

# Advanced Group Accounting (RIKA)

Block 6

RECHTSWISSENSCHAFT WIRTSCHAFTSWISSENSCHAFTEN

Foto: Thomas Müller Ivan Reimann

# Course Structure

Block	Topic
	<i>Preparation: recap double-entry bookkeeping (online, self-study)</i>
1	Key Concepts
2	Acquisition Method
3	Consolidation
4	Subsequent Consolidation Goodwill Impairment
5	Joint Arrangement and Investments at Equity Changes in Control
6	<b>Analyzing Consolidated F/S</b>

# Course Structure

Block	Topic
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6	Analyzing Consolidated F/S
6.1	A Framework for Financial Ratio Analysis
6.2	Financial Ratio Analysis – Details

$$ROE = 10\%$$

$$\frac{\text{income}}{\text{investment}} = \text{return}$$



- How can we use financial ratios to assess the value of the corporate group?

risk

≈ cost of 5% equity

# What drives value?

$$ROE > r$$

## Three Pillars of Firm Value

### Profitability

*How large is the return on investment generated by the business?*

Measured by return on invested capital  
(equity holders: **RoE**)

### Risk

*Which return does the investment need to generate to be competitive with similar investment opportunities?*

Measured by cost of capital (**r**)

### Growth

*By how much does the firm change the scale of its business?*

Measured by the change in invested capital  
(growth rate: **g**)

Value is created by **profitable growth**, relative to the firm's risk profile:

$$(1 + g) * (ROE - r) > 0$$

# What drives profitability?

What drives RoE? – The “**Basic DuPont Model**” provides some insights by decomposing RoE.

$$ROE = \frac{\text{profit}}{\text{sales}} \times \frac{\text{sales}}{\text{average total assets}} \times \frac{\text{average total assets}}{\text{average common equity}}$$

$$ROE = \text{net profit margin} \times \text{asset turnover} \times \text{leverage}$$

**Detailed margin analysis**

How profitably can the firm convert sales into profits?

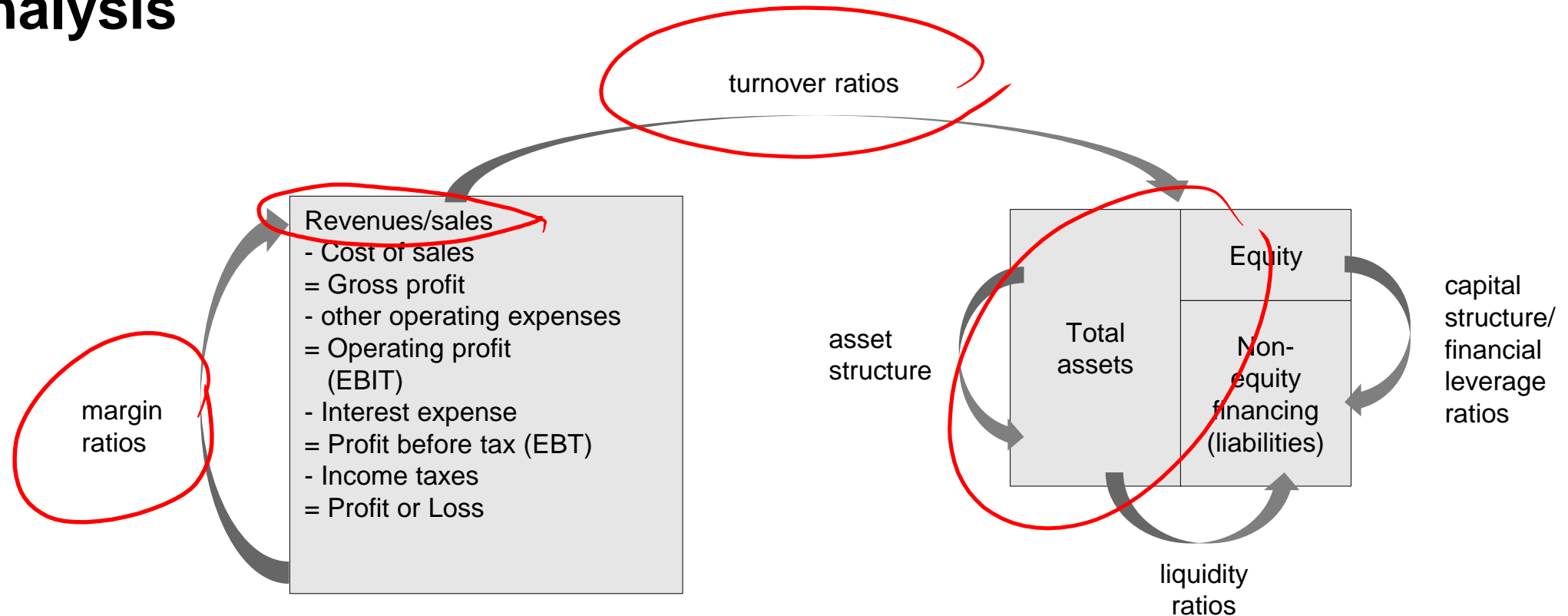
**Detailed turnover analysis**

How efficiently does the firm use its assets to make sales?

**Detailed leverage analysis**

How do the firm's long-term solvency and short-term liquidity look like?

# Financial Ratios for detailed margin, turnover, and leverage analysis



When comparing flows (→ income statement) to stocks (→ balance sheet): use average stocks for the year!

# Balance Sheet Effects of M&A Transactions

Parent Consolidated Balance Sheet (prior to consolidation of Sub) Dec 31, 20X1	
Assets	Equity
	Liabilities
Total	Total

*changes in capital structure*

- + equity attributable to NCI
- + Sub's book value of liabilities and fair value adjustments
- Intragroup liabilities (e.g., loan from Sub to Parent)

- Intragroup assets (e.g., receivable from Sub owed to Parent)

- + Sub's book value of assets, any fair-value revaluations (hidden reserves), newly identified intangibles, and goodwill

# Income Statement Effects of M&A Transactions

+ Depreciation / amortization of fair value adjustments

Parent Consolidated Income Statement (prior to consolidation of Sub) Dec 31, 20X1	
Sales	
- Cost of sales	
= Gross profit	
- R&D expenses	
- SG&A expenses	
- Net other operating expenses	
= EBIT	
+ Income from associates	
+ Interest income	
- Interest expense	
= EBT	
- Tax expense	
= Net income	

+ interest from newly issued debt

- Items from intragroup transactions (e.g., sales from Parent to Sub)

+ items of Sub's stand-alone income statement

+ income generated through synergies (e.g., increased sales or lower costs)



# Understanding margin ratios

mark-up  
↳ competition



R&D advertising

# Profit margins for selected industries: **lowest** gross profit margin

	<i>Profit Margins</i>				<i>Cost Structure</i>		
<i>Industry Name</i>	<i>Gross Margin</i>	<i>Net Margin</i>	<i>EBIT Margin</i>	<i>EBITDA Margin</i>	<i>COGS/Sales</i>	<i>R&amp;D/Sales</i>	<i>SG&amp;A/Sales</i>
Engineering/Construction	12.15%	2.18%	4.06%	5.66%	87.85%	0.02%	7.65%
Healthcare Support Services	14.62%	2.46%	4.53%	5.04%	85.38%	0.02%	8.54%
Auto Parts	16.73%	4.92%	8.88%	11.32%	83.27%	3.24%	6.51%
Aerospace/Defense	20.72%	7.92%	11.94%	13.67%	79.28%	3.41%	6.93%
Chemical (Basic)	21.25%	9.30%	12.73%	16.26%	78.75%	0.63%	7.61%
Construction Supplies	22.82%	7.47%	11.79%	13.30%	77.18%	2.47%	8.54%
Computer Services	24.70%	4.03%	8.35%	10.76%	75.30%	1.89%	13.66%
Building Materials	26.62%	5.23%	9.37%	11.90%	73.38%	0.80%	15.89%
Food Processing	27.86%	11.98%	13.22%	16.83%	72.14%	0.60%	14.08%
Retail (Distributors)	28.21%	5.63%	8.01%	8.28%	71.79%	0.01%	18.65%
Advertising	28.54%	3.10%	11.62%	14.43%	71.46%	0.44%	13.80%

Source: Aswhin Damodaran's data page

# Profit margins for selected industries: **highest** gross profit margin

	<i>Profit Margins</i>				<i>Cost Structure</i>		
<i>Industry Name</i>	<i>Gross Margin</i>	<i>Net Margin</i>	<i>EBIT Margin</i>	<i>EBITDA Margin</i>	<i>COGS/Sales</i>	<i>R&amp;D/Sales</i>	<i>SG&amp;A/Sales</i>
Information Services	55.28%	18.41%	26.86%	30.45%	44.72%	1.81%	22.41%
Telecom. Services	55.37%	18.76%	18.54%	31.04%	44.63%	0.51%	20.92%
Healthcare Products	57.74%	5.80%	15.30%	21.71%	42.26%	7.67%	32.47%
Semiconductor	58.16%	21.47%	29.61%	37.19%	41.84%	17.07%	9.27%
Oil/Gas (Production and Exploration)	58.49%	9.94%	13.74%	35.31%	41.51%	0.06%	7.82%
Software (Internet)	63.27%	1.88%	11.22%	18.00%	36.73%	12.62%	35.70%
Software (Entertainment)	65.91%	18.91%	27.62%	28.48%	34.09%	15.95%	21.89%
Drugs (Pharmaceutical)	68.60%	10.94%	23.30%	29.77%	31.40%	19.28%	26.46%
Software (System & Application)	70.67%	10.45%	21.28%	26.98%	29.33%	16.91%	31.77%
Drugs (Biotechnology)	70.71%	-1.61%	19.31%	28.69%	29.29%	35.92%	28.48%

Source: Aswhin Damodaran's data page

# M&A Transactions and Margin Ratios

Which margin ratios do you think are affected and how?

- Buyer is an international cosmetics company (production and distribution). Target is a well-known B2C company that operates cosmetics stores in Australia. Buyer purchases Target to gain access to the Australian customer market segment. 40% of the purchase price is allocated to Target's brand value.
- Buyer is a producer of pharmaceutical products. Target is a research company with significant in-process R&D.
- Buyer is a supermarket chain operating several (physical) stores. Target operates an online shopping platform. The collection and analysis of customer data is key to Target's business model.
  - Alternative: What if Target operates the physical stores and Buyer operates the online platform?

# What drives profitability? – Disaggregating RoE

What drives RoE? – The “**Basic DuPont Model**” provides some insights by decomposing RoE.

$$ROE = \frac{\text{profit}}{\text{average common equity}}$$

$$ROE = \frac{\text{profit}}{\text{sales}} \times \frac{\text{sales}}{\text{average total assets}} \times \frac{\text{average total assets}}{\text{average common equity}}$$

$$ROE = \text{net profit margin} \times \text{asset turnover} \times \text{leverage}$$

**Detailed margin analysis**

How profitably can the firm convert sales into profits?



**Detailed turnover analysis**

How efficiently does the firm use its assets to make sales?

**Detailed leverage analysis**

How do the firm's long-term solvency and short-term liquidity look like?

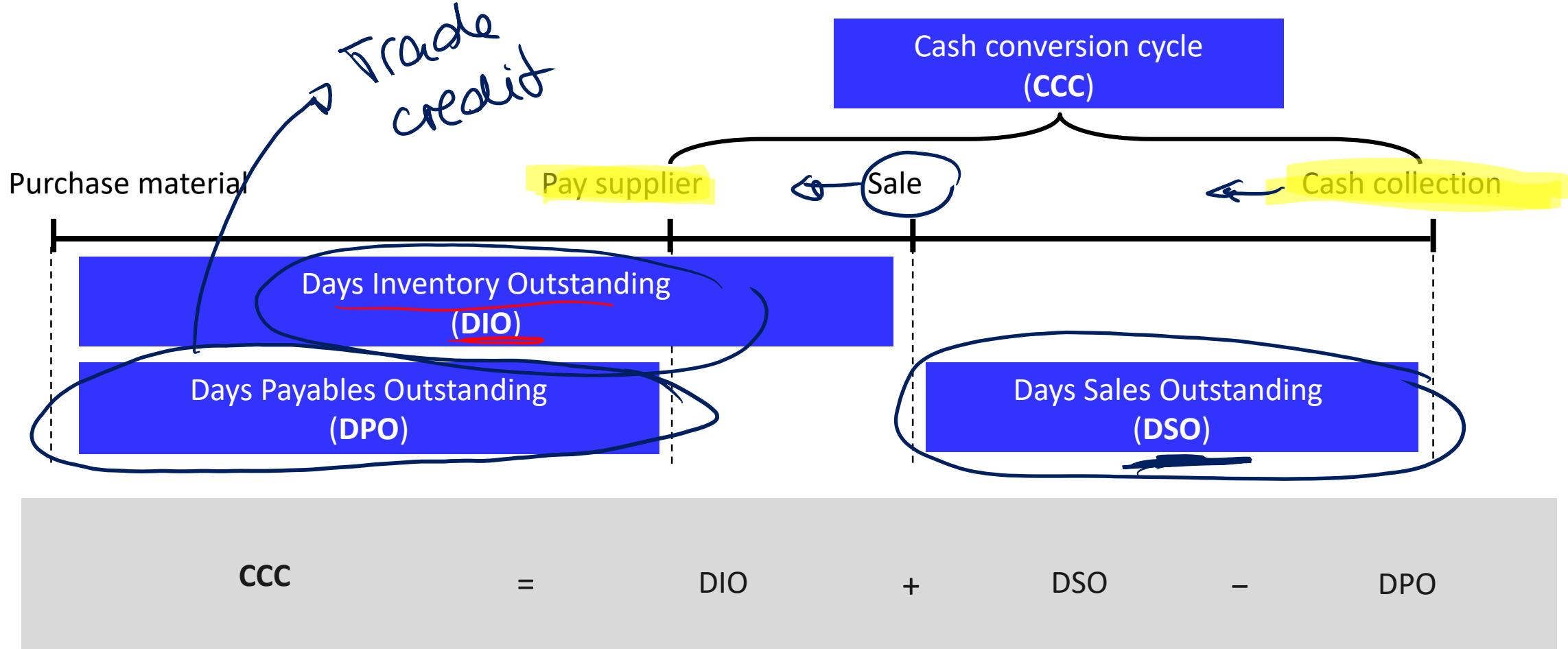
See also: Lundholm, R. and R. Sloan, Equity Valuation and Analysis with eVal, 3<sup>rd</sup> edition 2013, pp. 116-121.

# Detailed turnover analysis

- General definition: **sales / balance sheet item**
  - Example: Total asset turnover of 2 means that for \$1 of sales, the firm needs to maintain 0.5\$ of assets.
- Turnover ratios reflect the amount of assets which the firm requires to generate its sales.
- Also referred to as **“efficiency ratios,”** as they reflect how efficiently the firm is employing its assets.
- Turnover ratios may be affected by missing recognition on the balance sheet.
  - Example: intangible assets, self-generated brand value
- Turnover ratios may be affected by working capital management around the balance sheet dates.

# Cash conversion cycle

- How efficiently does the company manage its working capital?



# Turnover ratios

- **Net working capital turnover ratio:  $\text{Sales} / (\text{Current Operating Assets} - \text{Current Operating Liabilities})$** 
  - Efficient working capital management would be reflected in low working capital, and high turnover ratio
  - Trade-offs involved in maintaining low working capital (e.g., discounts from suppliers; credit sales needed to attract customer purchases)
- **Receivables turnover:  $\text{Sales} / \text{Receivables}$** 
  - Reflects how often the firm turns over its receivables into sales each year
  - The higher the receivables turnover, the shorter the average days to collect receivables.
- **Inventory turnover:  $\text{Cost of Goods Sold} / \text{Inventory}$** 
  - Use Cost of Goods Sold rather than Sales because inventories are carried at cost; ratio reflect efficiency of inventory use rather than price mark-ups
  - The higher inventory turnover, the shorter the average inventory holding period.
- **Payables turnover:  $\text{Purchases} / \text{Payables}$** 
  - Use Purchases (costs of goods sold plus change in inventory) to reflect input measure rather than price mark-up



# Turnover ratios

- **PP&E turnover ratio:  $\text{Sales} / \text{PP\&E}$**

- Low PP&E ratios may reflect idle capacities (e.g., lavish headquarters)
- Reveals, e.g., how efficiently a retailer can use its stores
- Reflects different business models (e.g., internet sales versus offline sales)

- **Intangible assets turnover ratio:  $\text{Sales} / \text{Intangibles}$**

- Ability to convert intellectual property into sales (e.g., rents from innovation; licensed/patented products)
- Affected by different accounting treatments for acquired vs. self-generated intangibles

# M&A transactions and turnover ratios

Which turnover ratios do you think are affected and how?

- Buyer is a producer of pharmaceutical products. Target is a research company with significant in-process R&D.
- Buyer is a jewelry manufacturer. Target is a supplier of gold. Previous to the acquisition, Target has supplied gold to Buyer. (Vertical acquisition)
- Buyer and Target are both professional services firms. After the acquisition, they will be able to share Buyer's headquarter building.

# What drives profitability? – Disaggregating RoE

What drives RoE? – The “**Basic DuPont Model**” provides some insights by decomposing RoE.

$$ROE = \frac{\textit{profit}}{\textit{averagecommonequity}}$$

$$ROE = \frac{\textit{profit}}{\textit{sales}} \times \frac{\textit{sales}}{\textit{averagetotal assets}} \times \frac{\textit{averagetotal assets}}{\textit{averagecommonequity}}$$

$$ROE = \textit{net profit margin} \times \textit{asset turnover} \times \textit{leverage}$$

**Detailed margin analysis**

How profitably can the firm convert sales into profits?



**Detailed turnover analysis**

How efficiently does the firm use its assets to make sales?

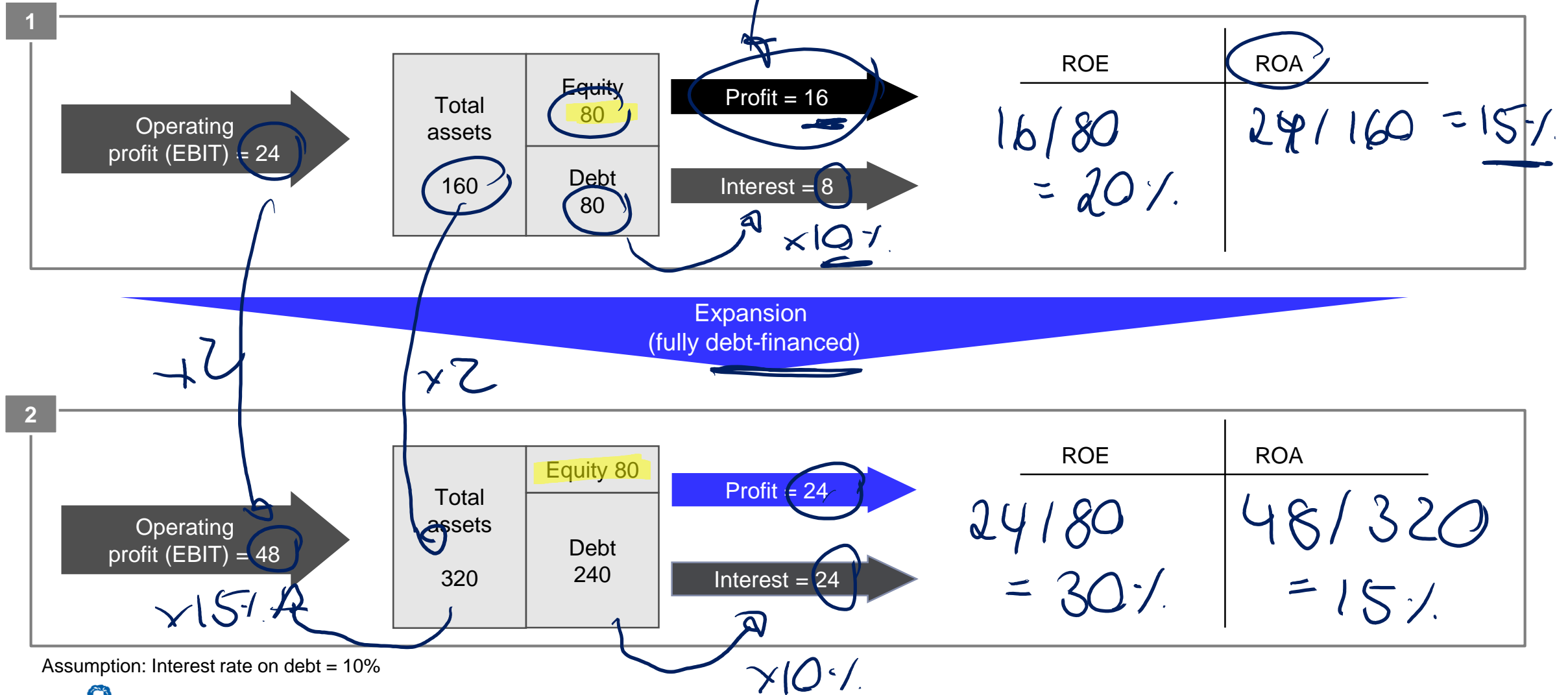


**Detailed leverage analysis**

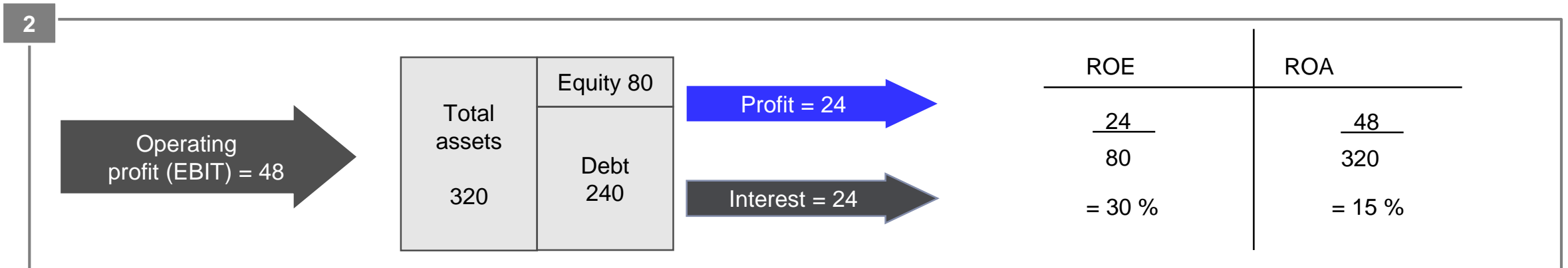
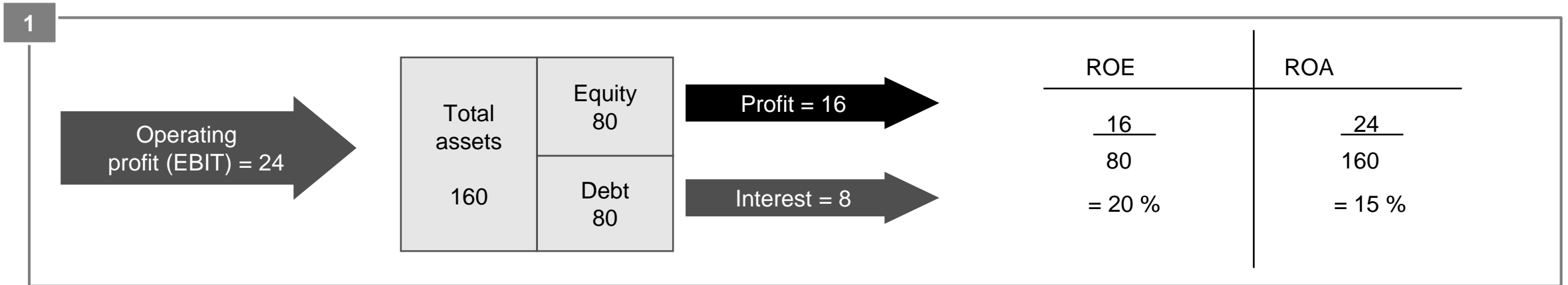
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# The leverage effect



# The leverage effect



Assumption: Interest rate on debt = 10%

# Better understanding leverage: the Advanced DuPont Model

- The Advanced DuPont model decomposes return on equity into a component that is due to operating profitability (Return on Net Operating Assets = RNOA) and the leverage effect

$$\text{Return on Equity} = \text{Return on Net Operating Assets} + \text{Leverage} \times \text{Spread}$$

- Ratios are calculated based on the **analytical financial statements**
  - Key idea: go line by line and assign all assets, liabilities, revenues, and expenses to the operating or financial sphere of the company

# Analytical Financial Statements

→ working capital, PP&E, intangibles

→ payables

A	E&L
Operating Assets	Equity
Financial Assets	Financial Liabilities
Total Assets	Operating Liabilities
	Equity + Liabilities

→ cash holdings, fin. instruments

Sales  
 Less: operating expenses  
 Plus: operating income  
 Less: financial expenses  
 Plus: financial income  
 Less: tax expense  
 = Net income

A	E&L
Operating assets	Equity
Less: operating liabilities	Financial obligations
= Net Operating Assets (NOA)	Less: financial assets
	= Net Financial Obligations (NFO)
NOA	Equity + NFO

Sales + operating income – operating expense = net operating income (NOI) before tax  
 Less: tax burden on NOI  
 = NOI after tax  
 Financial expenses – financial income = net financial expenses (NFE) before tax  
 Less: tax shield on NFE  
 = NFE after tax

Net income = NOI after tax – NFE after tax

# From as-reported to analytical financial statements

## Your turn!

As-Reported Balance Sheet		Analytical Balance Sheet	
Operating assets	800	Equity	500
Financial assets	200	Operating liabilities	250
		Financial liabilities	250
<b>Total</b>	<b>1000</b>	<b>Total</b>	<b>1000</b>

Operating assets	800	Equity	500
Less: Operating liabilities	250	Financial liabilities	250
<b>Net Operating Assets (NOA)</b>	<b>550</b>	Less: Financial assets	200
		<b>Equity + Net Financial Obligations (NFO)</b>	<b>550</b>

NFO = 50

Note:

- The reformulation does not change the overall amount of assets/liabilities.
- Therefore, equity is the same in the analytical financial statements as in the as-reported statements.



# From as-reported to analytical financial statements

## Solutions

As-Reported Balance Sheet			
Operating assets	800	Equity	500
Financial assets	200	Operating liabilities	250
		Financial liabilities	250
<b>Total</b>	<b>1000</b>	<b>Total</b>	<b>1000</b>

Analytical Balance Sheet			
Operating assets	800	Equity	500
Less: Operating liabilities	250	Financial liabilities	250
		Less: Financial assets	200
<b>Net Operating Assets (NOA)</b>	<b>550</b>	<b>Equity + Net Financial Obligations (NFO)</b>	<b>550</b>

Note:

- The reformulation does not change the overall amount of assets/liabilities.
- Therefore, equity is the same in the analytical financial statements as in the as-reported statements.

# From as-reported to analytical income statement

## Your turn!

As-reported Income Statement	
Sales	500
- Operating expenses	-300
+ other operating income	100
<b>= EBIT</b>	<b>300</b>
	5
+ Interest income	
- Interest expense	-40
<b>= EBT</b>	<b>265</b>
- Tax expense (effective tax rate: 20%)	-53
<b>= Net income</b>	<b>212</b>

Analytical Income Statement	
Net operating income before tax = <b>EBIT</b>	300
Less: tax on net operating income	-60
<b>= Net operating income after tax</b>	<b>240</b>
Net financing expense before tax	35
Less: tax shield on net financing expense	-7
<b>= Net financing expense after tax</b>	<b>28</b>
Net operating income after tax	240
Less: Net financing expense after tax	28
<b>= Net income</b>	<b>212</b>

$53 = 60 - 7$   
 tax burden 60      tax shield -7

# From as-reported to analytical income statement

## Solutions

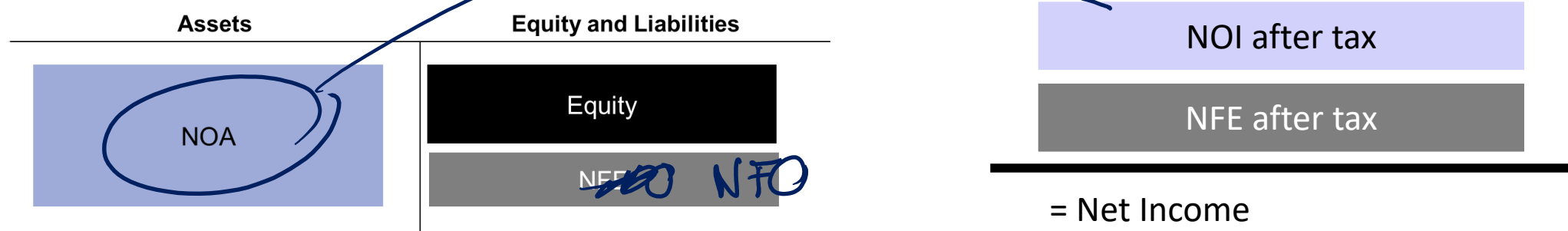
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Analytical Income Statement	
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Less: tax shield on net financing expense	-7
<b>= Net financing expense after tax</b>	<b>28</b>
Net operating income after tax	240
Less: Net financing expense after tax	28
<b>= Net income</b>	<b>212</b>

Note:

- The reformulation does not change the overall amount of expenses/income. Therefore, net income is the same in the analytical financial statements as in the as-reported statements.
- The reformulation does not change the overall amount of taxes, but only allocates the total tax expense to the financial/operating sphere. Therefore, total tax expense is the same in the analytical as in the as-reported statements (53 = 60 - 7).

# Financial ratios based on analytical F/S

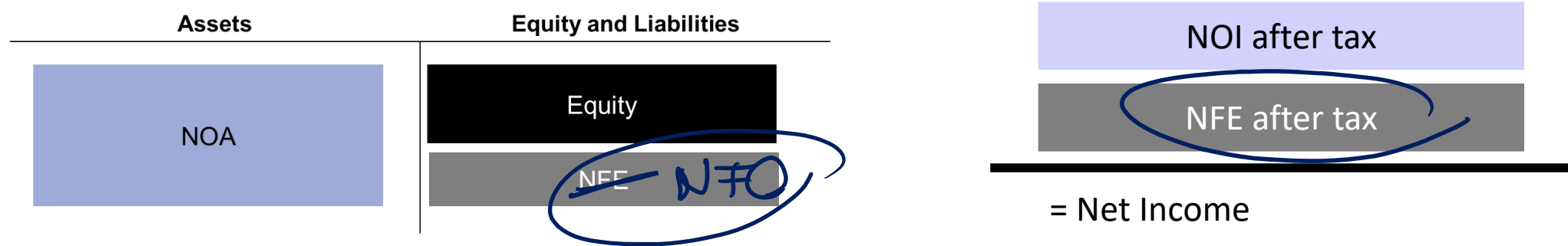


$$\text{Return on Net Operating Assets} = \frac{\text{Net operating income}}{\text{Net operating assets}}$$

## Interpretation:

- Net operating income reflects the after-tax income earned by the firm's operating assets
- Net operating assets reflect the resources used to generate the firm's net operating income
- RNOA presents a measure of the firm's operating performance that abstracts from the firm's financing.

# Financial ratios based on analytical F/S



$$\text{Net Borrowing Cost} = \frac{\text{Net financing expense}}{\text{Net financial obligations}}$$

## Interpretation:

- Net financing expense reflects the after-tax expense incurred by the firm for the financing of its operations
- Net financial obligations reflect the level of external capital (i.e., debt, non-controlling interests, and preferred stock) taken on by the firm to finance its operations
- NBC presents a measure of the flow to external capital providers relative to the amount of capital they provide

# Financial ratios based on analytical F/S

Spread =

Return on Net Operating Assets

–

Net Borrowing Cost

## Interpretation:

- The spread expresses the excess return that the firm can generate via its operations in excess of its financing costs

# Financial ratios based on analytical F/S



$$\text{Leverage} = \frac{\text{Net financial obligations}}{\text{Equity}}$$

## Interpretation:

- Relates the amount of capital provided by external capital providers to the capital provided by the firm's equity investors.
- The larger the ratio, the larger the leverage effect.

# Putting it all together: the Advanced DuPont Model

$$\text{Return on Equity} = \text{Return on Net Operating Assets} + \text{Leverage} \times \text{Spread}$$

- We can decompose ROE into two components:
  - Return generated by the firm in its operations (**RNOA**)
  - Return added by the leverage effect (**Leverage x Spread**)
    - Leverage is good if the firm earns a **positive spread**
    - Leverage is bad if the firm earns a **negative spread**
    - The extent of the leverage effect increases with the **scope of external financing** (a positive/negative spread matters more if leverage is higher)



# Putting it all together

Analytical Income Statement	
Net operating income before tax = EBIT	300
Less: tax on net operating income	-60
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Analytical Balance Sheet			
Operating assets	800	Equity	500
Less: Operating liabilities	250	Financial liabilities	250
		Less: Financial assets	200
<b>Net Operating Assets (NOA)</b>	<b>550</b>	<b>Equity + Net Financial Obligations (NFO)</b>	<b>550</b>

} NFO = 50

$$\begin{aligned}
 \text{RoE} &= \text{RNOA} + \text{Leverage} * \text{Spread} \\
 &= \frac{240}{550} + \frac{50}{500} * \left( \frac{240}{550} - \frac{28}{50} \right) \\
 &= 43\% + 0.1 * (43\% - 56\%)
 \end{aligned}$$

# Putting it all together

Analytical Income Statement	
Net operating income before tax = EBIT	300
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$$RoE = RNOA + Leverage * Spread$$

$$RoE = \frac{240}{550} + \frac{550}{500} * \left( \frac{240}{550} - \frac{28}{50} \right)$$

$$RoE = 43\% + 0.1 * (-13\%) = 42\%$$

# Analytical Financial Statements of Corporate Groups

- Classification of **non-controlling interests**:
  - Analytical balance sheet: equity or NFO
  - Analytical income statement: NOI of NFE; if NFE, no tax shield!
- Classification of income from associates (**equity method**):
  - Analytical balance sheet: operating asset or financial asset
  - Analytical income statement: NOI or NFE
- In both cases, **consistency** of classification is key!

# Analyzing the Profitability Effects of M&A Transactions

$$\text{Return on Equity} = \text{Return on Net Operating Assets} + \text{Leverage} \times \text{Spread}$$

- Consolidated RNOA: How much does the target contribute to the RNOA of the corporate group?
  - Unconsolidated RNOA of Target, relative to that of corporate group
  - Negative: increases in NOA due to uncovering of identifiable assets, fair value adjustments, and goodwill; reductions in revenues due to elimination of intra-group revenues; reductions in NOI due to depreciation and amortization on fair value adjustments
  - Positive: synergies (to the extent not captured by goodwill)
- Consolidated leverage
  - Effect depends on financing of transaction
  - Increase in leverage due to capital consolidation (equity)
  - Potential reduction in leverage due to elimination of intra-group liabilities

# Block 6: Key take-aways



- A key objective of financial statement analysis is to better understand the drivers of a firm's return on equity (RoE).
- Margin ratios capture the firm's ability to convert sales into profits further down towards the bottom line of the P&L. They are importantly influenced by a firm's competitive environment. Barriers to competition allow firms to charge higher mark-ups (reflected in the gross profit margin), but typically come with higher expenses below the gross profit line (e.g., R&D, marketing/advertising).
- Turnover ratios reflect how effectively the firm uses its resources. The uncovering of hidden reserves and fair value adjustments of business combinations tentatively reduce turnover ratios of organically grown firms (compared to those that grew by external acquisitions).
- The Advanced DuPont model decomposes the firm's profitability into a component that is driven by its operating profitability (RNOA) and the leverage effect.

# What's next?

- Self-study material, multiple choice questions and textbook references on Moodle
- End of semester:
  - Case study with PwC (12<sup>th</sup> July)
  - Recap and exam prep session (19<sup>th</sup> July) – send your questions in advance