Analyzing Firm Performance Using Financials

Assume the goal is to analyze how the firm creates value. This sheet focuses on two things:
- Reading financial statements to understand a firm's business model
- Identifying drivers of return on invested capital from various perspectives via ratio analysis

Flow and stock measures.

Why do we often divide by average stock values?

$$RoE = \frac{\text{net income}_t}{(\text{Equity}_t + \text{Equity}_{t-1})/2}$$

E.g., want to put net income into perspective to the average amount of invested equity in the period

Net income FY 2020

Equity 31.12.X1 · Equity 31.12.X2

Often true development unknown -> use average

Net income FY 2020 ?

Equity 31.12.X1 · Equity 31.12.X2

Net income FY 2020

Equity 31.12.X1 · Equity 31.12.X2

Analyzing means comparing

(In many cases, analyzing is the same as answering a question by making clever comparisons)
- Ratios: compare one number to another
  -> pick the right comparison for the right question
- Compare ratios/numbers over time
- Compare ratios/numbers to other companies
- Compare ratios/numbers to theoretical benchmarks

Central importance of Return on equity

$$\text{Equity Value}_t = BV_{eq,t} + \mathbb{E}_t\left[\sum_{i=1}^{\infty} \frac{(RoE_{t+i} - r_{eq}) * BV_{eq,t+i-1}}{(1 + r_{eq})^i}\right]$$

(Oversimplified: $RoE_{t+i} > r_{eq}$ key for value generation)

Return on Equity

How many $ does a firm earn its owners per $1 of equity put into it?

$$RoE_t = \frac{\text{Net Income}_t}{\text{Avg. } BV_{eq,t-1}}$$

Form of periodic return on investment

Entity and Equity Perspective of a Firm
- Firm is a combination of assets that are cleverly combined to create value
- How are these assets financed? -> Who has how much claim on the return on the (net) operating assets?
- Crucial for understanding different return on invested capital viewpoints

Return measure vs corresp. hurdle rate

RNOA vs r_{WACC}

RoE vs r_{eq}

| Firm Assets | Financial Assets | Operating Liabilities | Net Operating Assets | Invested Capital (Entity) | External Financing | Invested Capital (Equity) |

Assets not used in operations · Operation's "built-in" financing · Two sides of the same coin: net operating assets vs the amount of capital needed to run the firm's operations · Capital provided by external parties (e.g., bank debt) · Capital provided by the firm owners

Reading Financials to Understand a Business
- What are the big items on the BS? Indicators of material investments, risks, sources of finance, etc.
- What are the big items in the IS? Major sources of revenues, major cost sources
- Compare and put different positions into perspective
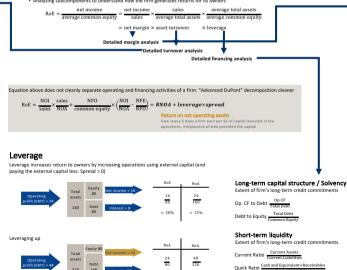- Conduct a detailed ratio analysis

Framework for Financial Analysis: What determines high return on investment for owners?
- If RoE is key, what are its determinants?
- Margins, Turnover, Leverage as subcomponents
- Analyzing subcomponents to understand how the firm generates returns for its owners

$$RoE = \frac{\text{net income}}{\text{average common equity}} = \frac{\text{net income}}{\text{sales}} \times \frac{\text{sales}}{\text{average total assets}} \times \frac{\text{average total assets}}{\text{average common equity}}$$

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

Detailed margin analysis

Detailed turnover analysis

Detailed financing analysis

Turnovers
- Compares amount of assets/invested capital to the revenues these generate
- Key aspect of performance: How much sales can the firm generate per deployed dollar of net operating assets?
- Used to analyze "leanness"/ efficiency from an invested capital perspective

Standard Balance Sheet Setup

Net working capital

DuPont Rearrangement

Fin. Assets	Op. Liabilities
Op. Assets	Fin. Liabilities
Fin. Assets	Op. Liabilities
Op. Assets	Fin. Liabilities
	Equity

Net Op. Assets → Net Fin. Oblig. / Net Fin. Oblig. / Equity

Net Operating Assets · Invested Capital (Entity)

Net operating assets (NOA) = op. assets (OA) − op. liabilities (OL)

Net financial obligations (NFO) = fin. liabilities (FL) − fin. Assets (FA)

Equation above does not cleanly separate operating and financing activities of a firm. "Advanced DuPont" decomposition cleaner

$$RoE = \frac{NOI}{\text{sales}} \times \frac{\text{sales}}{NOA} + \frac{NFO}{\text{common equity}} \times \left(\frac{NOI}{NOA} - \frac{NFE}{NFO}\right) = RNOA + leverage \times spread$$

Return on net operating assets

How many $ does a firm earn per $1 of capital invested in the operations, irrespective of who provided the capital

Net Operating Asset Turnover

$$\frac{\text{sales}}{\text{avg. net operating assets}}$$

How much sales can be generated with $1 of invested capital

Net Working Capital Turnover

$$\frac{\text{sales}}{\text{avg. curr. operating assets} - \text{avg. curr. operating liabilities}}$$

Working capital efficiency How much sales can be generated per $1 of net working capital

... any non-current sensible non-current turnover

Avg. Days to Collect Receivables
$$\frac{365}{\text{sales/avg. accounts receivable}}$$
Lower receivable collection period implies higher efficiency

Avg. Days to Sell Inventory
$$\frac{365}{\text{cogs/avg. inventory}}$$
Lower inventory holding period implies higher efficiency

Avg. Days to Pay Payables
$$\frac{365}{\text{purchases/avg. accounts payables}}$$
*(purchases = cogs + Δinventory)

How long can you stretch to pay payables. Longer payback time increases working capital efficiency

Leverage

Leverage increases return to owners by increasing operations using external capital (and paying the external capital less: Spread > 0)

Operating profit (EBIT) = 24

| Total assets 160 | Equity 80 | Net income = 16 |
| | Debt 80 | Interest = 8 |

	RoE	RoA
	$\frac{16}{80}$	$\frac{24}{160}$
	= 20%	= 15%

Leveraging up

Operating profit (EBIT) = 48

| Total assets 320 | Equity 80 | Net income = 24 |
| | Debt 240 | Interest = 24 |

	RoE	RoA
	$\frac{24}{80}$	$\frac{48}{320}$
	= 30%	= 15%

Long-term capital structure / Solvency

Extent of firm's long-term credit commitments

Op. CF to Debt $\frac{\text{Op CF}}{\text{Total Debt}}$

Debt to Equity $\frac{\text{Total Debt}}{\text{Common Equity}}$

Short-term liquidity

Extent of firm's long-term credit commitments

Current Ratio $\frac{\text{Current Assets}}{\text{Current Liabilities}}$

Quick Ratio $\frac{\text{Cash and Equivalent+Receivables}}{\text{Current Liabilities}}$

EBIT interest coverage $\frac{\text{EBIT}}{\text{Interest Expense}}$

Margins
- Compares (sub) profits versus revenues
- Key aspect of profitability: How much does the firm earn on a dollar of revenues generated?
- Used to analyze "which costs eat up most of revenues" by walking down the income statement

| Revenue |
Gross Profit	Cost of goods sold
EBITDA	Other operating expenses
EBIT	Depr. & Amort.
EBT	Interest expenses
Net income	Tax expenses

Gross Margin $\frac{\text{Gross Profit}}{\text{Revenue}}$ — "Price premium" How much can firm charge over cost of making/buying product?

EBITDA Margin $\frac{\text{EBITDA}}{\text{Revenue}}$ — How much is left per dollar of sales after cost of operations?—ignoring wear and tear

EBIT Margin $\frac{\text{EBIT}}{\text{Revenue}}$ — How much is left per dollar of sales after cost of operations? (Note: less direct relation with sales depending on variable to fixed costs ratio)

Net Margin $\frac{\text{Net Income}}{\text{Revenue}}$ — How much is left per dollar of sales all costs?

Other margins
- For specific cost combinations (e.g., cogs + marketing)
- For cleaner separation of (core) operations vs. financing or non-recurring items
- Often industry or business model specific

NOI Margin $\frac{\text{Net operating income}}{\text{Revenue}}$ — "Cleaner" version of EBI margin

Sales Margin $\frac{\text{Gross Profit} - \text{sales expense}}{\text{Revenue}}$ — Example of an industry-specific margin

Note on EBITDA as a performance measure:
Some accounting experts don't like it, but it's very prevalent (e.g., private equity, M&A, etc.) Common arguments for EBITDA make it sound like "a generalizable (one-size fits all) number that summarizes (1) the firm's profitability, (2) cash flow, and (3) credit quality (ability to service debt)". (Bouwens, Jan, Ties De Kok, and Arnt Verriest. "The prevalence and validity of EBITDA as a performance measure." Comptabilité-Contrôle-Audit 25.1 (2019): 55-105.) That obviously cannot all be true at once. Bouwens et al. have a good discussion. It's a hybrid, often used for strategic reasons. The sensible use case seems to be if you are interested in the operating performance before important investment and financing outlays. (e.g., as private equity often is because they often change investment and financing policies.) It is also often advocated as being "closer to cash flow". That's fine. But remember, we do not view cash flow generally good periodic performance measure.

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