

Financial Statement Analysis and Security Valuation

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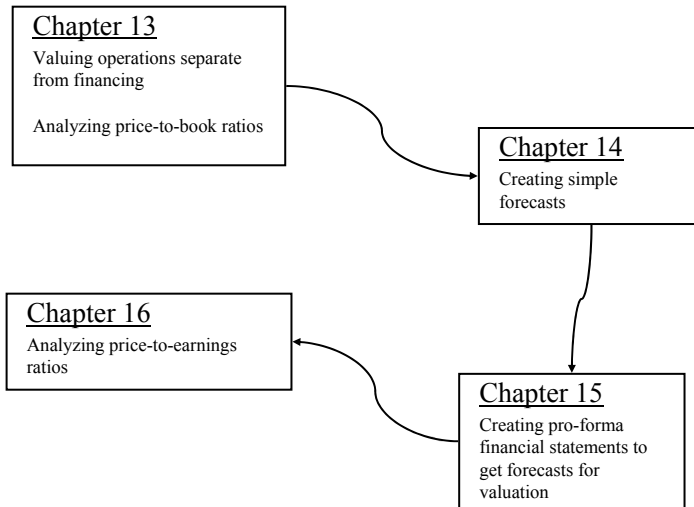
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Part III

Forecasting and Valuation Analysis

Layout of Part III



Valuation of Operations and the Analysis of Price-to-Book Ratios

Chapter 13

What you will learn in this chapter

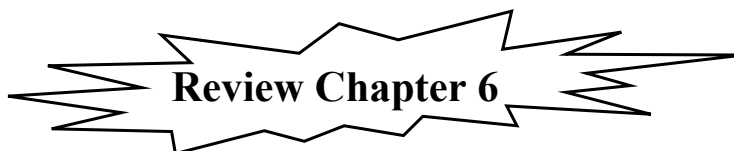
- What a perfect balance sheet is
- How a perfect balance sheet implies a zero residual earnings forecast
- What a normal P/B is
- Why forecasted residual income on financial assets and liabilities is usually zero
- How one values firms based on forecasts of operating activities
- What residual operating income is
- The drivers of residual operating income
- The difference between the cost of capital for equity and the cost of capital for operations
- How financial leverage effects both ROCE and the required return for equity
- The difference between levered and unlevered P/B ratios and how they are calculated

The Accrual Accounting Valuation Model

$$V_0^E = CSE_0 + \sum_{t=1}^T \rho_E^{-t} (\overline{earn}_t - (\rho_E - 1) \overline{CSE}_{t-1}) + CV_T / \rho_E^T$$

The valuation of equity

- Forecast future residual income (RE)
- Calculate continuing value
- Take present values and add to current book value



The First Three Steps of Fundamental Analysis

1. Identify the forecast target: future earnings and book values (Chapter 6)
2. Establish the current information: financial statement analysis (Part II: Chapters 7-12).
This reveals current RE (and ROCE) and its drivers
3. Forecasting: determine the transition from the current to the future
How will future RE be different from current RE?

Forecasting involves preparing pro forma financial statements for the future, following the template in Chapter 9

The RE Forecast is a Forecast of Earnings Against a Benchmark

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$$\overline{RE}_1 = \overline{earn}_1 - \underbrace{(\rho_E - 1)CSE}_2_0$$

- (1) Forecast of comprehensive earnings for next year
- (2) Benchmark forecast of comprehensive earnings: CSE will earn at the cost of capital

The Perfect Balance Sheet

MS, Inc. Balance Sheet, December 31, Year 0					
<u>Assets</u>	<u>Year 0</u>	<u>Prior Year</u>	<u>Equities</u>	<u>Year 0</u>	<u>Prior Year</u>
Marketable equity securities (at market)	23.4	20.3	Long-term debt (NFO)	7.7	7.0
	_____	_____	Common shareholders' equity (CSE)	<u>15.7</u>	<u>13.3</u>
NOA	<u>23.4</u>	<u>20.3</u>		23.4	<u>20.3</u>

The Perfect Balance Sheet (cont.)

<u>MS, Inc.</u> <u>Income Statement, Year 0</u>	
Operating income	
Dividends from equity securities	1.2
Unrealized gains from equity securities	<u>1.9</u>
	3.1
Interest expense: 0.10 x 7.0	<u>(0.7)</u>
Net income	2.4
<u>MS, Inc.</u> <u>Statement of Cash Flows, Year 0</u>	
Cash flow from operations (cash dividends)	1.2
Cash flow - investment activities	<u>(1.2)</u>
Free cash flows	<u>0.0</u>
Cash-financing activities	0.0
<i>(Borrowing cost is 10%; equity cost of capital is 12%)</i>	

Forecasting from a Perfect Balance Sheet

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$$\overline{earn}_1 = (\rho_E - 1) CSE_0 = 0.12 \times \$15.7 = \$1.884$$

<u>MS, Inc.</u>	
<u>Pro Forma Income Statement, Year 1</u>	
Operating Income	2.654
Interest Expense: $0.10 \times \$7.7$	<u>0.770</u>
Net Income: $0.12 \times \$15.7$	<u>1.884</u>

$$V_0^E = CSE_0$$

The Normal P/B Ratio

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Box 13.1

- Residual earnings expected to be zero
- ROCE expected to equal the cost of equity capital
- Cum-dividend book values expected to grow at the cost of equity capital

- $V_0^E = CSE_0 \Rightarrow \frac{V_0^E}{CSE_0} = 1$

The Imperfect Balance Sheet

PPE, Inc.
Balance Sheet, December 31 Year 0

<u>Assets</u>	<u>Year 0</u>	<u>Prior Year</u>	<u>Equities</u>	<u>Year 0</u>	<u>Prior Year</u>
Property, plant & equipment (at cost less accum deprec)	74.4	69.9	Long-term debt (NFO)	7.7	7.0
			Common shareholders' equity (CSE)	<u>66.7</u>	<u>62.9</u>
NOA	<u>74.4</u>	<u>69.9</u>		<u>74.4</u>	<u>69.9</u>

PPE, Inc.
Income Statement, Year 0

Operating income	
Sales of products	124.9
Cost of goods sold (included dep. of 21.4)	<u>(114.6)</u>
	10.3
Other operating expenses	<u>(0.5)</u>
	9.8
Interest expense: 0.10×7.0	<u>(0.7)</u>
Net income	<u>9.1</u>

**The
Imperfect
Balance
Sheet (cont.)**

PPE, Inc.
Statement of Cash Flows, year 0

Cash flow from operations	
Operating income	9.8
Depreciation	<u>21.4</u>
	31.2
Cash flow from investing activities	
Investments in PPE (21.4+4.5)	<u>25.9</u>
Free cash flows	5.3
Financing flows	<u>5.3</u>
Dividends paid	5.3

A Modification of the RE Model

- RE Model:

$$V_0^E = CSE_0 + PV \text{ of } RE$$

Some assets and liabilities have zero expected RE because they are measured at market value

- Modified Model:

$$V_0^E = CSE_0 + PV \text{ of } RE \text{ of net assets not at market value}$$

Residual Earnings Components

Net Income Component	Book Value Component	Residual Earnings Component
Operating Income (OI)	Net Operating Assets (NOA)	$ReOI = OI_t - (\rho_F - 1) NOA_{t-1}$
Net Financial Expense (NFE)	Net Financial Obligations (NFO)	$ReNFE = NFE_t - (\rho_D - 1) NFO_{t-1}$
Earnings (earn)	Common Stockholders' Equity (CSE)	$RE = \text{earn}_t - (\rho_E - 1) CSE_{t-1}$

Forecasting Residual Operating Income (ReOI)

- NFO **are** usually at market value on the balance sheet (or close to it). So residual earnings from NFO are expected to be zero
- NOA **are not** usually at market value in the balance sheet

$$V_0^E = \underbrace{NOA_0 + \sum_{t=1}^{\infty} \rho_F^{-t} (\overline{OI}_t - (\rho_F - 1) \overline{NOA}_{t-1})}_{(1)} - \underbrace{NFO_0}_{(2)}$$

The Residual Operating Earnings Model

(1) Value of the firm (value of the operations)

(2) Value of the net debt

The Residual Earnings Model

$$\begin{aligned}
 V_0^E &= \underbrace{CSE_0}_{\downarrow} + \sum_{t=1}^{\infty} \rho_E^{-t} \left(\underbrace{\overline{earn}_t}_{\downarrow} - \underbrace{(\rho_E - 1) \overline{CSE}_{t-1}}_{\downarrow} \right) \\
 &= \underbrace{NOA_0 - NFO_0}_{\downarrow} + \sum_{t=1}^{\infty} \rho_E^{-t} \left[\underbrace{\overline{OI}_t - \overline{NFE}_t}_{\downarrow} - (\rho_E - 1) \underbrace{(\overline{NOA}_{t-1} - \overline{NFO}_{t-1})}_{\downarrow} \right] \\
 &= \underbrace{NOA_0 - NFO_0}_{\downarrow} + \sum_{t=1}^{\infty} \rho_F^{-t} \left(\overline{OI}_t - (\rho_F - 1) \overline{NOA}_{t-1} \right) - \sum_{t=1}^{\infty} \rho_D^{-t} \left(\overline{NFE}_t - (\rho_D - 1) \overline{NFO}_{t-1} \right) \\
 &= \underbrace{NOA_0 - NFO_0 + \sum_{t=1}^{\infty} \rho_F^{-t} \left(\overline{OI}_t - (\rho_F - 1) \overline{NOA}_{t-1} \right)}_{\downarrow} + \underbrace{0}_{\downarrow}
 \end{aligned}$$

The Residual Operating Earnings Model

Residual Earnings Forecast Components

	Nike	Reebok
Base Data for 1996:		
Net operating assets (NOA)	2,659	1,135
Net financial obligations (NFO)	<u>228</u>	<u>720</u>
Total equity	2,431	415
Minority interest	<u>-</u>	<u>34</u>
Common stockholders' equity (CSE)	2,431	381
Analysts' earning forecast for 1997		
Earnings forecast	648	143
Less NFE forecast (NFO x Core NBC)	(8)	(29)
Less minority interest in earnings	<u>-</u>	<u>(15)</u>
Analysts' implicit OI forecast	656	187
Calculation of residual earnings components:		
Residual operating income (ReOI) forecast		
Nike: $656 - (0.110 \times 2,659)$	364	
Reebok: $187 - (0.101 \times 1,135)$		72
Residual net financial expense (ReNFE) forecast		
Nike: $8 - (0.035 \times 228)$	0	
Reebok: $29 - (0.040 \times 720)$		0

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Box 13.2

Continuing Values for the Residual Operating Income Model

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Box 13.3

$$\text{Case 1: } CV_T = 0$$

$$\text{Case 2: } CV_T = \frac{\text{Re } OI_{T+1}}{\rho_F - 1}$$

$$\text{Case 3: } CV_T = \frac{\text{Re } OI_{T+1}}{\rho_F - g}$$

Reebok Int'l. Ltd. Residual Operating Income Valuation

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Table 13.2

	<u>1996A</u>	<u>1997E</u>	<u>1998E</u>	<u>1999E</u>	<u>2000E</u>
Operating income		187.0	200.4	214.4	229.4
Net operating assets (NOA)	1,135	1,214.5	1299.5	1390.4	1487.8
RNOA (%)		16.5	16.5	16.5	16.5
ReOI (0.101)		72.4	77.7	83.2	89.0
PV of ReOI (1.101 ¹)		65.8	64.1	62.3	60.6
Total PV of ReOI	253				
Continuing value (CV) ¹					3,071.9
PV of CV	<u>2,091</u>				
Value of NOA	<u>3,479</u>				
Book value of NFO	<u>720</u>				
Value of equity	<u>2,759</u>				
Value of minority interest ²	<u>210</u>				
Value of common equity	<u>2,549</u>				
Value per share (on 55.840 million shares)	45.65				

¹CV = (89.0 x 1.07)/(1.101 - 1.07) = 3071.9
²The value of the minority interest depends on the value of the NOA in the relevant subsidiaries. It has been calculated here as 14 times minority interest earnings.

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The Drivers of Residual Operating Income

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- The Drivers of RE:

$$RE_t = \text{earn}_t - (\rho_E - 1)CSE_{t-1} = [ROCE_t - (\rho_E - 1)]CSE_{t-1}$$

- The Drivers of ReOI:

$$\text{Re } OI_t = OI_t - (\rho_F - 1)NOA_{t-1} = [RNOA_t - (\rho_F - 1)]NOA_{t-1}$$

(1)
(2)

(1) RNOA

(2) NOA put in place to earn at RNOA

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The Cost of Capital for Operations

- Operations have their own risk, referred to as operational risk
- This risk determines the required return (or cost of capital) to invest in the operations
- The required return is called the cost of capital for operations or the cost of capital for the firm: ρ_F
- It is also called the weighted average cost of capital because

$$\text{For MS, Inc. } \rho_F = \frac{V_0^E}{V_0^{NOA}} \rho_E + \frac{V_0^D}{V_0^{NOA}} \rho_D$$

$$11.34\% = \left[\frac{15.7}{23.4} \times 12\% \right] + \left[\frac{7.7}{23.4} \times 10\% \right]$$

The Cost of Capital for Debt

After Tax Cost of Debt (ρ_D) = Nominal Cost of Debt \times (1 - t)

t is the marginal income tax rate

The Cost of Equity Capital

- The cost of capital for equity is really derived from the cost of capital for operations (not vice versa)

$$\rho_E = \frac{V_0^{NOA}}{V_0^E} \rho_F - \frac{V_0^D}{V_0^E} \rho_D$$

or
$$\rho_E = \rho_F + \frac{V_0^D}{V_0^E} (\rho_F - \rho_D)$$
 (Compare to the ROCE formula)

Equity risk has two components

- 1. Operational risk
- 2. Financing risk
 - Leverage
 - Spread
- So, for MS, Inc., the equity cost of capital is

$$12.0\% = \left[\frac{23.4}{15.7} \times 11.34\% \right] - \left[\frac{7.7}{15.7} \times 10\% \right]$$

Cost of Operating Capital: Nike and Reebok

- Cost of equity using CAPM:
 - Nike: $5.4\% + .95 \times 6\% = 11.1\%$
 - Reebok: $5.4\% + 1.10 \times 6\% = 12.0\%$

- Market values at 1996 year end:

	Nike	Reebok
Market value of equity	14,950	2,352
Net financial obligations (assumed at market)	228	720
Market value of net operating assets	15,178	3,072

- Cost of capital for operations (WACC):

$$\text{Nike: } \left[\frac{14,950}{15,178} \times 11.1\% \right] + \left[\frac{228}{15,178} \times 3.5\% \right] = 11.0\%$$

$$\text{Reebok: } \left[\frac{2,352}{3,072} \times 12.0\% \right] + \left[\frac{720}{3,072} \times 4.0\% \right] = 10.1\%$$

Required Return and Accounting Return on Equity

Required Return
on Equity:

$$\rho_E = \rho_F + \frac{V_0^D}{V_0^E} (\rho_F - \rho_D)$$

market
leverage

Accounting Return
on Equity:

$$ROCE = RNOA + \frac{NFO}{CSE} (RNOA - NBC)$$

book
leverage

Leverage and Valuation

ReOI Valuation of Firm with 9% cost of capital for operations & 5% after-tax cost of debt

	0	1	2	3
Net operating assets	1,300			
Net financial obligations	<u>300</u>			
Common shareholders' equity	1,000			
Operating income		135	135	135---->
Net Financial expense (300 x 0.05)		<u>15</u>	<u>15</u>	<u>15</u> ---->
Earnings		<u>120</u>	<u>120</u>	<u>120</u> ---->
Residual operating income, ReOI (0.09)		18	18	18---->
PV of ReOI	<u>200</u>			
Value of common equity	<u>1,200</u>			
Value per share (on 600 shares)	<u>2.00</u>			

Leverage and Valuation

RE Valuation of the Same Firm

Cost of equity capital =	$9.0\% + \frac{300}{1,200} \times [9.0\% - 5.0\%] = 10.0\%$			
	0	1	2	3
Net operating assets	1,300			
Net financial obligations	<u>300</u>			
Common shareholders' equity	1,000			
Earnings		120	120	120---->
ROCE		12%	12%	12%---->
Residual earnings, RE (0.10)		20	20	20---->
PV of RE	<u>200</u>			
Value of common equity	<u>1,200</u>			
Value per share (on 600 shares)	<u>2.00</u>			

Leverage and Valuation

RE Valuation for the Same Firm after Debt for Equity Swap

Cost of equity capital =	$9\% + \frac{700}{800} \times [9\% - 5\%] = 12.5\%$			
	0	1	2	3
Net operating assets	1,300			
Net financial obligations	<u>700</u>			
Common shareholders' equity	600			
Operating income		135	135	135---->
Net Financial expense (700 x 0.05)		<u>35</u>	<u>35</u>	<u>35</u> ---->
Earnings		<u>100</u>	<u>100</u>	<u>100</u> ---->
ROCE		16.7%	16.7%	16.7%
Residual earnings, RE (0.125)		25	25	25---->
PV of RE	<u>200</u>			
Value of common equity	<u>800</u>			
Value per share (on 400 shares)	<u>2.00</u>			

Levered and Unlevered P/B Ratio

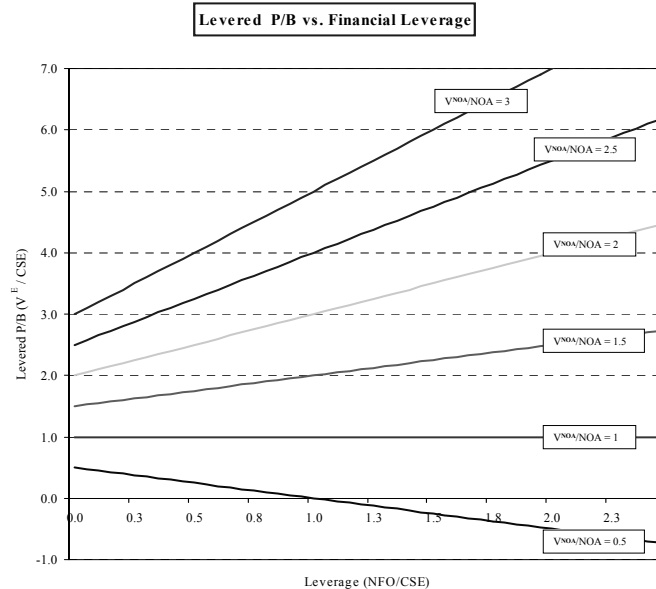
$$\text{Levered P/B} = \frac{V_0^E}{CSE_0}$$

$$\text{Unlevered P/B} = \frac{V_0^{NOA}}{NOA_0}$$

$$\text{Levered P/B} = \frac{V_0^{NOA} - V_0^{NFO}}{NOA - NFO} = \frac{V_0^{NOA}}{NOA_0} + FLEV \left[\frac{V_0^{NOA}}{NOA_0} - 1 \right]$$

[FLEV is the leverage ratio, NFO/CSE]

Levered P/B vs. Financial Leverage

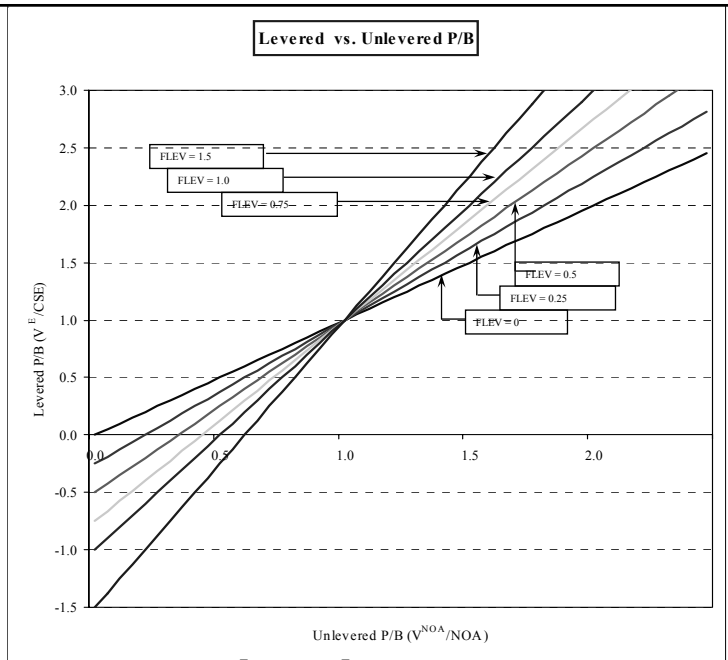


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Figure 13.1a

$$\frac{V^E}{CSE} = \frac{V^{NOA}}{NOA} + FLEV \left[\frac{V^{NOA}}{NOA} - 1 \right]$$

Levered vs. Unlevered P/B

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Figure 13.1b



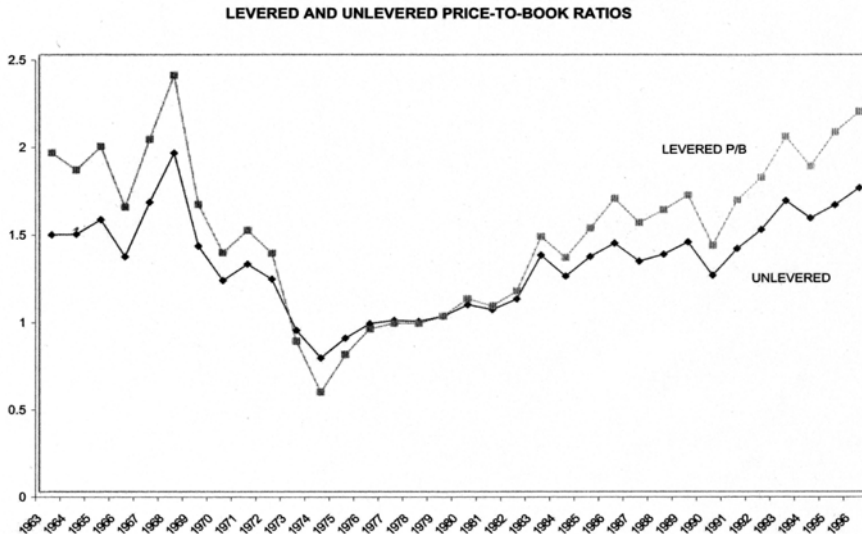
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$$\frac{V^E}{CSE} = \frac{V^{NOA}}{NOA} + FLEV \left[\frac{V^{NOA}}{NOA} - 1 \right]$$

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Median Levered and Unlevered P/B Ratios, 1963-96 for NYSE & AMEX Firms

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Figure 13.2



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The Leverage Effects

Concept	Levered Measure	Unlevered Measure	Relationship
Profitability	ROCE	RNOA	$ROCE = RNOA + FLEV[RNOA - NBC]$
Cost of Capital	ρ_E	ρ_F	$\rho_E = \rho_F + \frac{V_0^D}{V_0^E} [\rho_F - \rho_D]$
P/B Ratio	V_0^E / CSE_0	V_0^{NOA} / NOA_0	$\frac{V_0^E}{CSE_0} = \frac{V_0^{NOA}}{NOA_0} + \frac{NFO_0}{CSE_0} \left[\frac{V_0^{NOA}}{NOA_0} - 1 \right]$