOUNTED CASH FLOW MODELS



FRAMEWORK FOR DCF-BASED VALUATION

Method	Measure of CF	Discount Factor	Assessment
WACC method or Enterprise Discounted Cash Flow (FCFF)	FCFF	WACC	Works best for projects, business units, and companies that manage their **capital structure to a target level**. Will obtain the value of the operating assets (EV). Add on the value of nonoperation assets to arrive at firm value.
Flow to Equity or Equity cash flow (FCFE)	FCFE	Levered cost of equity	Challenging to implement correctly because capital structure is embedded within the cash flow. **Best used when valuing financial institutions**. Will yield the value of equity in a business
Residual Income	Economic profit	Levered cost of equity	Explicitly highlights when a company creates value. Useful for firms without free cash flows and when cash flows are unpredictable.
Adjusted Present Value (APV)	FCFF	Unlevered cost of equity (R_A)	Highlights changing capital structure more easily than WACC-based models. Works best for companies that **maintain the amount of debt**

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ISSUES USING THE GORDON GROWTH MODEL

Strengths	Limitations
• Simple and applicable to stable, mature firms	• Not applicable to non-dividend-paying firms
• Can be applied to entire markets	• *g* must be constant
• *g* can be estimated using macro data (real GDP + π)	• Stock value is very sensitive to $r - g$
• Can be applied to firms that repurchase stock	• Most firms have nonconstant growth in dividends (multistage models?)

ISSUES USING THE GORDON GROWTH MODEL

Most Appropriate

- Minority shareholders of companies with a stable dividend policy
- Companies with:
  - Stable growth
  - Stable leverage
  - Dividend growth similar to FCFE growth
  - Beta of around 0.8 and stable over time

Least Appropriate

- Ineffective with takeovers, as there are no guarantees that the acquirer will keep the dividend policy
- Changes (even small) in management may result in an irregular dividend policy
- Sensitivity to agency conflicts (corporate governance)

DIVIDEND DISCOUNT MODEL

Stock's expected rate of return

$$r = \frac{D_1}{P_0} + g$$

Two-Stage DDM with different growth rates (S-short period; L-long period)

$$V_0 = \sum_{t=1}^{n} \frac{D_0(1+g_S)^t}{(1+r)^t} + \frac{D_0(1+g_S)^n(1+g_L)}{(1+r)^n(r-g_L)}$$

H-Model (declinig dividend in Stage 1)

$$V_0 = \frac{D_0(1+g_L) + D_0 H(g_S - g_L)}{r - g_L}, H = (high\ growth\ period/2)$$

DIVIDEND DISCOUNT MODEL

Dividend Policies

A) Constant Dividend Policy

A company pays a percentage of its earnings as dividends every year. A constant payout ratio makes it easier for management to decide how much of the profits should be retained.

B) Stable Dividend Policy

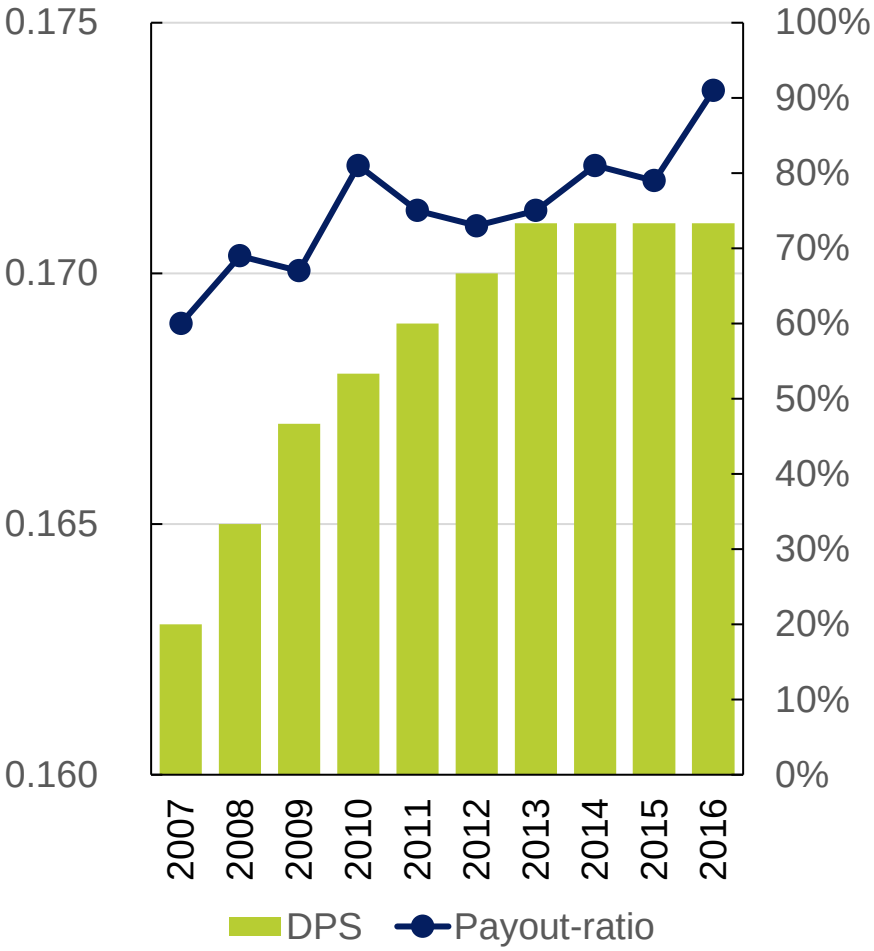
Pays out a steady and predictable dividend payout every given period, regardless of the volatility in the market. A constant dividend per share is more suitable for companies whose earnings remain stable over several years

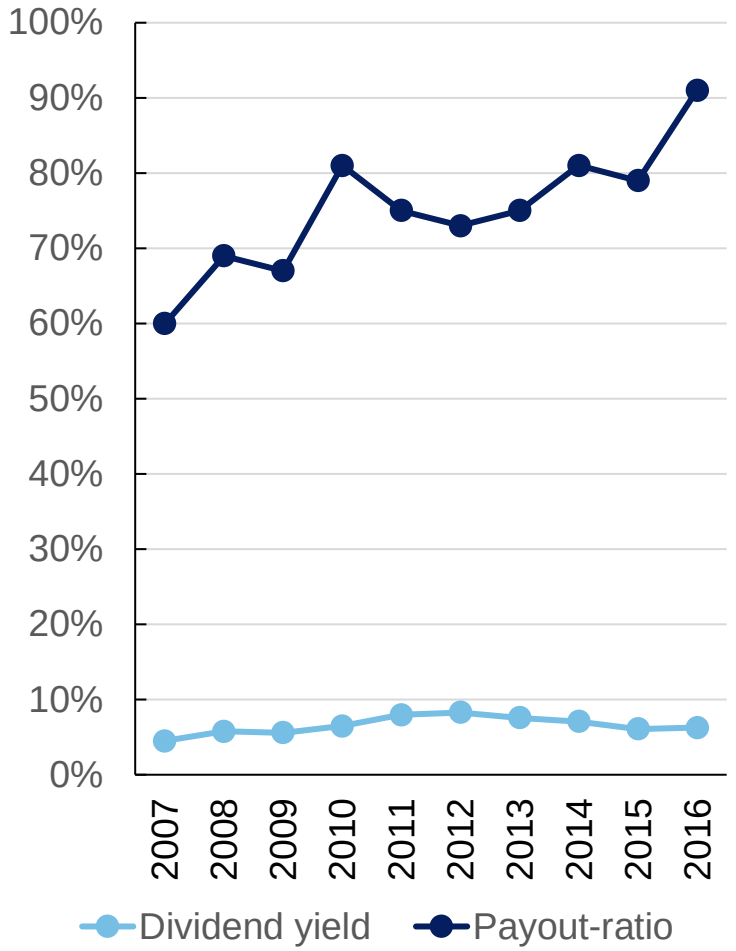
C) Residual Dividend Policy

The company pays out what dividends remain after the company has paid for capital expenditures (CAPEX) and working capital.

DIVIDEND DISCOUNT MODEL

REN – Redes Energéticas Nacionais SGPS SA





DIVIDEND DISCOUNT MODEL

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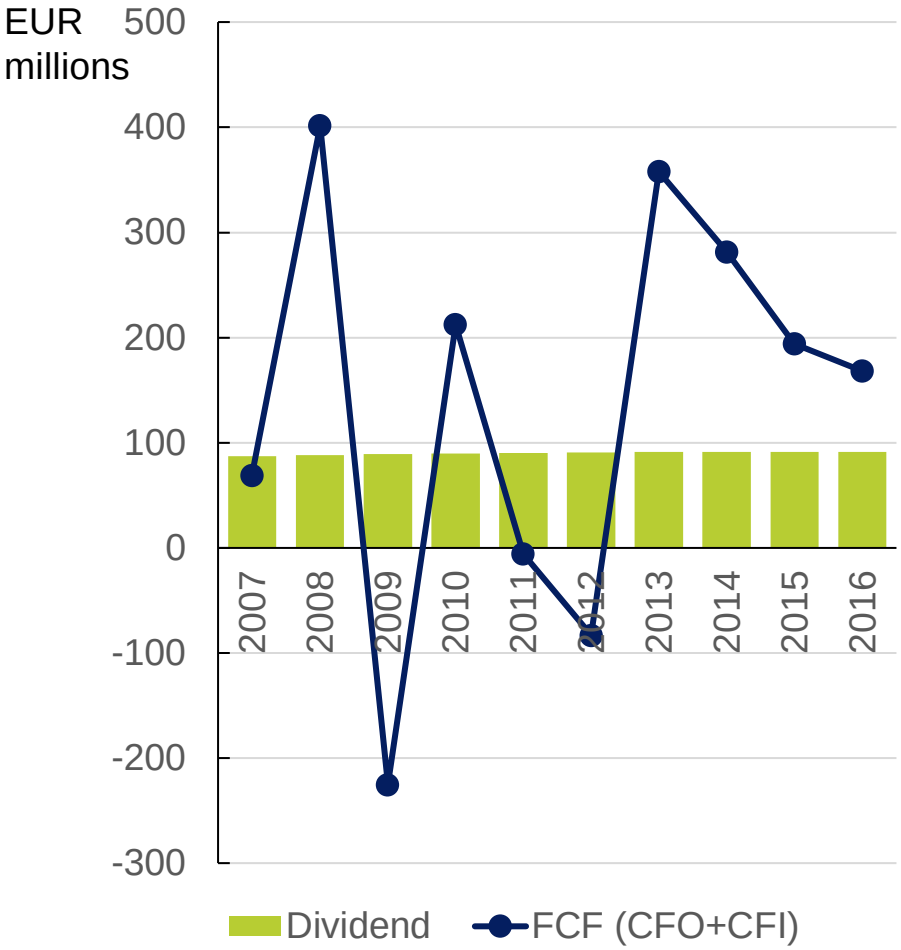
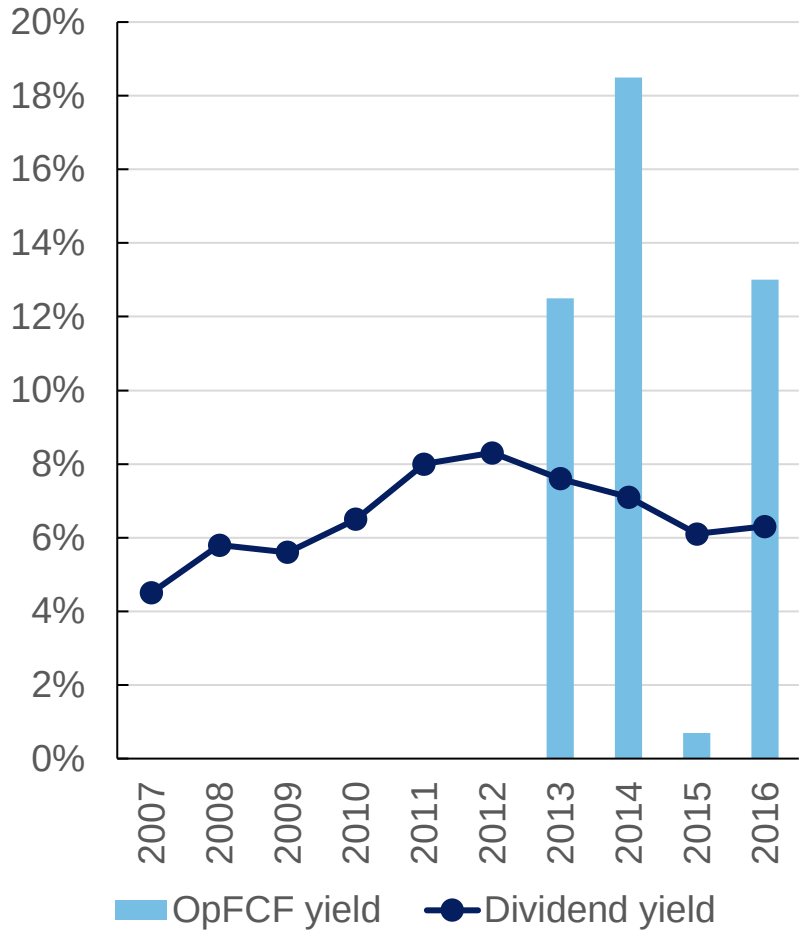
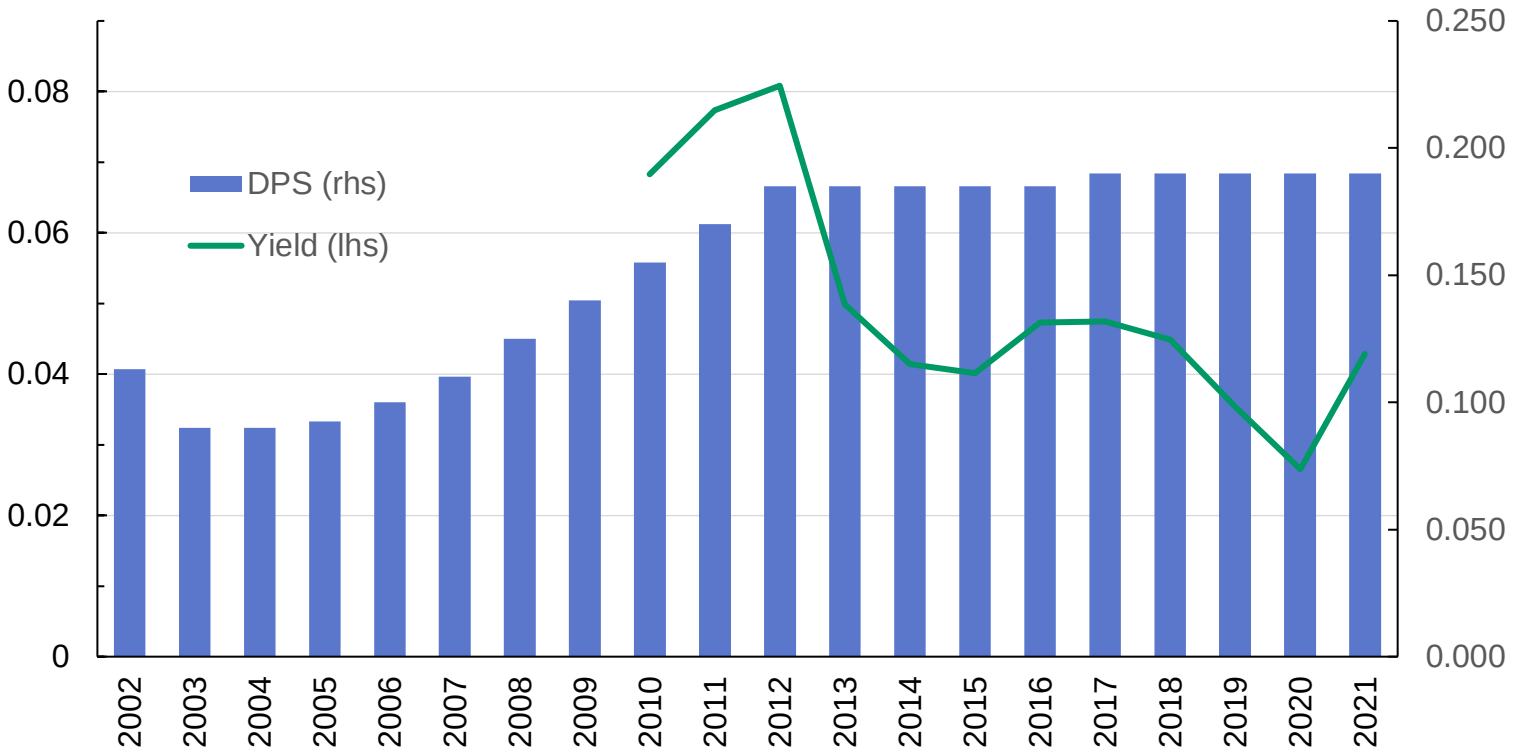




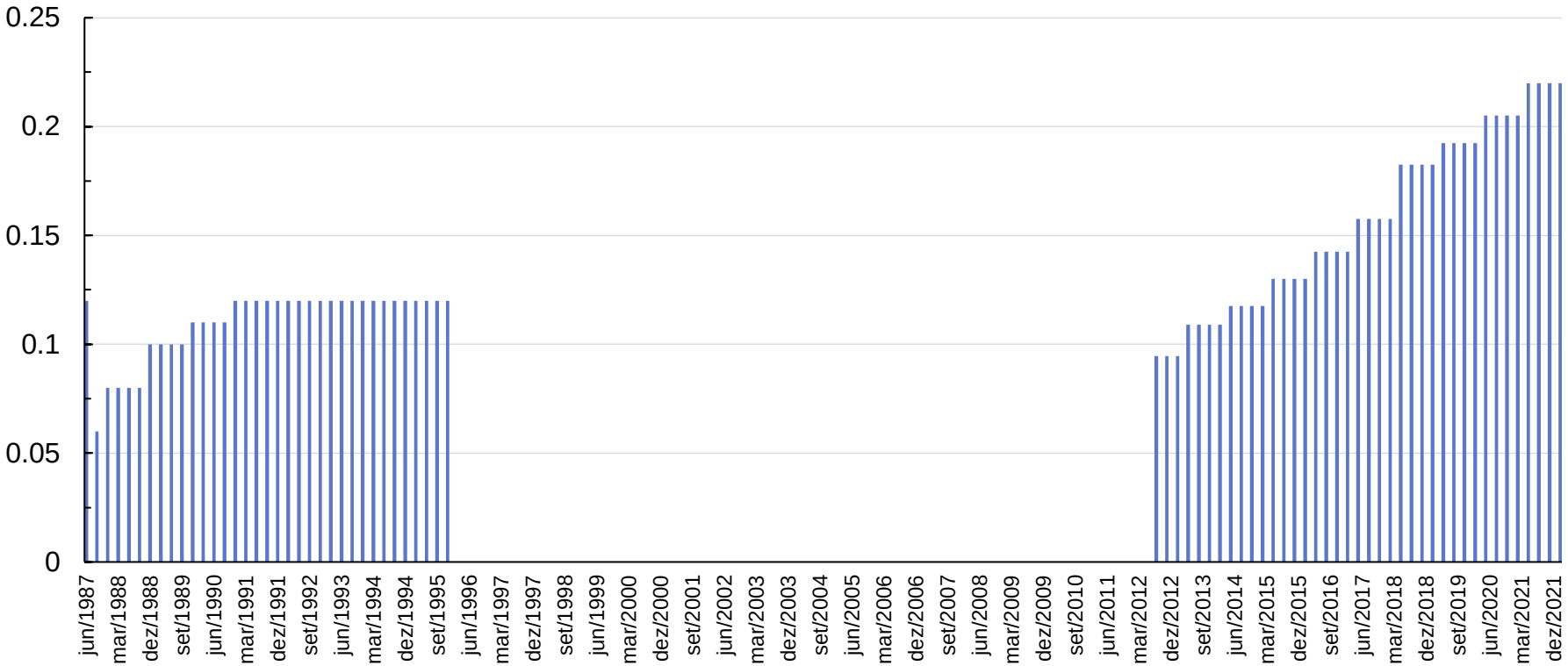
DIVIDEND DISCOUNT MODEL

EDP Energias De Portugal SA



DIVIDEND DISCOUNT MODEL

Apple Inc



DIVIDEND DISCOUNT MODEL

LafargeHolcim, Ltd

- LHN has a clear policy of paying dividends to shareholders. It has targeted a **payout ratio of 50%** of its net income attributable to its shareholders in the coming years. Thus, dividends are linked to the company's earnings.
- The company **will also pay in dividends the excess cash** of cash flow from its operations.

Three Stage DDM assumptions

Three Stage Dividend Discount Model		
High Growth Period		
Cost of Equity (Ke)	8.11%	Equal to Ke used in the DCF method.
Expected growth rate (G_1)	3.27%	Computed using the following formula: ROE*(1-Payout Ratio), in which the Payout Ratio is 30% as initially assumed for the 2016F year.
Transition Stage (H)	4	We assume a 4-year transition stage.
Stage Growth Period		
Cost of Equity (Ke)	8.11%	Equal to Ke used in the DCF method.
Growth rate of economy (G_2)	2.31%	According to Damodaran, we use as a proxy the economy GDP growth rate. Because LHN has business at global level, we choose the world GDP growth rate forecasted by the IMF for 2021F. Moreover, we apply a 40% discount over that rate to update for current market conditions enabling us to achieve a more conservative value.

DIVIDEND DISCOUNT MODEL

LafargeHolcim, Ltd

Total dividends paid

Million CHF	2016F	2017F	2018F	2019F	2020F	2021F
Net Income	1.560	2.198	2.316	2.374	2.385	2.439
Dividends	468	879	1.158	1.306	1.431	1.585
Cash Dividend	790	941	615	664	646	770
Total Dividends Paid	**1.258**	**1.820**	**1.773**	**1.970**	**2.077**	**2.355**

Three Stage DDM price target

Year	EPS	DPS	Ke	PV Dividends
2016F	2.57	2.07	8.11%	1.92
2017F	3.62	3.00	8.11%	2.57
2018F	3.82	2.92	8.11%	2.31
2019F	3.91	3.25	8.11%	2.38
2020F	3.93	3.42	8.11%	2.32
2021F	4.02	3.88	8.11%	2.43
Sum PV Dividends				**13.92**
Terminal Price				71.05
PV Terminal Price				44.49
PV Dividends + PV Terminal Price				**58.41**

Total shares = 606.9m

Calculate P_0?

(begining 2016)

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DISCOUNTED CASH FLOW MODELS (DCF)

Free Cash Flow to the Firm (FCFF) vs. Free Cash Flow to Equity (FCFE)

Theoretically, they should yield the same estimates.

Nevertheless, often, they reflect different assumptions.

Stable capital structure:

- FCFE is simpler and more direct in estimating the price target

Levered company with negative FCFE:

- FCFF may be more accessible and is more appropriate

Levered company with changing capital structure (deleveraging?):

- FCFF growth is more linked with the company's fundamentals
- r_e is more sensitive to changes in the capital structure than WACC

DISCOUNTED CASH FLOW MODELS (DCF)

Free Cash Flow to the Firm

$$
\begin{aligned}
\text{FCFF} = \quad & +\text{EBIT} \times (1 - \text{t}) \\
& +\text{Non Cash Charges} \\
& -\text{Net increase in Working Capital} \\
& -\text{Capital Expenditures (CapEx)}
\end{aligned}
$$

$$
\left.
\begin{aligned}
& +\text{Net Income} \\
& +\text{Interest} \times (1 - \text{t}) \\
& +\text{Depreciations \& Amortizations}
\end{aligned}
\right]
$$

Non-Cash Charges (not only Depreciations & Amortizations)

DISCOUNTED CASH FLOW MODELS (DCF)

Other Non-Cash Adjustments

Amortization	• Added back
Restructuring Expense	• Added back
Restructuring Income	• Subtracted out
Capital Gains	• Subtracted out
Capital Losses	• Added back
Employee Option Exercise	• Added back
Deferred Taxes	• Added back?
Tax Asset	• Subtracted out?

DISCOUNTED CASH FLOW MODELS (DCF)

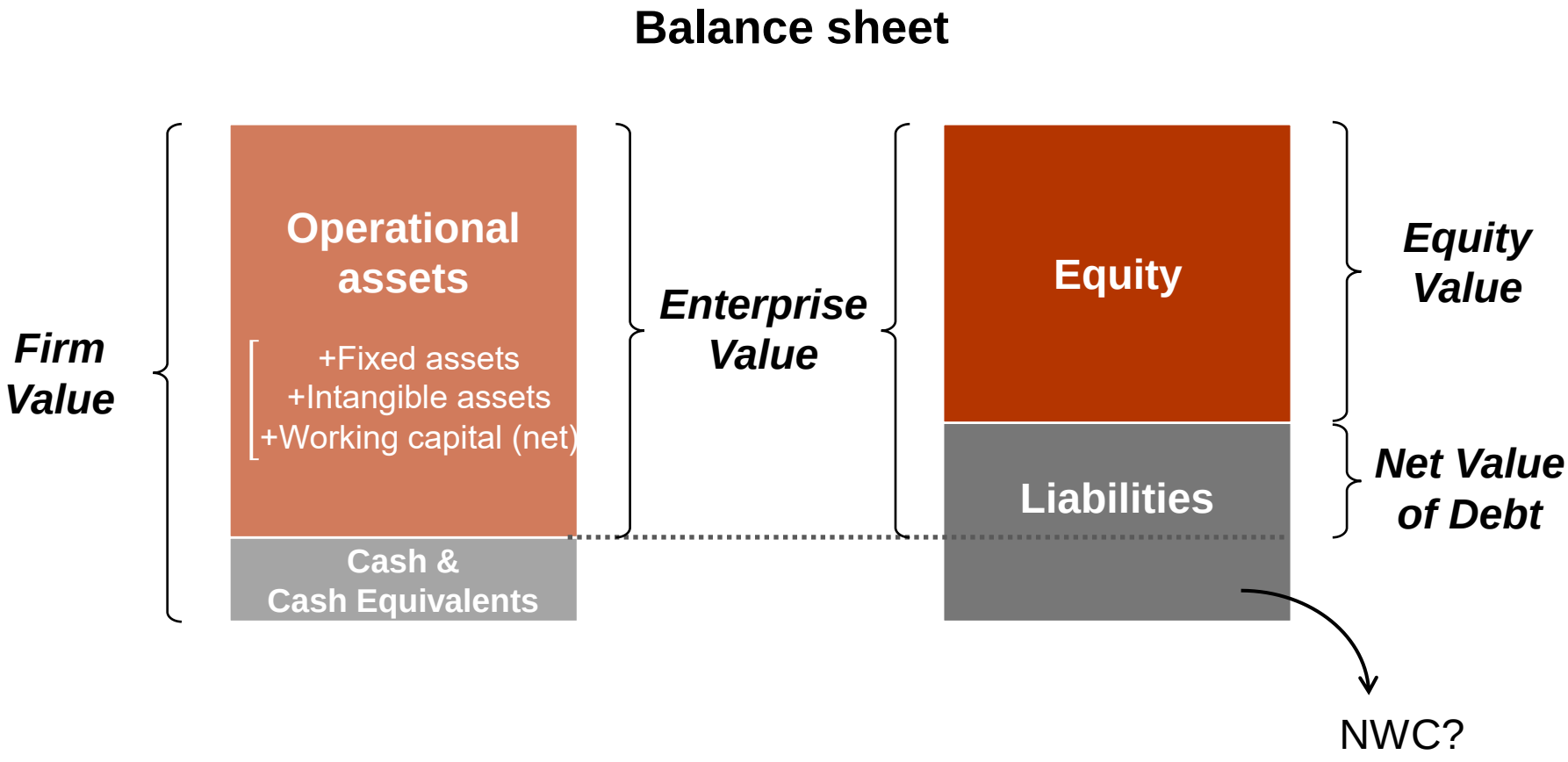
Free Cash Flow to Equity

$$
\begin{aligned}
\text{FCFE} = \; & +\text{FCFF} \\
& -\text{Interest expense} \times (1 - \text{t}) \\
& +\text{Net Borrowing} \\
& -\text{Preferred Dividend}
\end{aligned}
$$

$$
\begin{aligned}
\text{FCFE} = \; & +\text{Net Income} \\
& +\text{Non Cash Charges} \\
& -\text{Net increase in Working Capital} \\
& -\text{Capital Expenditures (CapEx)} \\
& +\text{Net Borrowing} \\
& -\text{Preferred Dividend}
\end{aligned}
$$

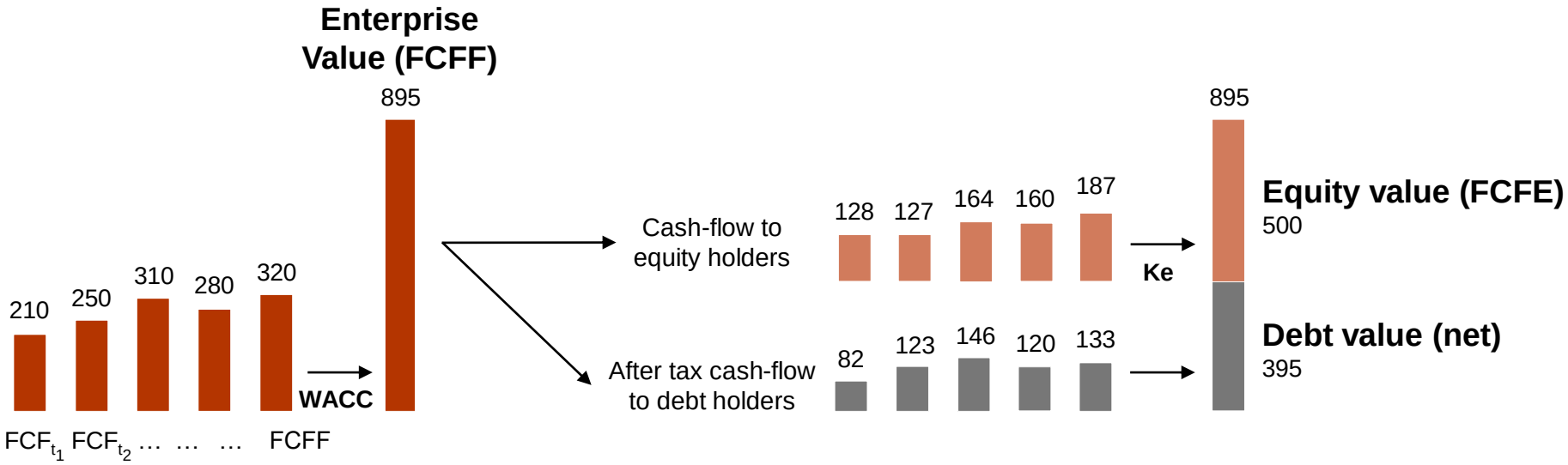
$$\text{Net Borrowing} = \text{New debt borrowing} - \text{Debt repayment}$$

DISCOUNTED CASH FLOW MODELS (DCF)



Net Value of Debt =
Short-Term Debt + Long-Term Debt + Pension Obligations + Preferred shares + Minority Interests – Cash & Cash Equivalents ± Others

DISCOUNTED CASH FLOW MODELS (DCF)



The net value of debt equals the discounted after-tax cash flow to debt holders plus the present value of interest tax shield, preferred shares, other obligations (pension plans) and minority interests, and minus cash and cash equivalents.

Source: Koller at. al. (2010), adjusted

DISCOUNTED CASH FLOW MODELS (DCF)

Enterprise Value (EV)

$$\mathrm{EV}_0 = \sum_{t=1}^{\infty} \frac{\mathrm{FCFF}_t}{(1+\mathrm{WACC})^t} = \frac{\mathrm{EBIT}_{n+1}(1-\mathrm{t}) \times \left(1 - \frac{\mathrm{r}}{\mathrm{ROIC}}\right)}{\mathrm{WACC} - \mathrm{g}}$$

Constant-growth FCFF Model

$$\mathrm{EV}_0 = \frac{\mathrm{FCFF}_1}{\mathrm{WACC} - g} = \frac{\mathrm{FCFF}_0(1+g)}{\mathrm{WACC} - g}$$

Two-Stage FCFF Model

$$\mathrm{EV}_0 = \sum_{t=1}^{n} \frac{\mathrm{FCFF}_t}{(1+\mathrm{WACC})^t} + \frac{\mathrm{FCFF}_{n+1}}{(\mathrm{WACC} - g)} \frac{1}{(1+\mathrm{WACC})^n}$$

DISCOUNTED CASH FLOW MODELS (DCF)

Equity Value (Eq)

$$\text{Equity Value} = \text{Enterprise Value} - \text{Net Market Value of Debt}$$

$$\text{Equity Value} = \sum_{t=1}^{\infty} \frac{\text{FCFE}_t}{(1+r)^t}$$

Constant-growth FCFE Model

$$\text{Equity Value} = \frac{\text{FCFE}_1}{r-g} = \frac{\text{FCFE}_0(1+g)}{r-g}$$

Two-Stage FCFE Model

$$\text{Equity Value} = \sum_{t=1}^{n} \frac{\text{FCFE}_t}{(1+r)^t} + \frac{\text{FCFE}_{n+1}}{(\text{r}-g)} \frac{1}{(1+r)^n}$$

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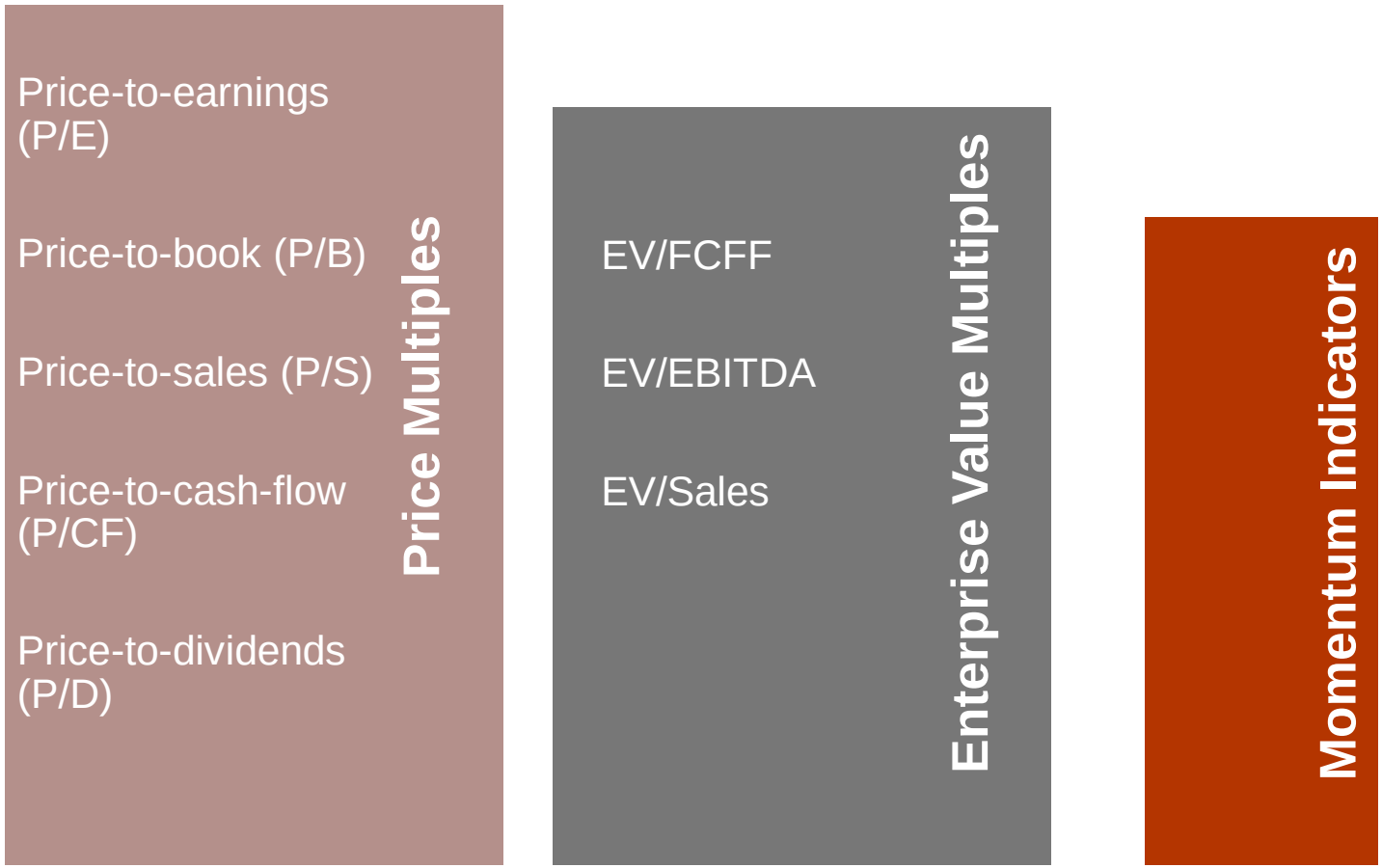
MARKET-BASED VALUATION



Cognitive Biases
- Regret-aversion
- Overconfidence

Relative Valuation Methods

Multiples are highly used in the industry because people believe that they have to make fewer assumptions compared to intrinsic valuation.

Is this a valid argument?

A. Yes

B. No

MARKET-BASED VALUATION

Price-to-Equity

PER (ou P/E, *price earnings ratio*)

$$\frac{P}{E} = \frac{Share\ price}{Earnings\ per\ share} = \frac{1}{k_d} + \frac{(1/k_d) - \mathrm{PE}_u}{\left(\frac{\mathrm{D}}{\mathrm{V}}\right)(k_d)(\mathrm{PE}_u) - 1}$$

Adjusts for capital structure

$$= \frac{Payout \times (1+g)}{r-g}$$

PE_u: unlevered P/E

D/V: ratio of debt to value

RATIONALE	DRAWBACKS
EPS is driver of value	Zero, negative, or very small earnings
Widely used	Permanent vs. transitory earnings
Related to stock returns	Management discretion for earnings

MARKET-BASED VALUATION

Price-to-Equity

PER (ou P/E, *price earnings ratio*)

- If it had been a FCFE Model

$$\frac{P_0}{EPS_0} = P/E = \frac{FCFE \times (1+g)}{r-g}$$

Regression

PE, Growth and Risk

$$P/E = \alpha + g_{\text{EPS or NI 5y}} + \text{Payout} - \text{Beta}$$

MARKET-BASED VALUATION

PEG Ratio

$$PEG = \frac{P/E}{Earnings\ Growth\ Rate}$$

Two stage equity discount cash flow model

$$PEG = \frac{Payout(1+g)\left(1-\frac{(1+g)^n}{(1+r)^n}\right)}{g(r-g)} + \frac{Payout_n(1+g)^n(1+g)}{g(r-g_n)(1+r)^n}$$

Regression

$$PEG = \alpha + Payout - \ln[E(EPS_g)] - Beta$$

MARKET-BASED VALUATION

Price-to-Book

P/B (*price to book ratio*)

$$\frac{P}{B} = \frac{Share\ price}{Book\ Value} = \frac{ROE \times Payout \times (1+g)}{r-g}$$

RATIONALE

- Book Value Is Usually Positive
- More Stable than EPS
- Appropriate for Financial Firms
- Appropriate for Firms that Will Terminate

DRAWBACKS

- Does Not Recognize Nonphysical Assets
- Misleading when Asset Levels Vary
- Can Be Misleading Due to Accounting Practices
- Less Useful when Asset Age Differs
- Can Be Distorted Historically by Repurchases

MARKET-BASED VALUATION

Price-to-Book

Peer group for Iberian banks (Portugal and Spain)

(sort by PBV)

Name	Market Cap. 18HY (€ bn)	P/E 18E	PBV 18E	ROE 18E
Bankinter SA	7.50	13.18x	1.517x	12.0%
Caixabank SA	22.17	10.54x	0.914x	8.7%
Banco Santander SA	74.10	9.00x	0.731x	8.4%
BBVA SA	40.50	6.99x	0.690x	10.0%
Bankia SA	9.89	10.56x	0.664x	6.3%
Banco Comercial Portugues SA	3.85	11.79x	0.622x	5.8%
Banco de Sabadell SA	8.08	14.24x	0.549x	3.3%
Liberbank SA	1.29	11.11x	0.483x	4.7%
Unicaja Banco SA	2.35	10.92x	0.448x	4.1%
Mean	**18.86**	**10.927x**	**0.735x**	**7.0%**
Median	8.08	10.920x	0.664x	6.3%

MARKET-BASED VALUATION

Price-to-Book

P/B (*price to book ratio*)

$$g = (1 - Payout) \times ROE \qquad \frac{P}{B} = \frac{ROE \times Payout \times (1+g)}{r-g}$$

Substituting *g* back into the P/B equation:

$$\frac{P}{B} = \frac{ROE - g}{r - g}$$

Regression

P/B = α – Beta + $g_{\text{EPS or NI 5y}}$ + ROE

P/B = α + ROE – Std Dev

MARKET-BASED VALUATION

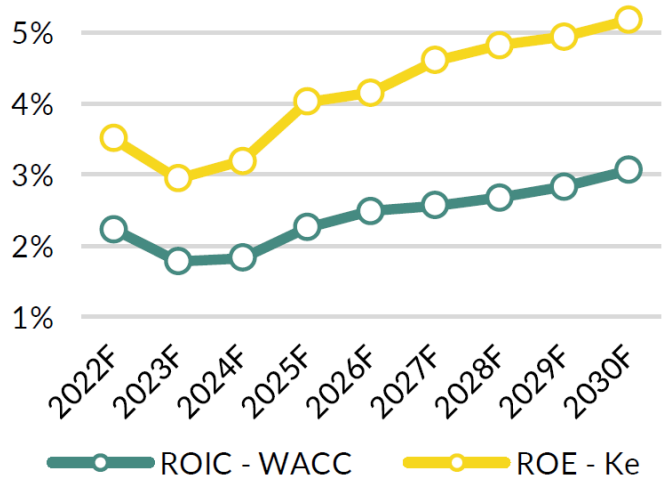
Price-to-Book

Now considering the firm perspective:

$$EV = \frac{FCFF}{WACC - g}$$

$$\frac{EV}{IC} = \frac{ROIC - g}{WACC - g}$$

Figure 34: ROIC spread to WACC vs ROE spread to Cost of Equity



MARKET-BASED VALUATION

Price-to-Sales

P/S (*price to sales*)

$$\frac{P}{S} = \frac{Share\ price}{Sales} = \frac{NPM \times Payout \times (1+g)}{r-g}$$

RATIONALE

- Sales Less Easily Manipulated
- Sales Are Always Positive
- P/S Appropriate For Mature, Cyclical, & Distressed Firms
- P/S More Stable Than P/E

DRAWBACKS

- Sales ≠ Earnings & Cash Flow
- Numerator & Denominator Not Consistent
- P/S Does Not Reflect Cost Differences
- P/S Can Be Misleading Due to Accounting Practices

MARKET-BASED VALUATION

Price-to-Cash Flows

PCF (*price to cash flow*)

$$\frac{P}{CF} = \frac{Share\ price}{Cash\ flow\ per\ share}$$

CF	• Earnings + Depreciation + Amortization + Depletion
CFO	• From statement of cash flows
FCFE	• Most valid but volatile
EBITDA	• Best used with enterprise value

RATIONALE

- Cash Flow Less Easily Manipulated
- Ratio More Stable Than P/E
- Ratio Addresses Quality of Earnings Issue with P/E

DRAWBACKS

- Cash Flow Can Be Distorted
- FCFE More Volatile and More Frequently Negative
- Cash Flow Increasingly Managed by Firms

MARKET-BASED VALUATION

Inverse Price Ratios

Price Ratio	Inverse Price Ratio
Price-to-earnings (P/E)	Earnings yield (E/P)
Price-to-book (P/B)	Book-to-market (B/P)
Price-to-sales (P/S)	Sales-to-price (S/P)
Price-to-cash-flow (P/CF)	Cash flow yield (C/P)
Price-to-dividends (P/D)	Dividend yield (D/P)

MARKET-BASED VALUATION

EV Multiples

- EV / EBITDA

$$\frac{EV}{EBITDA} = \frac{MV_{FCFE} + MV_{PF} + (MV_D - Cash)}{EBITDA}$$

PF: preferred shares D: debt

RATIONALE

- Useful for comparing firms of different leverage
- Useful for comparing firms of different capital utilization
- Usually positive

DRAWBACKS

- Exaggerates cash flow
- FCFF more strongly grounded

MARKET-BASED VALUATION

EV Multiples

- EV / EBITDA

$$EV = \frac{FCFF}{WACC - g}$$

$$EV = \frac{EBITDA(1-t) + D\&A(t) - \Delta NWC - CAPEX}{WACC - g}$$

$$\frac{EV}{EBITDA} = \frac{(1-t)}{WACC - g} + \frac{\left(\frac{D\&A(t)}{EBITDA}\right)}{WACC - g} - \frac{\left(\frac{\Delta NWC}{EBITDA}\right)}{WACC - g} - \frac{\left(\frac{CAPEX}{EBITDA}\right)}{WACC - g}$$

MARKET-BASED VALUATION

EV Multiples

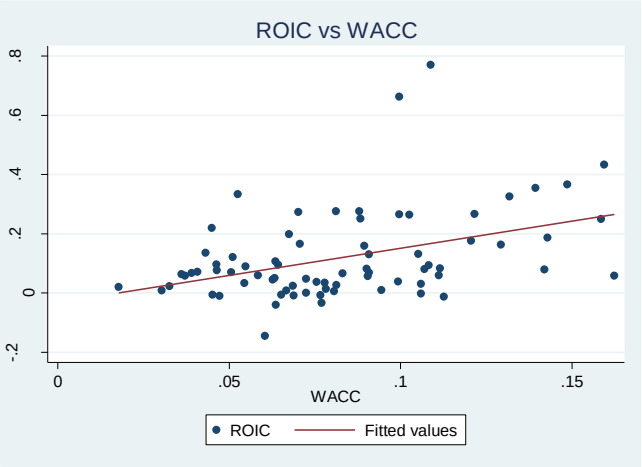
Regression

$$EV/EBITDA = \alpha + g_{Revenue} - WACC - Debt\ Ratio - Tax\ Rate$$

EV/EBITDA = 10.560 – 9.578×Growth + 50.794×WACC – 3.054×Debt ratio – 14.108×Tax rate

COR multiple (EV/EBITDA) = 9.92x

Number of obs	=	98		F(4, 93)	=	2.04
R-squared	=	0.0805		Prob > F	=	0.0957
EV/EBITDA	Coef.	Std. Err.	t	P>| t |	[95% Coef.	Interval]
Constant	10.560	5.111	2.07	0.042	0.410	20.710
Growth	-9.578	6.751	-1.42	0.159	-22.983	3.828
WACC	50.794	29.577	1.72	0.089	-7.941	109.529
Debt ratio	-3.054	4.770	-0.64	0.524	-12.527	6.418
Tax rate	-14.108	15.452	-0.91	0.364	-44.792	16.576



MARKET-BASED VALUATION

EV Multiples

- EV / SALES

$$\frac{EV}{SALES} = \frac{MV_{FCFE} + MV_{PF} + (MV_D - Cash)}{SALES}$$

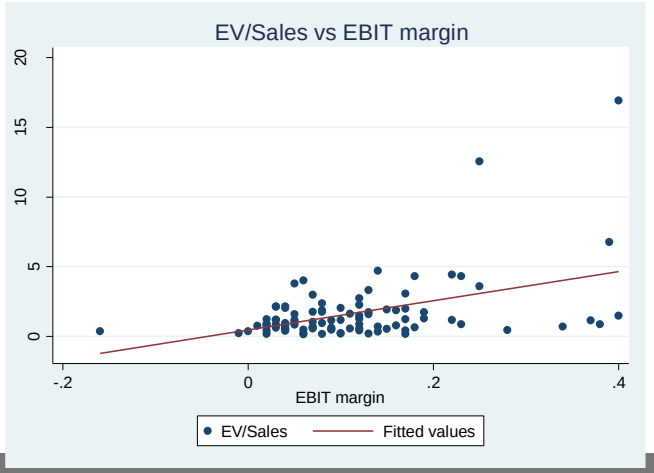
Regression

EV/Sales = α + $g_{Revenue}$ + $EBIT_m$ – Debt Ratio – Tax Rate

EV/Sales = 1.958 – 2.389×Growth + 10.625×EBIT margin – 0.881×Debt ratio – 4.868×Tax rate

COR multiple (EV/Sales) = 1.89x

Number of obs	=	95		F(4, 90)	=	7.08
R-squared	=	0.2393		Prob > F	=	0.0001
EV/Sales	Coef.	Std. Err.	t	P>| t |	[95% Coef.	Interval]
Constant	1.958	0.911	2.15	0.034	0.148	3.769
Growth	-2.389	1.550	-1.54	0.127	-5.468	0.690
EBIT margin	10.625	2.412	4.4	0.000	5.833	15.417
Debt ratio	-0.881	1.054	-0.84	0.405	-2.974	1.212
Tax rate	-4.868	3.506	-1.39	0.168	-11.834	2.097



MARKET-BASED VALUATION

EV Multiples

- EV / EBITA

(**E**arnings **B**efore **I**nterest, **T**axes and Amortization of **A**cquired intangibles)

Focus on key value drivers ($NOPLAT$ / $ROIC$ / $WACC$ / g) to compare industry multiples

$$NOPLAT \approx EBITA(1-T)$$

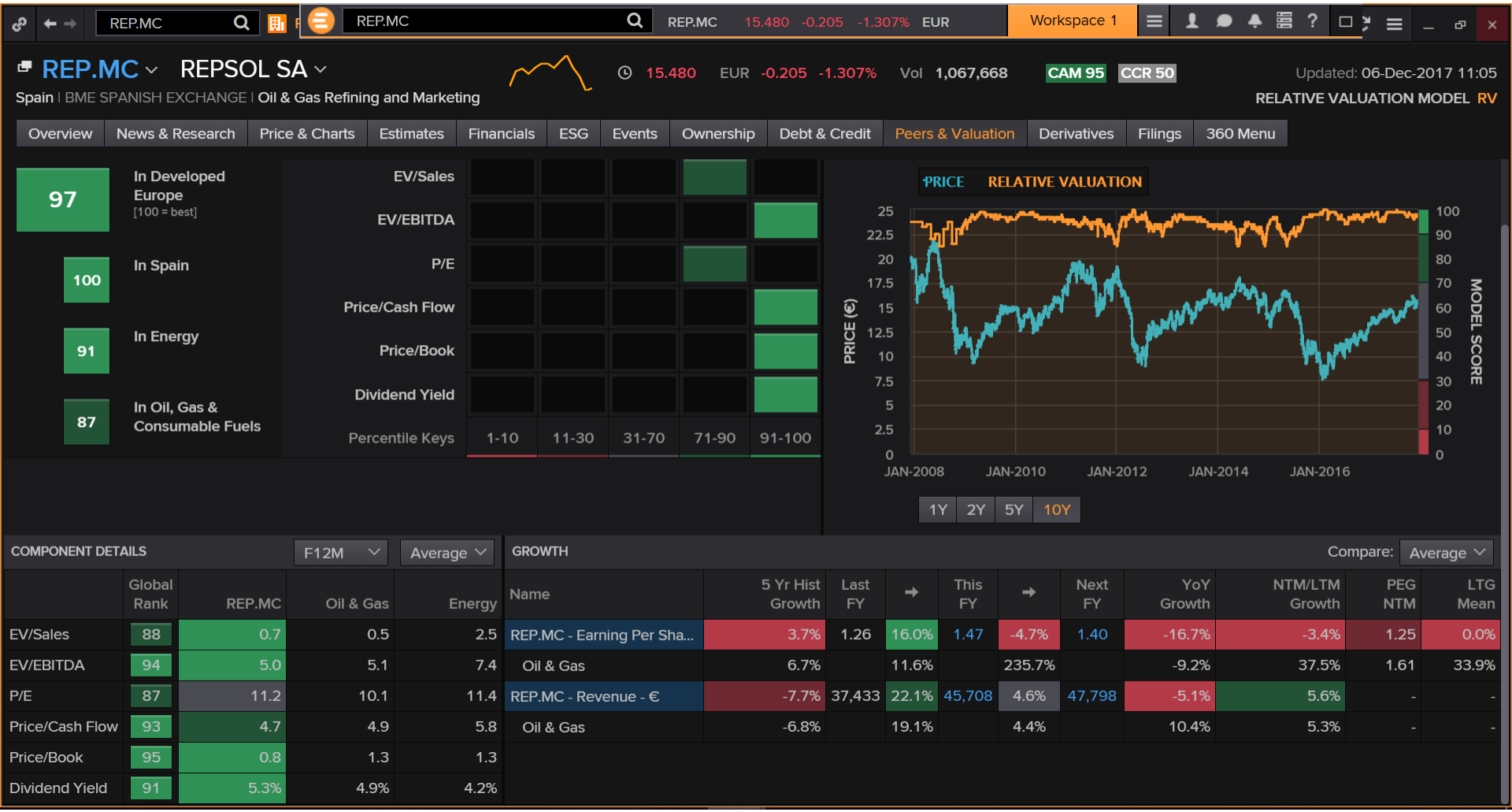
$$\frac{EV}{EBITA} = \frac{(1-T)\left(1-\frac{g}{ROIC}\right)}{WACC-g}$$

MARKET-BASED VALUATION

Benchmark Value of the Multiple Choices

- Industry peers
- Industry or sector index
- Broad market index
- Firm's historical values

MARKET-BASED VALUATION



	Global Rank	REP.MC	Oil & Gas	Energy
EV/Sales	88	0.7	0.5	2.5
EV/EBITDA	94	5.0	5.1	7.4
P/E	87	11.2	10.1	11.4
Price/Cash Flow	93	4.7	4.9	5.8
Price/Book	95	0.8	1.3	1.3
Dividend Yield	91	5.3%	4.9%	4.2%

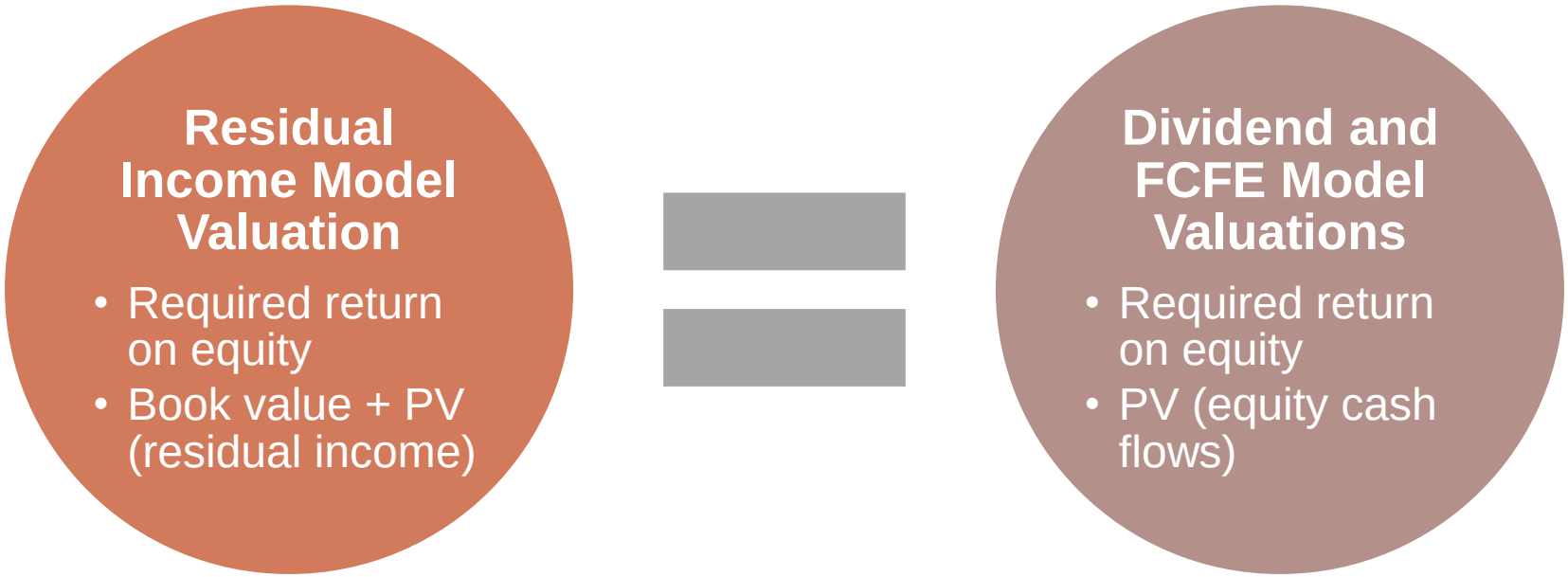
Name	5 Yr Hist Growth	Last FY	→	This FY	→	Next FY	YoY Growth	NTM/LTM Growth	PEG NTM	LTG Mean
REP.MC - Earning Per Sha...	3.7%	1.26	16.0%	1.47	-4.7%	1.40	-16.7%	-3.4%	1.25	0.0%
Oil & Gas	6.7%		11.6%		235.7%		-9.2%	37.5%	1.61	33.9%
REP.MC - Revenue - €	-7.7%	37,433	22.1%	45,708	4.6%	47,798	-5.1%	5.6%	-	-
Oil & Gas	-6.8%		19.1%		4.4%		10.4%	5.3%	-	-

CONTENT

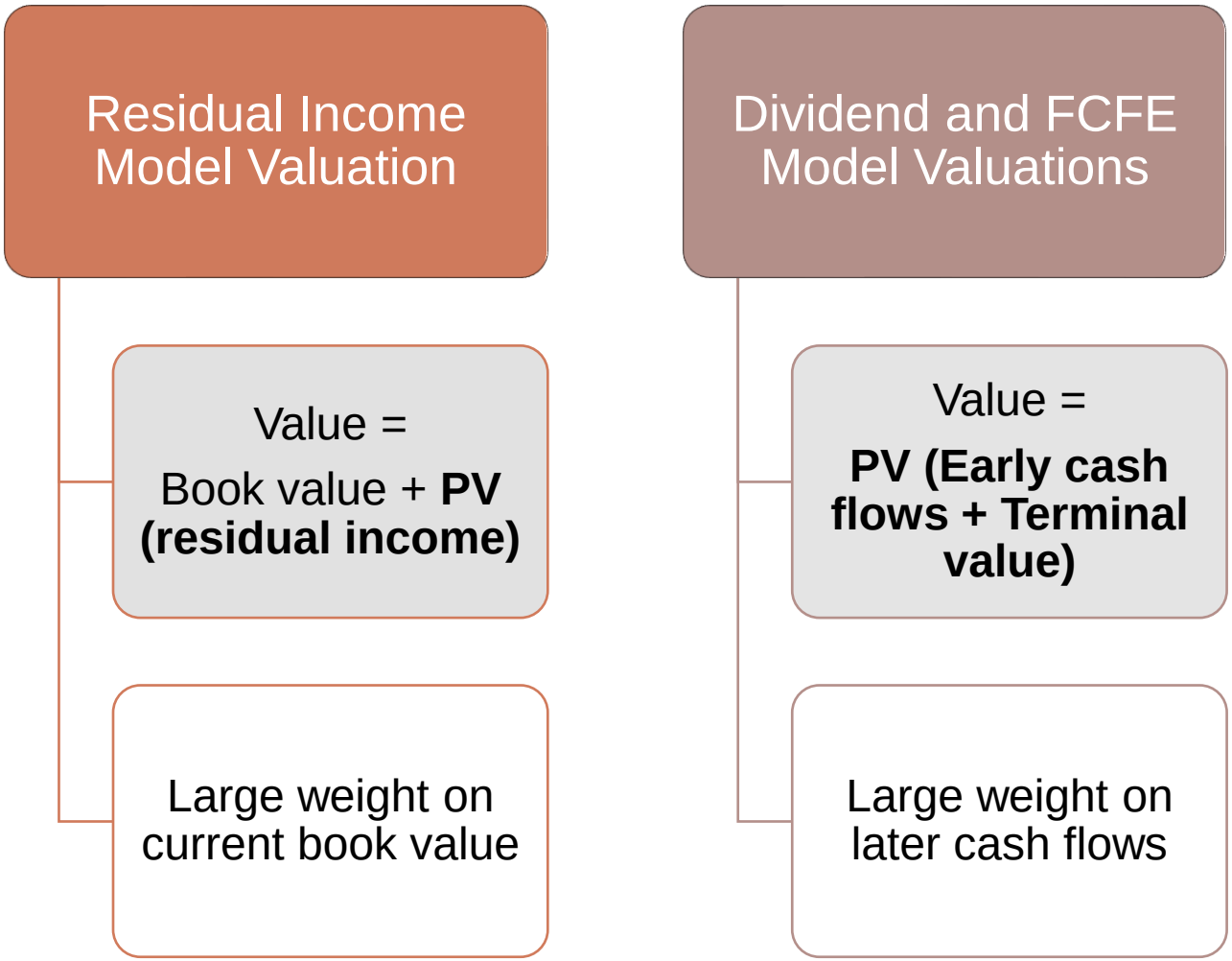
Valuation Methods

1. **Dividend Discount Model (DDM)**
2. **Discounted Cash Flow Models (DCF)**
3. **Market-Based Valuation**
4. **Residual Income Valuation**
5. **Moving from EV to P**

RESIDUAL INCOME AND DIVIDEND AND FCFE MODEL VALUATIONS



RESIDUAL INCOME



RESIDUAL INCOME

Strengths

- Puts less weight on the terminal value
- Uses available accounting data
- Is useful for non-dividend-paying firms
- Is useful for firms without free cash flows
- Is useful when cash flows are unpredictable
- Is based on economic value

Limitations

- Relies on accounting data
- May require adjustments to accounting data
- Relies on clean surplus relation
- Assumes that *Cost of debt = Interest expense*

RESIDUAL INCOME

Most Appropriate

- At non-dividend-paying firms
- At firms without free cash flows
- When terminal values are highly uncertain

Least Appropriate

- When the clean surplus relationship does not hold
- When the determinants of residual income are not predictable

RESIDUAL INCOME

Uses of Residual Income

- **Valuation**
- **Measuring Goodwill Impairment**
- **Measuring Internal Corporate Performance**
- **Determining Executive Compensation**

RESIDUAL INCOME

Valuing Common Stock using Residual Income

$$V_0 = B_0 + \sum_{t=1}^{+\infty} \frac{RI_t}{(1+r)^t} = B_0 + \sum_{t=1}^{+\infty} \frac{E_t - r \times B_{t-1}}{(1+r)^t}$$

$$RI_t = E_t - r \times B_{t-1}$$

Residual Income Valuation and the P/B

$$V_0 = B_0 + \frac{ROE - r}{r - g} B_0$$

$$\frac{V_0}{B_0} = 1 + \frac{ROE - r}{r - g}$$

RESIDUAL INCOME

Charge for Equity Capital =

Required return on equity × Beginning book value per share

- 10% × $20.00 = $2.00

Residual Income in Year 1 =

EPS – Charge for equity capital

- $2.50 – $2.00 = $0.50

End-of-Year Book Value for Year 1 =

Beginning-of-year book value + Earnings – Dividends

- $20.00 + $2.50 – $1.00 = $21.50
- Beginning book value for year 2

Charge for Equity Capital in Year 2 =

Required return on equity × Beginning book value per share

- 10% × $21.50 = $2.15

Residual Income in Year 2 =

- $3.00 – $2.15 = $0.85

Additionally, Assume:

- Residual income in year 3 = $1.00
- The firm ceases operations in three years

$$V_0 = \$20 + \frac{\$0.50}{1.10^1} + \frac{\$0.85}{1.10^2} + \frac{\$1.00}{1.10^3}$$

$$V_0 = \$20 + \$1.91$$

$$V_0 = \$21.91$$

RESIDUAL INCOME

Continuing Residual Income

= Long-Term Residual Income

Potential Scenarios:

- RI is constant forever
- RI is zero at the terminal period
- RI gradually declines to zero where ROE = *r*
- RI gradually declines to a constant level where ROE > *r*

RESIDUAL INCOME

Continuing Residual Income and Persistence Factors

High Persistence	Low Persistence
• Low dividend payout • Historically high industry ROEs	• Extreme ROE • Extreme levels of special items • Extreme accounting accruals

$$V_0 = B_0 + \sum_{t=1}^{T-1} \frac{E_t - r \times B_{t-1}}{(1+r)^t} + \frac{E_t - r \times B_{T-1}}{(1+r-\omega)(1+r)^{T-1}}$$

Persistence Factor (ω)

- $0 \leq \omega \leq 1$
- $\omega = 1$ → Residual income will not fade
- $\omega = 0$ → Residual income will not persist after the initial forecast to rise
- $\omega = 0.62$ → It has been observed, on average, empirically

RESIDUAL INCOME

Example: Multistage Residual Income Model

From the First Valuation Example:

- Beginning book value at time 0 = $20.00
- Residual income in year 1 = $0.50
- Residual income in year 2 = $0.85
- Residual income in year 3 = $1.00
- Required return on equity = 10 percent
- Value was $21.91

Now Assume:

- The firm continues operations after three years

RESIDUAL INCOME

Example: Multistage Residual Income Model – $\omega = 1.0$

$$V_0 = B_0 + \sum_{t=1}^{T-1} \frac{E_t - r_E B_{t-1}}{(1+r_E)^t} + \frac{E_T - r_E B_{T-1}}{(1+r_E-\omega)(1+r_E)^{T-1}}$$

$$V_0 = \$20 + \frac{\$0.50}{1.10^1} + \frac{\$0.85}{1.10^2} + \frac{\$1.00}{(1+0.10-1.0)(1.10^2)}$$

$$V_0 = \$20 + \frac{\$0.50}{1.10^1} + \frac{\$0.85}{1.10^2} + \frac{\$1.00}{(0.10)(1.10^2)}$$

$$V_0 = \$29.42$$

RESIDUAL INCOME

Example: Multistage Model using the P/B

Calculate the PV of continuing residual income using P/B

- Use this to determine terminal value

Assume for the previous example

- Book value in year 3 = $25.00

  P/B is projected in year 3 as 1.10

The projected stock price in year 3:

- $25 × 1.10 = $27.50

EXAMPLE: MULTISTAGE MODEL USING THE P/B

$$V_0 = B_0 + \sum_{t=1}^{T} \frac{E_t - r_E B_{t-1}}{(1+r_E)^t} + \frac{P_T - B_T}{(1+r_E)^T}$$

$$V_0 = \$20 + \frac{\$0.50}{1.10^1} + \frac{\$0.85}{1.10^2} + \frac{\$1.00}{1.10^3} + \frac{\$27.50 - \$25.00}{1.10^3}$$

$$V_0 = \$23.79$$

RESIDUAL INCOME

Accounting Adjustments for the Residual Income Model

Example	Adjustment to Financial Statement
Over several years, Firm A has consistently **recorded losses in its available-for-sale securities**	Adjust net income downward ↓
Firm B consistently **capitalizes expenditures** that should have been expensed	Adjust net income and book value downward ↓
Firm C has recorded **foreign currency translation losses** on its balance sheet over several years; the losses are expected to continue	Adjust net income downward ↓
Firm D **accelerates revenues** to the current period and defers expenses to later periods	Adjust net income and book value downward ↓

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MOVING FROM EV TO P

Valuing nonoperating assets

- **Excess cash and marketable securities**

  They can be converted into cash on short notice. Reported at fair market value (IFRS/US GAAP)

  Shouldn't value liquid nonoperating assets if market values are available!

- **Nonconsolidated subsidiaries and equity investments**

  Equity stakes between 20% and 50%: historical cost plus reinvested income (equity method)

  Equity stakes below 20%: historical cost (may be used fair value AFS/FV)

  Exchange rate effects?

  Price/EV multiples?

  Estimations by analysts?

MOVING FROM EV TO P

Valuing nonoperating assets

- **Loans to other companies**

  Loans to nonconsolidated subsidiaries and other companies: use the reported book value.

- **Finance subsidiaries**

  Because financial subsidiaries differ significantly from manufacturing and services, these segments have to be **valued separately** (e.g., PSA, Volkswagen).

- **Discontinued operations**

  Remove from the **FCF** and adjust **earnings** to exclude gains/losses from these operations.

MOVING FROM EV TO P

Valuing nonoperating assets

- **Excess real estate**

  They are no longer required for the firm's operations. Any cash flow generated by these assets is **excluded from the FCF projection**. These assets shouldn't be valued separately, except if they are expected to be sold in the near term – use book values (conservatism).

- **Tax loss carryforwards**

  A firm may have DTA and DTL. Only tax loss carry-forwards should be **valued separately**. Create a separate account for the accumulated tax loss carry-forwards and forecast the development of this account.

- **Excess pension assets**

  See slides "*Advanced Valuation Issues* - Chp 5. financial analysis and reporting"

MOVING FROM EV TO P

Valuing debt and debt equivalents

- **Debt**

  If the debt is relatively secure and actively traded (commercial paper, notes payable, fixed and floating bank loans, corporate bonds, and capitalized leases), **use its market value**. If not, **estimate the current value** using YTMs.

  If the default risk is low, the book value is a good approximation for **fixed-rate debt**.

  Market values of **floating-rate debt** are not sensitive to interest rates if the default risk is relatively stable.

- **Highly levered firms**

  Especially for distressed companies, it can be applied as an integrated-scenario approach.

  The scenario valuation approach treats equity like a **call option** on EV.

MOVING FROM EV TO P

Valuing debt and debt equivalents

- **Operating leases**

  See slide "*Advanced Valuation Issues* - Chp 5. financial analysis and reporting"

- **Securitized receivables**

  See slide "*Advanced Valuation Issues* - Chp 5. financial analysis and reporting"

- **Provisions**

  See slide "*Advanced Valuation Issues* - Chp 5. financial analysis and reporting"

- **Contingent liabilities**

  See slide "*Advanced Valuation Issues* - Chp 5. financial analysis and reporting"

MOVING FROM EV TO P

Valuing hybrid securities and minority interests

- **Convertible debt and convertible preferred stock**

  Straight corporate bond + call option on equity

  1. Market value: if actively traded
  2. Black-Scholes value: if the market value is inappropriate, use an option-based valuation
  3. Conversion value: assumes that all convertible bonds are immediately exchanged for E

- **Employee stock options**

  1. Black-Scholes or advanced binomial models
  2. Exercise value approach: all options are exercised immediately – ignores the time value of the options

- **Minority interests**

  Similar to nonconsolidated subsidiaries but should **use the market or intrinsic value**.