University of Nottingham
UK | CHINA | MALAYSIA

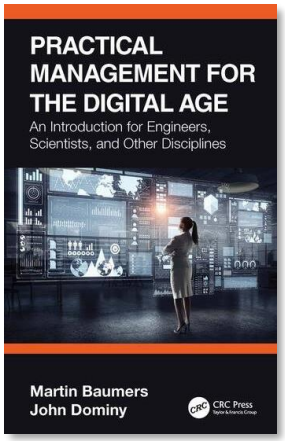
Department of Mechanical, Materials and Manufacturing Engineering

Financial analysis

What we will talk about today:

Financial Analysis

- *What is financial analysis about?*
- *Profitability, solvency, liquidity and stability*
- *Financial ratios*
  - *Profitability ratios*
  - *Activity ratios*
  - *Liquidity ratios*
- *Cost-volume-profit analysis*
- *Financial metrics and ratios*



Lecture builds on Chapter 14 in Baumers and Dominy (2021)

Financial analysis

The topic of *financial analysis* concerns
the assessment of the commercial viability,
stability and benefits of a business
(or *any* other project of a commercial nature).

→ *Where financial analysis draws information from the financial statements, it is also referred as financial statement analysis or analysis of finance.*

Objectives of financial statement analysis

On the basis of the financial statements, it is important to be able to relate the figures that are presented to those of other businesses. This is necessary to allow us to:

- Compare with our own organisation in past (and projected future) years
  - Informing business strategy
- Compare with competing companies
  - Assess standing in competition
- Compare with other sectors
  - e.g. is it more profitable to invest in our coffee club or the oil industry?
- Demonstrate to (potential) owners how profitable the company is
  - Could inform investment decision, e.g. on the stock market

→ *A surprising amount of information about companies can be obtained in this way…*

There are four fundamental issues which are assessed:

When applied to the business as a whole, financial analysis is often directed at identifying four aspects: profitability, solvency, liquidity and stability.

- **Profitability** – does the company offer a good return on its sales?

- **Solvency** –in financial management, solvency is the degree to which the current assets of a business exceed the current liabilities of that business. Solvency thus reflects the ability to pay bills, meet obligations and pursue activities directed at growth.

Four fundamental issues cont'd:

- **Liquidity** – is the company able to meet its current and future commitments, for instance can it afford raw materials, pay for the premises and pay its workforce?

    - "Liquidity" is an important concept in finance and business. Here, it describes the availability of cash or the capacity to obtain it on demand

    - Also applies to assets

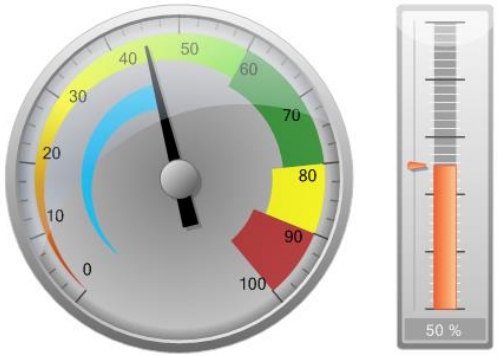
→ "current assets" or "variable assets"

→ "non-current assets" or "fixed assets"

- **Stability** – the ability to endure temporary problems such as periods of low sales, lower-than ideal levels of funding, the unavailability of important equipment or the loss of important employees

In management, accounting and finance a number of "financial ratios" are often used to assess the situation and condition of a business

- Financial ratios give information on the **relative magnitude of two or more selected numerical values**
- The numerical values are taken from the **financial statements**
- **There are many different** standard financial ratios. But beware: Often, the same financial ratio is known under different names!
- Come in a group of categories… we will present the main ones



1. Profitability Ratios

Profitability ratios measure the firm's use of its assets and control of its expenses to generate an acceptable rate of return

Gross Profit to Sales Ratio

$$Gross\ Profit\ to\ sales\ ratio = \frac{Gross\ profit}{Sales\ revenue} \times 100$$

- This is the basic ratio for evaluating the Gross Profit. It provides a measure of the gross profit for every £100 of sales
- It is also known as the "Gross margin"
- Hence, if the answer is 15%, the company is making £15 on each £100 of sales:
  - Effectively, this relates the sales revenue to the cost of manufacture
  - If the ratio is positive the product is a least potentially profitable if other costs can be controlled
  - A negative ratio indicates that the product will always make a loss unless something can be done about the manufacturing costs

Net Profit to Sales Ratio

$$Net\ Profit\ to\ sales\ ratio = \frac{Net\ profit}{sales\ revenue} \times 100$$

- Also known simply as the “Net margin”
- Since it is based on the net profit, it takes operating and other costs into account
- If the ratio is positive then the company is making money. If not then it will be making a loss
- However, the loss may be recoverable if the costs of operating the company can be controlled
- This is often when companies start to “downsize” or cut R&D spending for example
- A change in the net profit ratio would indicate either:
    - A change in the Gross profit to sales ratio
    - A change in the expenses involved in running the company

Expenses to Sales Ratio

$$Expenses\ to\ sales\ ratio = \frac{Expenses}{Sales\ revenue} \times 100$$

- This represents the cost of running the company, relative to the companies revenues
- Clearly, then, high values are bad. An increase in the expense ratio would indicate:
  - An increase in the cost of running the company
  - A decrease in sales
- Either would require management action

Return on Capital Employed (ROCE)

$$Return\ on\ capital\ employed = \frac{EBIT}{Total\ assets - Current\ liabilities} \times 100$$

This ratio shows how much profit has been made relative to the capital employed (= the money the owners put in) and long-term liabilities

- This information comes from the balance sheet and the profit & loss statement.
- Example:

Item from financial statements	Company A	Company B
EBIT	$3,837.00	$13,955.00
Total assets	$11,123.00	$115,406.00
Current liabilities	$3,200.00	$29,210.00
Capital employed ($Total\ assets - Current\ liabilities$)	$7,923.00	$86,196.00
Return on capital employed	48.43%	16.19%

2. Activity Ratios

Also known as Efficiency Ratios, Activity Ratios measure the effectiveness of a firm's use of its resources.

Stock Turnover Ratio

$$Stock\ Turnover\ Ratio = \frac{Cost\ of\ Goods\ Sold\ (COGS)}{Average\ stock}$$

- Also often called "Stock Turn". Note that it expressed as a simple number, not as a percentage:
  - A fundamental of lean manufacture is that a company should keep its stock as low as possible and sell is goods as soon as possible. Stock Turn defines how well a company is managing to do this
- Typically, for a manufacturing business a reasonable stock turn would be 2-8.
- Normally, if the company increases stock turn, it will become more profitable

Example: a company incurs COGS (= Sales – Gross Profit) of £50,000. It has an opening stock of £4,000 and a closing stock of £6,000. The average stock = (£4,000 + £6,000) / 2 = £5,000. The stock turn is then obtained by forming the ratio £50,000 / £5,000 = 10.

3. Liquidity Ratios

Liquidity ratios help understand a company pay its current liabilities. If a company has sufficient funds (generally called “working capital”) to pay its debts at the appropriate time it is said to have satisfactory liquidity.

Current Ratio (or working capital ratio)

$$Current\ Ratio = \frac{Current\ assets}{Current\ liabilities}$$

- The current ratio is the most commonly used liquidity ratio. I answers the question “Does the company have a sufficient financial cushion to meet its current bills?”
- So, if the current assets are £150,000 and the current liabilities are £50,000, then the Current Ratio is 3
- This ratio may change quite rapidly due, for instance, to paying creditors or developing a new product
- Companies generally try to have a current ratio of around 1. Lower current ratios can indicate a liquidity problem

Acid Test

$$Acid\ Test = \frac{Current\ assets - Inventory}{Current\ liabilities}$$

- The Acid Test is also referred to as the “Quick Ratio”
- Essentially, it measures the amount of “quick liquid assets” per £ of current liabilities
- It is a measure of the ratio of only assets that are cash or quickly convertible to cash, to the liabilities. These assets can also include marketable securities and accounts receivable
- It shows whether there are enough liquid assets to be able to pay current liabilities quickly
- If it gets too low, it sounds alarms to the suppliers and bankers and the company may find it difficult to operate normally. Essentially, is shows if the company meet its short term obligations if it cant sell its inventory of stock

A Worked Example

Based on excerpts from Profit & Loss statement and balance sheet:

Profit & loss statement entries for the year ended December 31, 2020

	Crazy Things Inc.	Spaced-Out Inc.
Sales Revenues		
Cash sales	$25,000	$22,500
Credit sales	$50,000	$91,000
Total sales revenue	$75,000	$113,500
Cost of goods sold	$15,000	$17,500
Gross profit	$60,000	$96,000
Operating expenses		
Salaries	$9,000	$6,000
Advertising	$4,000	$5,000
Office Rent	$4,000	$6,000
Utilities	$300	$600
Office supplies and consumables	$400	$200
Depreciation	$100	$700
Other expenses	$300	$200
Total operating expenses	$18,100	$18,700
Operating profit	$41,900	$77,300
Other expenses		
Interest expenses	$3,400	$2,000
Income tax expenses	$4,500	$7,000
Net profit	$34,000	$68,300

Additional information:

CTI: opening stock of $2,000 and closing stock of $4,000

SOI: opening stock of $7,000 and closing stock of $6,000

Balance sheet entries, December 31, 2020

	CTI	SOI
Assets		
Current assets		
Cash and cash equivalents	$3,000	$7,000
Accounts receivable	$200	$500
Inventory	$4,000	$6,000
Prepaid expenses	$1,500	$500
Investment	$4,000	$2,000
Total current assets	**$12,700**	**$16,000**
Fixed assets		
Land	$10,000	$1,200
Buildings and improvements	$10,500	$1,000
Equipment	$3,300	$4,000
Less accumulated depreciation	-$1,000	-$500
Other assets		
Intangible assets	$3,500	$4,000
Less accumulated amortization	-$200	-$300
Total assets	**$38,800**	**$25,400**
Liabilities and owners' equity		
Current liabilities		
Accounts payable	$500	$1,000
Notes payable	$100	$100
Accrued expenses	$2,800	$500
Deferred revenue	$1,200	$200
Total current liabilities	**$4,600**	**$1,800**
Long term liabilities		
Long term debt	$15,000	$1,200
Total liabilities	**$19,600**	**$3,000**
Owners' equity		
Common shares	$17,400	$15,000
Additional paid-in capital	$2,000	$3,000
Retained earnings	$2,300	$4,900
Treasury shares	-$2,500	-$500
Total liabilities and owner's equity	**$38,800**	**$25,400**

Now we calculate the financial ratios

Financial ratio	Crazy Things Inc.	Spaced-Out Inc.
Gross Profit to Sales Ratio	$\frac{\$60,000}{\$75,000} = 80\%$	$\frac{\$96,000}{\$113,500} = 85\%$
Net Profit to Sales Ratio	$\frac{\$34,000}{\$75,000} = 45\%$	$\frac{\$68,300}{\$113,500} = 60\%$
Expense to Sales Ratio	$\frac{\$18,100}{\$75,000} = 24\%$	$\frac{\$18,700}{\$113,500} = 16\%$
ROCE	$\frac{\$34,000 + \$3,400 + \$4,500}{\$38,800 - \$4,600} = 123\%$	$\frac{\$68,300 + \$2,000 + \$7,000}{\$25,400 - \$1,800} = 328\%$
Stock Turnover Ratio	$\frac{\$15,000}{(\$2,000 + \$4,000)/2} = 5.0$	$\frac{\$17,500}{(\$7,000 + \$6,000)/2} = 2.7$
Current Ratio	$\frac{\$12,700}{\$4,600} = 2.8$	$\frac{\$16,000}{\$1,800} = 8.9$
Acid Test	$\frac{\$12,700 - \$4,000}{\$4,600} = 1.9$	$\frac{\$16,000 - \$6,000}{\$1,800} = 5.6$

What observations can we make from this?

- Spaced-Out Inc. is more profitable than Crazy Things Inc., both in terms of net profit and ROCE → very high values of ROCE for both businesses are typical of small companies requiring only very limited capital
- Crazy Things Inc. exhibits a higher stock turnover ratio than Spaced-Out Inc., coupled with a lower level at sales. Maybe it is pricing the products too low? The stock turnover ratio for both businesses is not high
- Crazy Things Inc. has far greater fixed assets than Spaced-Out Inc and exhibits a higher expense to sales ratio. This suggests that Crazy Things Inc. should reconsider the structure of its operations → perhaps reducing assets?
- Spaced-Out Inc. exhibits a very high current ratio and acid test. This suggests that too much cash is held in the business…

Financial decision making

Why is financial analysis important?

Any business requires a measure of business performance This allows the managers and directors to answer questions such as:

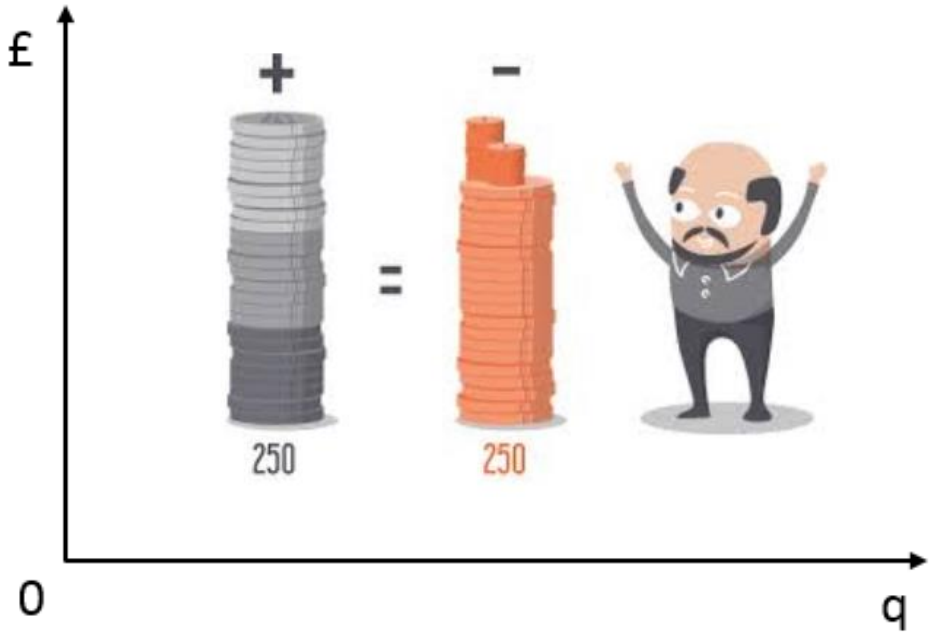
- Are we operating profitably?
- Are our costs under control?
- How our competitors doing in comparison with us?
- Can we bench-mark our performance with organisations in other sectors?

The tool we will use to measure this is called "Breakeven Analysis"…

Cost-volume-profit analysis (A.K.A. breakeven analysis)

Can be defined as techniques used to compare functional relationships sharing the same variable to identify points of intersection:

- Normally used to identify where financial inflows and outflows are in balance (they “break even”)
- Can also be used to evaluate other aspects, e.g. the costs of candidate technologies



The cost side

Recall the concepts of total cost (TC), variable costs (VC) and fixed costs (FC) in a simple, linear specification:

$$TC(q) = FC + VC(q) = a + bq$$

- Where *a* is a constant reflecting fixed cost and *b* is an cost increment reflecting variable cost and *q* is the quantity

On this basis, we can specify average cost (AC):

$$AC(q) = \frac{TC(q)}{q} = \frac{a + bq}{q} = aq^{-1} + b$$

… and marginal cost (MC) as the derivative of *TC(q):*

$$MC(q) = TC'(q) = \frac{d}{dq}[TC(q)] = \frac{d}{dq}[a + bq] = b$$

The revenue side

As before, recall the concepts of total revenue (TR) and average revenue (AR), again in a simple, linear specification:

$$TR(q) = pq \qquad AR(q) = \frac{TR(q)}{q} = p$$

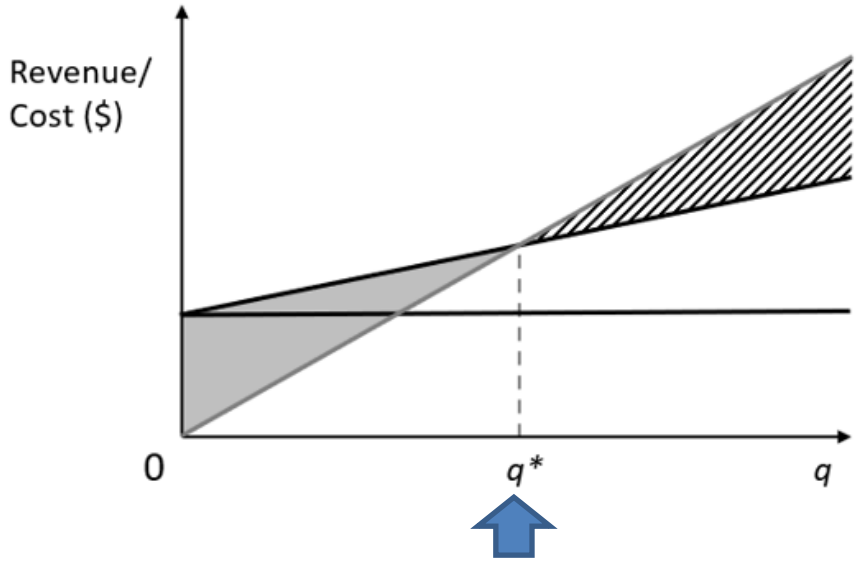
- Where *p* is the price obtained per unit sold and *q* is the quantity

On this basis, we can specify marginal revenue (MR) as the derivative of *TR(q):*

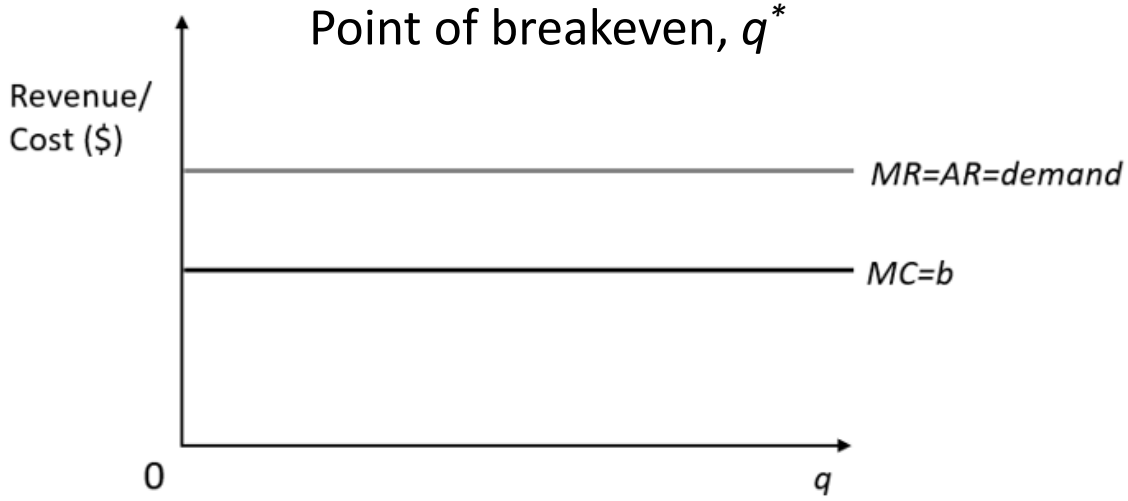
$$MR(q) = TR'(q) = \frac{d}{dq}[TR(q)] = \frac{d}{dq}[pq] = p = AR(q)$$

- Note that in the linear revenue model AR = MR = p, which also equates to the demand faced by the firm (horizontal line → price taker!)

Graphical solution for the breakeven analysis



Point of breakeven, q^*



Numerical solution

Simply set

$$TR(q^*) = \mathrm{TC}(q^*)$$

Which can be solved for q^*:

$$q^* = \frac{a}{p - b}$$

Note that MR and MC are both constant, and that the firm has no influence on price. This implies:

- The first order condition of profit maximisation will never be satisfied (MR=MC)
- This is a special case in which output can be expanded infinitely, suggesting a small company

Two simple financial metrics in breakeven analysis

Using the framework, we are able to calculate simple financial measures.

The first measure is the *Contribution*, which measures the additional profit obtained from the marginal unit of output.

Recall that profit (π) is the difference between TR and TC:

$$\pi(q) = TR(q) - TC(q)$$

So, in our simple linear framework:

$$\pi(q) = pq - (a + bq) = q(p - b) - a$$

Hence the marginal profit function can be specified as the derivative of *π(q):*

$$Contribution = \pi'(q) = \frac{d}{dq}[TR(q) - TC(q)] = \frac{d}{dq}[q(p - b) - a] = p - b$$

Margin of safety

Margin of safety is indicative of what amount is gained or lost over or below the point of breakeven.

- It is calculated by forming the ratio of the difference of total revenue and breakeven revenue to breakeven revenue and is normally expressed in percentage terms:

$$Margin\ of\ Safety = \frac{TR(q) - TR(q^*)}{TR(q)} \times 100$$

A worked example

A new and growing business in the medical sector called MEDITECH is to be investigated. We are asked to identify breakeven quantity, breakeven revenue and the Margin of Safety.

- The business reports its total revenue function and total cost function are both linear
- We receive the following data about MEDITECH:

Sales (= Total Revenue)	£500,000 / year
Total variable costs (*TVC*)	£350,000 / year
Total fixed costs (= Fixed Cost)	£100,000 / year
Price	£10

A worked example (cont'd)

The first step is to identify the Variable Costs (VC):

- We know that price p = £10 and that Total Revenue TR = £500,000.

→ At the observed level of VC, the quantity is £500,000/£10=50,000 and VC is linear. Hence, VC=TVC/q=£350,000/50,000=£7

- Now the TC and TR functions can be identified:

$$TR(q) = pq = £10q$$

$$TC(q) = a+bq = £100,000 + £7q$$

- Thus, at breakeven, where $TR(q^*) = TC(q^*)$:

$$£10q^* = £100,000 + £7q^*$$

$$q^* = 33,333 \text{ units / year}$$

A worked example (cont'd)

- Breakeven revenue is simply pq*, which is £10 x 33,333:

$$pq^* = £333,330 \text{ / year}$$

- Using the Total Revenue (£500,000) and pq* we can construct the margin of safety using the given formula:

Margin of safety = ((£500,000 - £333,330) / £500,000) x 100) = 33.33%

This flexible framework can be used for a variety of purposes….

So what happens when the technology changes:

- For example, you could explore the effect of a change in technology on the margin of safety, entering through a new total cost function.

- Total revenue stays the same:

$$TR(q) = pq = £10q$$

- But the total cost function changes, e.g. from using a scaled-up technology with higher fixed costs and lower variable costs.

$$TC_{new}(q) = a_{new} + b_{new}q = £200{,}000 + £2q$$

So what happens when the technology changes (cont'd):

- At breakeven we set $TR(q^*_{new}) = TC(q^*_{new})$:

$$£10q^*_{new} = £200{,}000 + £2q^*_{new}$$

$$q^*_{new} = 25{,}000 \text{ units / year}$$

- Using the total revenue from before (£500,000) and pq^*_{new} we can construct the margin of safety using the given formula:

Margin of safety = ((£500,000 - £250,000) / £500,000) x 100) = 50%

How do we interpret this?

- Prior to the technological change, we had a margin of safety of 33%

→ This indicates that, at the current level of Revenue, Meditech can lose 33% of its *actual* quantity and still be profitable…

- After the technological change with higher fixed costs and lower variable costs (perhaps through the adoption of higher volume processes) the margin of safety is 50%

→ Now Meditech can lose 50% of its quantity and still be profitable

→ In effect, despite having higher fixed costs, the technology adoption has de-risked the operation

Lecture summary in three points

- Know now what financial analysis is about
- Know and are able to calculate major financial metrics
- Understand cost-volume-profit analysis and can use it in simple models

University of Nottingham

UK | CHINA | MALAYSIA

Thank you!