C Reading Financial Statements

Section 1.6 showed where a single project appears in a firm's three financial statements. This appendix completes the tour for the reader who must actually open an annual report: what each statement says, how the three fit together in one worked year, which accounts an engineering economist reads first, a handful of ratios with worked numbers, and where a project's after-tax cash flow (Section 10.10) lands. It is a reading guide, not an accounting course.

Accrual accounting. Recording revenues when earned and expenses when incurred, not when cash moves. It is why profit and cash differ, and why the cash flow statement exists.

The three statements in one view

The *income statement* reports a period's revenues and expenses; its bottom line, net income, is the period's profit. The *balance sheet* is a snapshot at one date: assets on one side, liabilities and owners' equity on the other, always equal. The *cash flow statement* reports the cash that actually moved, in three groups: operating, investing, and financing. The statements are linked, not parallel: net income (income statement) flows into retained earnings (balance sheet); the change in cash (cash flow statement) is the change in the balance sheet's first asset line; and depreciation appears as an expense in the income statement, a subtraction from assets in the balance sheet, and an *add-back* in the cash flow statement, because no cash leaves when equipment ages.

The reason three reports are needed is accrual accounting. A firm that sells in December and collects in January has December revenue and January cash; a firm that buys a ten-year machine has one year's cash outflow and ten years of depreciation expense. Profit answers ''did the period create value?''; cash answers ''can the bills be paid?''; the balance sheet answers ''what is owned and owed right now?'' An engineer reading only one of the three is seeing a third of the firm.

One year at a small minerals firm

The example below runs a complete, small-scale year, the integrated version of Example 1.2, and every later section reads numbers from it. Amounts are in thousands of SAR.

Example C.1 — Sadu Gypsum's year in three statements

Sadu Gypsum, a small gypsum calcining firm, opens the year with the balance sheet below (thousands of SAR):

assets		liabilities and equity	
cash	200	accounts payable	180
accounts receivable	150	short-term loan	120
inventory	250	long-term loan	400
equipment (net)	900	paid-in capital	500
		retained earnings	300
total	1,500	total	1,500

During the year: sales 2,400 (cost of goods sold 1,560); selling and administrative expenses 430; depreciation 110; interest paid 40; the income tax rate is 20%. The firm replaces a calciner burner for 150 (capital expenditure), repays 60 of the long-term loan, and pays a dividend of 80. Over the year, receivables rise by 30, inventory by 20, and payables by 10. Build the three statements and close the balance sheet.

Solution.

Step 1: the income statement (the year's profit).

revenue	2,400
cost of goods sold	−1,560
gross profit	840
selling and administrative	−430
depreciation	−110
operating income	300
interest	−40
income before tax	260
income tax (20%)	−52
net income	**208**

The 150 burner purchase is absent: capital spending is not an expense; only its depreciation reaches this statement, year by year.

Step 2: the cash flow statement (the year's cash).

Start operating cash from net income, add back the non-cash depreciation, and subtract the cash absorbed by working capital (receivables and inventory grew, using cash; payables grew, providing some):

$$\begin{aligned} \text{operating: } & 208 + 110 - (30 + 20 - 10) = +278 \\ \text{investing: } & -150 \quad \text{(the burner)} \\ \text{financing: } & -60 - 80 = -140 \quad \text{(loan repayment, dividend)} \\ \text{net change in cash: } & \boxed{-12} \end{aligned}$$

A profitable year in which cash *fell*: the firm earned 208 and ended with 12 less in the bank, the wedge being capital spending, debt service, dividends, and growth in working capital.

Step 3: the closing balance sheet.

Roll every account forward: cash $200 - 12 = 188$; receivables $150 + 30 = 180$; inventory $250 + 20 = 270$; equipment $900 + 150 - 110 = 940$; payables $180 + 10 = 190$; long-term loan $400 - 60 = 340$; retained earnings $300 + 208 - 80 = 428$.

assets		liabilities and equity	
cash	188	accounts payable	190
accounts receivable	180	short-term loan	120
inventory	270	long-term loan	340
equipment (net)	940	paid-in capital	500
		retained earnings	428
total	**1,578**	total	**1,578**

The two sides agree at $\boxed{1{,}578}$, the built-in arithmetic check: every riyal of the year's story, profit kept, cash moved, assets bought, debt repaid, is in one of these accounts exactly once.

The accounts an engineering economist reads

Four account families carry almost everything this book computes.

Working capital. Current assets minus current liabilities: the cash tied up in running the operation (receivables, inventory) net of the financing suppliers provide (payables). Projects that grow sales usually grow working capital, a real cash outflow.

- **Capital expenditure** lives in the investing section of the cash flow statement (Sadu's -150) and accumulates in the balance sheet's equipment line. It is the I of every capital recovery computation, and it never touches the income statement directly.
- **Depreciation** appears three times: expense in the income statement (110), reduction of equipment in the balance sheet, add-back in the cash flow statement. Its only cash consequence is the tax shield of Section 10.10.1: at $t = 20\%$, Sadu's 110 saved 22 of tax.
- **Working capital** is read from the current accounts. Sadu's grew by $30 + 20 - 10 = 40$ this year, cash that the cash flow statement subtracts even though no invoice says ''working capital.'' Project evaluations that ignore it overstate early cash flows, which is why the integrated evaluation of Section 10.12 carries a working-capital line.
- **Debt** splits across all three statements: the balance owed (balance sheet: $120 + 340$), the interest expense (income statement: 40), and the principal repayment (financing section: 60). Note the split that Chapter 3 prices exactly: interest is an expense; principal repayment is not, it is returning borrowed money.

Retained earnings. The accumulated profit the firm has kept rather than paid out: prior balance plus net income minus dividends. It is equity earned, not cash held; Sadu retains 428 while holding 188 of cash.

In practice. The equipment line is where the engineer's asset registry meets the accounts. A net book value that is small against the original cost, Sadu's notes would show it, signals an aging fleet and a replacement wave ahead: Chapter 16 decisions queuing up. The accounts will not name the machines; the engineer who knows the registry can read the schedule between the lines.

Five ratios, worked

Ratios compress the statements into comparable numbers. Five cover most engineering-economy needs, worked here from Sadu's year (average total assets $= (1{,}500 + 1{,}578)/2 = 1{,}539$; current assets $188 + 180 + 270 = 638$; current liabilities $190 + 120 = 310$; total liabilities $310 + 340 = 650$).

ratio	formula	Sadu	reads as
current ratio	current assets / current liabilities	$638/310 = 2.06$	liquidity
debt-to-equity	total liabilities / equity	$650/928 = 0.70$	leverage
return on assets	net income / average total assets	$208/1{,}539 = 13.5\%$	earning power
gross margin	gross profit / revenue	$840/2{,}400 = 35.0\%$	pricing power
interest coverage	operating income / interest	$300/40 = 7.5$	debt safety

Read them as an engineer reads gauges: against a baseline, not in isolation. A current ratio of 2.06 says short-term bills are covered twice over; a debt-to-equity of 0.70 says lenders have put in about two-thirds of what owners have, moderate

leverage; a 13.5% return on assets is the operating reality behind any MARR the firm sets, capital that earns 13.5% inside the business will not be released to projects promising less; a 35% gross margin is the room between price and direct cost from which everything else is paid; and 7.5 times coverage means operating income could fall by more than 85% before interest went unpaid. Trends matter more than levels, and industry norms differ: compare a firm with its own history and its peers.

In practice. Investors read a startup's statements in one pass: gross margin for whether the product earns anything per unit, operating cash flow for the burn rate, cash on the balance sheet divided by monthly burn for the runway, and debt for who gets paid first if it ends. A founder should know these four numbers to the month; Example C.1 is the complete machinery for computing them.

Where a project's ATCF lands

The after-tax cash flow table of Section 10.10 is not a fourth kind of statement; it is a forecast of how one project will perturb the three. Each row of the ATCF lands in a known place once the project is running:

ATCF row	where it lands
revenue	income statement (revenue)
O&M cost	income statement (operating expenses)
depreciation	income statement (expense); balance sheet (asset reduction)
income tax	income statement; operating section of cash flow
net operating cash	operating section of the cash flow statement
investment ($-I$ at year 0)	investing section; balance sheet (equipment)
salvage recovery	investing section; disposal gain or loss to the income statement
working capital	balance sheet (current accounts); operating section
loan flows, if financed	financing section; interest to the income statement

Two consequences are worth carrying back to the main text. First, the identity "operating cash = net income + depreciation ± working capital changes," visible in both Example 1.2 and Example C.1, is the same arithmetic as the ATCF's income-statement approach: the project evaluation and the firm's reporting are one bookkeeping system read at two scales. Second, an approved project changes the firm's ratios, capex raises assets and usually debt before it raises income, so return on assets dips and leverage rises during construction. An engineer who can say "this project takes debt-to-equity from 0.70 to 0.78 for two years, and return on assets to 15% from year three" is answering the question the approval committee is actually asking.