CHARTA LEARNING · LESSON NOTES

Financial statement modeling and forecasting

CFA Level I · Financial Statement Analysis

You will learn: Build a sales-driven forecast of the statements, adjust it for inflation and competitive position, choose a forecast horizon with a terminal value, and offset the biases that distort forecasts.

Running example: Worked examples follow one made-up company, Kestrel Foods ($ millions). Base year: revenue 1,000, cost of goods sold 60% of sales (600), variable selling 8% (80), fixed administration 150, depreciation 50, EBIT 120, interest 20 (debt 400 at 5%), tax 25%, net income 75.

1. Building a sales-driven forecast

- A model is a set of linked calculations that starts from a sales forecast, built from volume × price or segment by segment. A pro forma statement shows the numbers if the forecast comes true. The method is the same under IFRS and US GAAP.
- Give each line its own rule: variable costs (cost of goods sold, variable selling) as a percentage of sales; fixed costs modelled on their own; depreciation from the asset base and capital spending; interest from forecast debt and its rate; tax at the effective rate on profit before tax.
- Treating fixed costs as variable hides operating leverage: profit grows faster than sales once fixed costs are covered. Treating every cost as variable would give profit growth of only 8.15%, understating profit by 16.3.

KESTREL NEXT YEAR (VOLUME +5%, PRICE +3%)		
Revenue	1,000 × 1.05 × 1.03	**1,081.5**
Cost of goods sold / variable selling	60% / 8% × 1,081.5	**648.9 / 86.5**
Operating profit (EBIT)	1,081.5 − 648.9 − 86.5 − 150 − 50	**146.1**
Profit before tax	146.1 − 20.0 interest	**126.1**
Net income	126.1 − 31.5 tax	**94.6**
Growth: sales / EBIT / net income		**8.15% / 21.73% / 26.08%**

Watch out: Treating fixed costs as a percentage of sales.

2. The balance sheet: working capital and the plug

- Turn turnover ratios around: receivables from days sales outstanding (DSO) on revenue, inventory from days of inventory on hand (DIO) on cost of goods sold (COGS), payables from days payables outstanding (DPO) on COGS. Past ratios use average balances; the forecast sets the year end balance directly, a simplification.
- The balance sheet must balance through a plug, usually cash, or a revolving credit line if cash would turn negative. Inspect it: a huge or negative plug means the growth, dividend or capital spending assumptions are probably unrealistic. Compare implied margins and returns with history and peers.

Receivables = DSO × revenue ÷ 365; inventory = DIO × COGS ÷ 365; payables = DPO × COGS ÷ 365

KESTREL (DSO 45, DIO 30, DPO 40; CAPEX 60; DIVIDENDS 30% OF INCOME; DEBT FLAT AT 400)		
Receivables	45 × 1,081.5 ÷ 365	**133.3**
Inventory	30 × 648.9 ÷ 365	**53.3**
Payables	40 × 648.9 ÷ 365	**71.1**
Net working capital	133.3 + 53.3 − 71.1	**115.6 (up 10.6 from 105)**
Equity	295 + 94.6 − 28.4	**361.2**
Cash: the plug	(471.1 + 361.2) − 696.7	**135.6 (up 45.6 from 90)**

Watch out: Accepting the plug without looking at it.

3. Inflation and competitive position

- Pricing power decides how much of a cost rise a firm keeps. Judge it with Porter's five forces: new entrants, substitutes, buyer power, supplier power and rivalry among competitors. Weak forces mean costs can be passed on. Under deflation a strong firm may keep prices while costs fall.
- The pricing power line runs from a unique brand, through few rivals and many rivals, to a commodity seller who takes the market price so cost inflation falls on its margin. Place the firm on it before choosing assumptions.
- Forecast price and volume separately, since higher prices may cost volume. Sales growth is a product, not a sum. Forecast each cost line at its own inflation rate: wages, materials and rent differ.

Sales growth = (1 + p)(1 + v) − 1; cost line = last year × (1 + v) × (1 + i)

STRONG AND WEAK FIRM (SALES 1,000, COGS 600, UNIT COSTS +6%)

Price +4%, volume −2%	1.04 × 0.98 − 1	**1.92% (not 2.00%)**
Strong firm: revenue, margin	1,000 × 1.06; (1,060 − 636) ÷ 1,060	**1,060.0; 40.0%**
Weak firm (price +2%, volume −3%): revenue	1,000 × 1.02 × 0.97	**989.4**
Weak firm: COGS	600 × 0.97 × 1.06	**616.9**
Weak firm: gross margin	(989.4 − 616.9) ÷ 989.4	**37.6%**
Kestrel COGS with 6% unit cost rise	600 × 1.05 × 1.06	**667.8**
Kestrel EBIT corrected	146.1 − 18.9 = 127.2; 127.2 ÷ 120 − 1	**6.0% growth, not 21.7%**

Watch out: Adding price growth and volume growth; assuming the margin holds when costs inflate.

4. Forecast horizon and terminal value

- The explicit period models each year in detail. Its length depends on the purpose and holding period, the cyclicality of the business and company events (acquisition, restructuring). It should span a full cycle so the final year is normal: ending on a peak overstates value.
- The terminal value (TV) captures all later years. Perpetual growth: TV = next year's cash flow ÷ (r − g). The alternative is an exit multiple of final year earnings or EBITDA. TV sits at the end of the explicit period, so discount it back by (1 + r)^n.
- Long-run growth should be modest, no higher than long-run nominal economic growth, and the discount rate must exceed it. TV is typically most of total value, so its assumptions deserve more scrutiny than year two detail.

TV = next year's cash flow ÷ (r − g); PV of TV = TV ÷ (1 + r)^n

KESTREL CASH FLOWS 80, 88, 95, 100, 105; R = 9%, G = 3%

PV of years one to five	each ÷ 1.09^year	**359.9**
Terminal value at year 5	105 × 1.03 ÷ (0.09 − 0.03)	**1,802.5**
PV of terminal value	1,802.5 ÷ 1.09^5	**1,171.5 (76.5% of total)**
Value today	359.9 + 1,171.5	**1,531.4**
Value at g = 2% / 4%		**1,354.3 / 1,779.4**
Exit multiple 9 × EBITDA 190	TV 1,710	**1,471.3 (implies g about 2.7%)**

5. Behavioural biases in forecasting

- Analysts are people, and their habits push forecasts in predictable directions. Naming the bias is half the cure; the other half is a routine that offsets it.
- Overconfidence makes ranges too narrow: keep a record of forecasts against outcomes and use scenario analysis. Conservatism bias anchors on old views: update deliberately, as in Bayes' rule. Representativeness extrapolates a vivid story and ignores base rates: check against what happens to similar companies.
- Illusion of control makes a detailed model feel accurate when most of the answer rests on a few drivers (sales growth, margin, terminal assumptions): focus on and test those. Confirmation bias seeks supporting evidence: look for the case against, for example by having a colleague argue it.

KESTREL: THREE BIASES WORKED

Overconfidence: 80% ranges that held	5 of 10 (expected 8 of 10)	**50%**
Scenario sales (25/50/25)	bear 1,020, base 1,080, bull 1,120	**1,075**
Conservatism: prior 30%, likelihoods 80% and 40%	0.24 ÷ (0.24 + 0.28)	**46.2%**
Representativeness: 20% growth for 5 years	1,000 × 1.2^5	**2,488.3**
Base rate of 8%	1,000 × 1.08^5	**1,469.3**
Overstatement	2,488.3 − 1,469.3	**1,019.0**

Key takeaways

- Start from sales, give each line its own rule, and keep fixed costs fixed to show operating leverage.
- Sales growth = (1 + price change)(1 + volume change) − 1. Never add the rates.
- Working capital comes from days ratios; the balance sheet balances through a plug you must inspect.
- Pricing power (Porter's five forces) decides whether a cost rise is passed on; forecast each cost at its own inflation rate.
- The horizon should span a cycle; terminal value = next cash flow ÷ (r − g), discounted back, and it is most of the value.
- Each behavioural bias has an offsetting routine: scenarios, Bayes update, base rates, key drivers, the case against.

Quick check

1. Price +5%, volume −3%. What is the sales growth?
   Answer: 1.05 × 0.97 − 1 = 1.85%, not 2%.
2. Next year's cash flow 60, r = 10%, g = 4%. Terminal value?
   Answer: 60 ÷ (0.10 − 0.04) = 1,000.
3. Ranges keep missing the outcome. Which bias, and the remedy?
   Answer: Overconfidence: track record and scenario analysis.