MSC SHIPPING MANAGEMENT · PIRAEUS

Costs, Revenue and Cashflow: The Art of Survival

Ship economics through the shipping cycle



THE LECTURE

Today's roadmap: from one ship to the whole company

We begin with the costs of one ship, then connect capital, revenue and accounting to the survival of the company. The guiding question throughout is who survives the depression.

01

Ship economics

Costs, capital and revenue establish the trading position.

02

Company accounts

Profit, assets and cash reveal different financial realities.

03

Decisions

Cashflow methods and valuation support two case discussions and calculations.

THE SURVIVAL RULE

Mr Micawber's rule applies to shipping

Income of twenty pounds against spending of nineteen is happiness; the reverse is misery.

Shipping cycles apply that rule brutally. An owner may possess valuable ships and report accounting profits, yet still fail when receipts do not meet payments. Survival requires attention to the timing of money, as well as the apparent profitability of the business.

SHIPPING CYCLES

The market is a marathon with no fixed length

The race continues until enough competitors drop out.

Booms, recessions and depressions follow each other, but owners cannot know precisely when the next recovery will arrive. Financial performance separates winners from losers because losses must be financed for as long as the depression lasts.

The relevant test is therefore endurance. A low-cost ship helps, but liquidity, debt commitments and the strength of the wider company determine whether its owner can stay in the race.

CASE DISCUSSION · 1983

Case: why a board sold a VLCC for scrap in 1983

$14.5m

Company loss in the previous year

The laid-up VLCC continued to drain cash. Scrapping required a write-off of book value, but it improved cashflow and reduced the demands placed on a company already under pressure.

The board also sold the dry bulk fleet to protect the tanker business. The decision concerned the survival of the company, rather than the accounting result on one ship.



SCRAPPING JUDGEMENT

Nine forces behind a scrapping decision

Scrapping is the outcome of several interacting judgements. A ship that remains technically serviceable may have no place in an owner's financing plan, while a stronger owner may keep an equivalent vessel trading.

The owner

- Owner finances
- Company cashflow
- Management attitudes

The ship

- Ship age and size
- Operating costs
- Book value

The market

- Market expectations
- Scrap price
- Second-hand market

These forces explain why owners do not all reach the scrap decision at the same freight rate.

THE COMMERCIAL CONSEQUENCE

Strong cashflow buys ships cheap; weak cashflow sells them

The financing of survival shapes the ownership of the fleet.

Success comes from blending ship, administration and financing into a cashflow robust enough to survive depressions. An owner with reserves can purchase ships when distressed sellers have few alternatives.

The same market therefore creates opportunity for one company and forces disposals on another. Ship selection and operational efficiency matter most when they are supported by a financing structure that can endure weak earnings.

PART 1

What does it cost to run a ship?

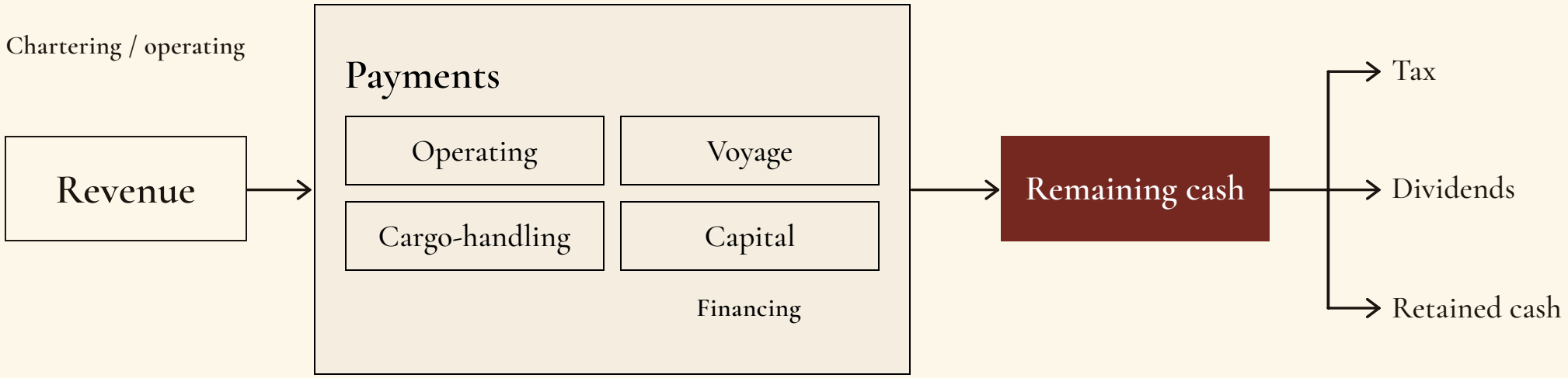
Separate the cost categories before comparing ships.



THE CASHFLOW MODEL

Three levers: revenue, running cost, financing

Revenue from chartering or operating the ship funds running costs and financing. Remaining cash meets tax, supports dividends or stays in the company. Changing financing can alter survival even when the ship and its operating performance remain unchanged.





Old ship or new ship: two different businesses

Old tonnage

Low debt is offset by high running costs. Lay-up is relatively cheap, so the owner can withdraw the ship when trading no longer covers the relevant cash costs.

Modern tonnage

Lower running costs come with debt financing. The ship must trade continuously to support fixed payments, making employment and financial management especially important.

Each strategy needs different management skills. The cheapest ship to operate is not necessarily the easiest ship to finance through a depression.

DEFINE THE TERMS

Five cost categories

There is no international standard for grouping ship costs. Define the categories before comparing estimates, because moving an item between headings can disguise rather than explain a difference.

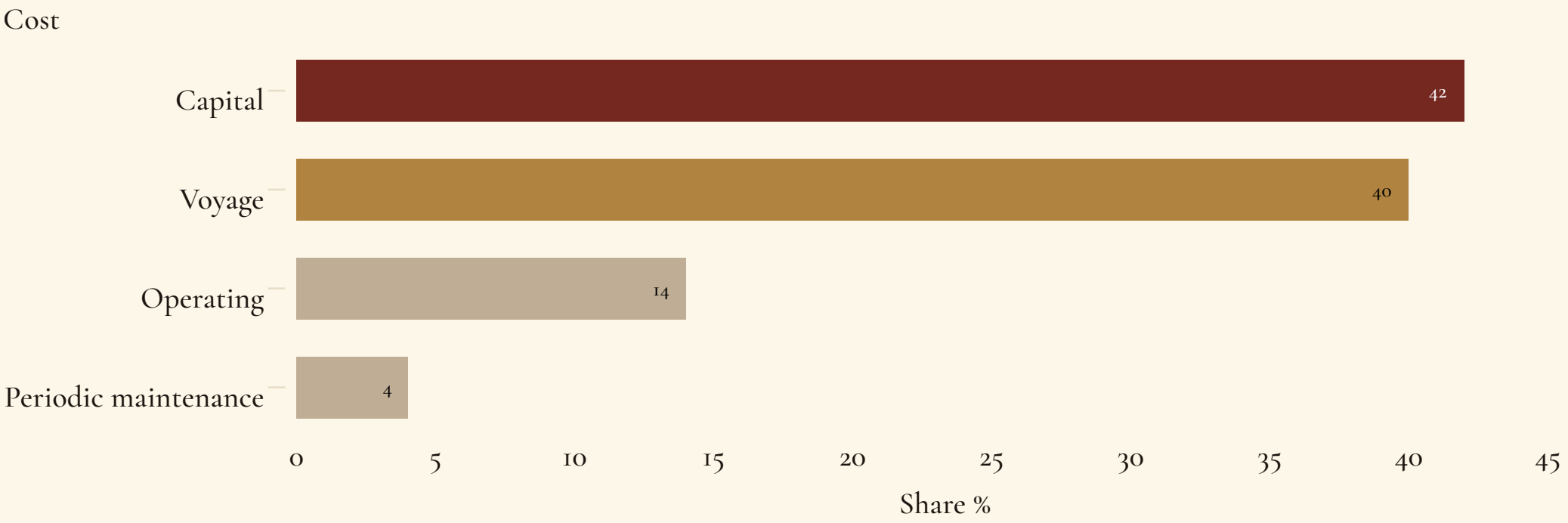
- Operating costs cover the ship's continuing day-to-day operation.
- Periodic maintenance covers scheduled docking and survey expenditure.
- Voyage costs arise from undertaking a particular voyage.
- Cargo-handling costs relate to loading and discharging cargo.
- Capital costs reflect the investment and its financing.

Keep the classification consistent throughout a calculation and distinguish accounting charges from cash payments.

CAPESIZE · 2005 PRICES

Where the money goes: a Capesize cost breakdown

For a 10-year-old Capesize, capital and voyage costs dominate the cost structure. Together they matter far more than day-to-day operating expenditure, so a narrow focus on crew or stores misses much of the economic exposure.

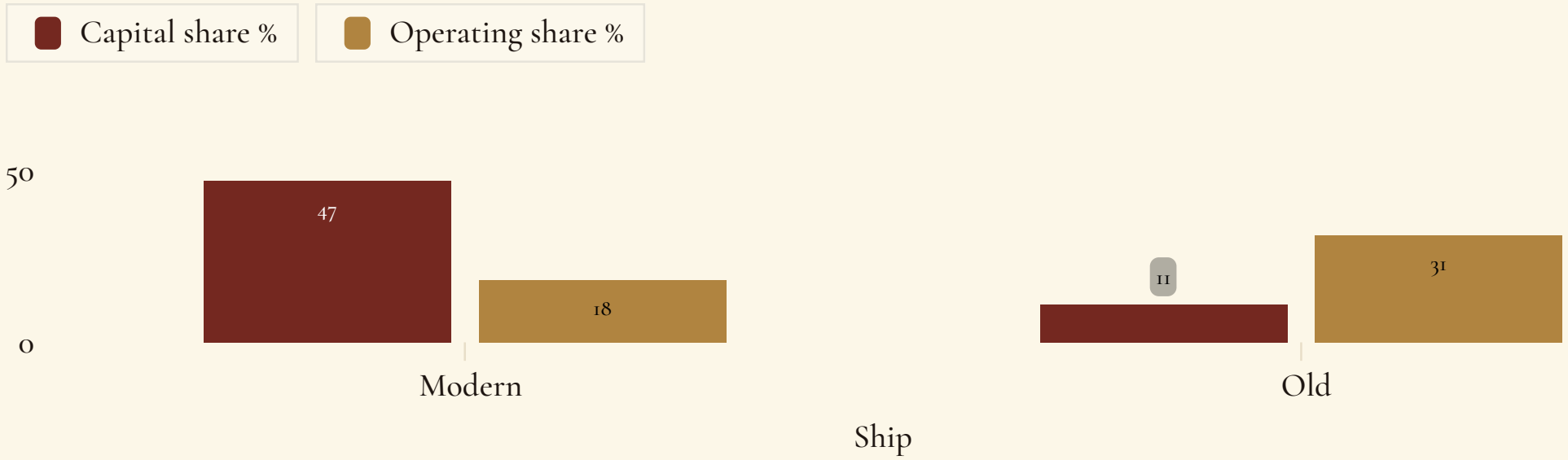


10-year-old Capesize at 2005 prices. The shares describe this example, not a universal ship-cost standard.

AGE AND COST COMPOSITION

Age changes the cost structure, not just the total

Cost per day is about equal for ships aged 5 and 10 years; the 20-year ship is about 13% cheaper. Yet the composition changes sharply, replacing capital exposure with a larger operating burden.



The older ship's lower total cost does not remove its vulnerability to cash operating costs and major repairs.

Who lays up first and who scraps?

Cash costs set the lay-up point. The old ship stops first because its higher running costs become difficult to recover as freight rates fall. Scrapping is a further decision, often triggered by a major expenditure that cannot be deferred indefinitely.

$2.2m

Fourth special survey

The approximate bill forces a fresh judgement on the ship's remaining earning power.

$6,000

Per day above costs

A year at this surplus would pay for the repair, making market expectations decisive.

FINANCIAL SELECTION

The modern ship is on trial too

The market filters out weak owners as well as weak ships.

A modern ship may have low operating costs, but bank debt creates fixed payments that can exceed those costs. Efficient machinery does not protect an owner whose earnings cannot meet the financing schedule.

Default allows the bank to seize the ship. The asset may remain commercially useful under a different owner, showing why technical competitiveness and financial survival must be examined separately.

UNIT ECONOMICS

Unit cost: the bigger ship wins

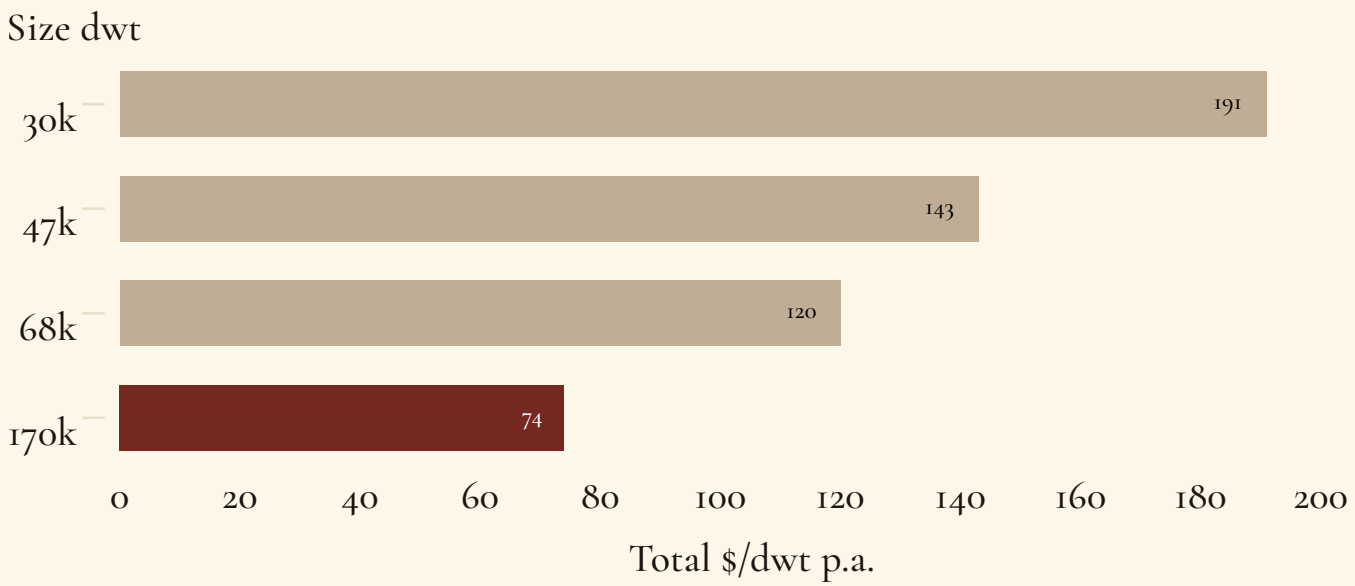
$$\text{Annual cost per dwt} = \frac{OC + PM + VC + CHC + K}{DWT}$$

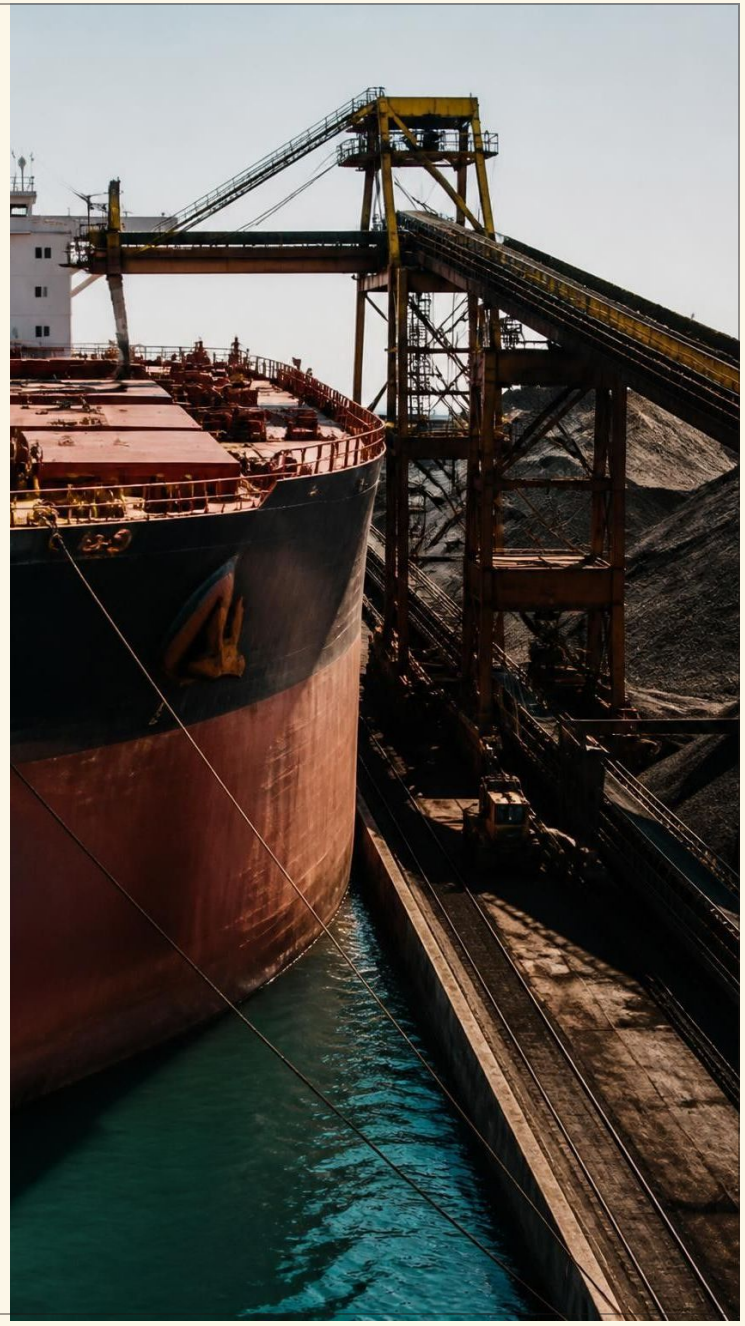
Costs do not rise in proportion to deadweight. A VLCC needs the same crew as a 29,000 dwt products tanker, so the larger vessel spreads some major costs across much greater carrying capacity.

The formula combines operating costs, periodic maintenance, voyage costs, cargo-handling costs and capital costs. It measures annual cost per unit of deadweight, not the profitability of a particular employment. Cargo availability and access to ports still determine whether the scale advantage can be used.

Economies of scale: 170,000 dwt versus 30,000 dwt

Under the 2005 assumptions, annual cost falls from about $191 to $74 per cargo tonne between the smallest bulker and the Capesize. The steep decline explains the attraction of larger ships where the trade can support them.







The price of size is flexibility

Larger ships can enter fewer ports and may find backhaul cargoes harder to secure. A lower unit cost therefore comes with a narrower set of commercial opportunities and potentially more ballast time.

Handy ships grew from 2,000 tons in 1870 to nearly 50,000 around 2000. Each new generation risks overstepping the mark: a ship can become too large for the cargo parcels, port infrastructure or trading pattern that originally justified its investment.

Scale pays only when the ship can use it.

Operating costs: five components

$$OC = \text{manning} + \text{stores} + \text{maintenance} + \text{insurance} + \text{administration}$$

Operating costs exclude fuel and account for about 14% of total ship costs in the Capesize example. They support the continuing operation of the vessel, rather than a particular voyage.

$1.7m

Annual operating costs at age 5.

$2.45m

Annual operating costs at age 20.

The age comparison shows why a low purchase price cannot be read as a low running-cost commitment. Manning, upkeep and other recurring requirements must be forecast over the intended ownership period.

Crew costs: the biggest operating item

Crew costs can account for up to half of operating costs. Crew complements fell from 40-50 in the 1950s to 17 on modern ships, but age and operating arrangements still influence the number required.

20	24	28
Age 5	Age 10	Age 20

Capesize crew complements in the example.

Flag and nationality can shift costs by 50%. A comparison must therefore distinguish crew numbers from the terms under which those seafarers are employed.



Stores, maintenance and insurance

These three items are substantial operating commitments even before manning and administration are included. Their shares provide a useful starting point, but ship condition and the scope of insurance cover must also be examined.

15%

Stores

About this share of operating costs.

14%

Maintenance

An old ship's maintenance can reach twice a modern one's.

14%

Insurance

Hull and machinery insurance sits alongside P&I club cover.

A 20-year ship can therefore expose the owner to a very different maintenance burden, even when its capital costs are low.

P&I clubs: mutual insurance among owners

The 13 clubs settle third-party claims through a mutual system in which members pay “calls”. This differs from treating insurance solely as a premium paid to a commercial insurer.

2005 layer	Exposure
Individual club	Up to $5m
Pool	$5-20m
Reinsurance	Above the pool

These are the historical arrangements in the example. P&I cover cannot be assigned to a mortgagee, an important distinction when considering the bank's security package and the owner's responsibilities.



Periodic maintenance: the bill that arrives on schedule

In the example, dry-docking occurs every 2 years and a special survey every 4. These scheduled commitments require cash planning even when the ship's daily trading account appears satisfactory.

Period	Total	Daily cost	
	First 5 years	$1.0m	$551
Years 11-15	$2.7m	$1,493	

Steel replacement drives the increase as the Capesize ages. The survey calendar turns a gradual deterioration in condition into a concentrated financing decision.

Voyage costs: fuel is 47%

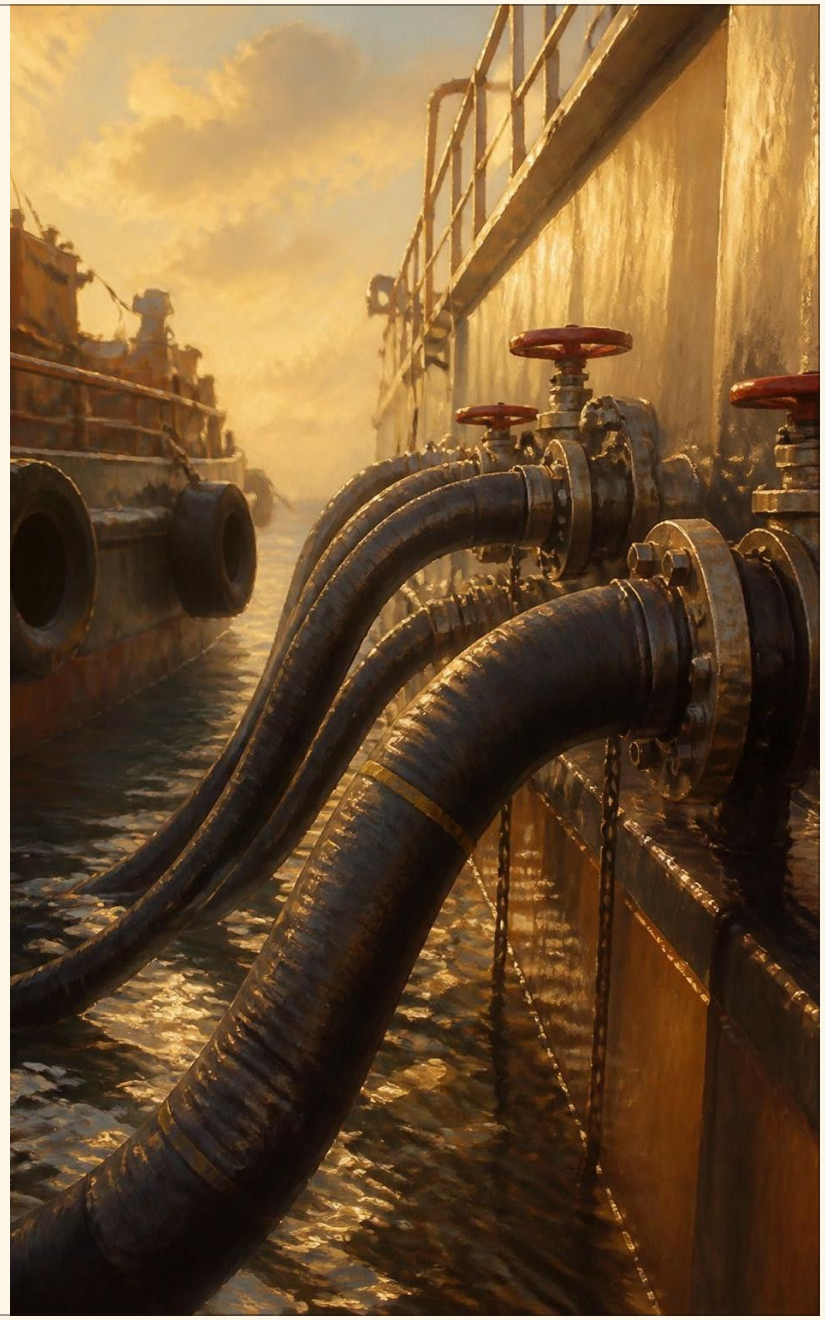
47%

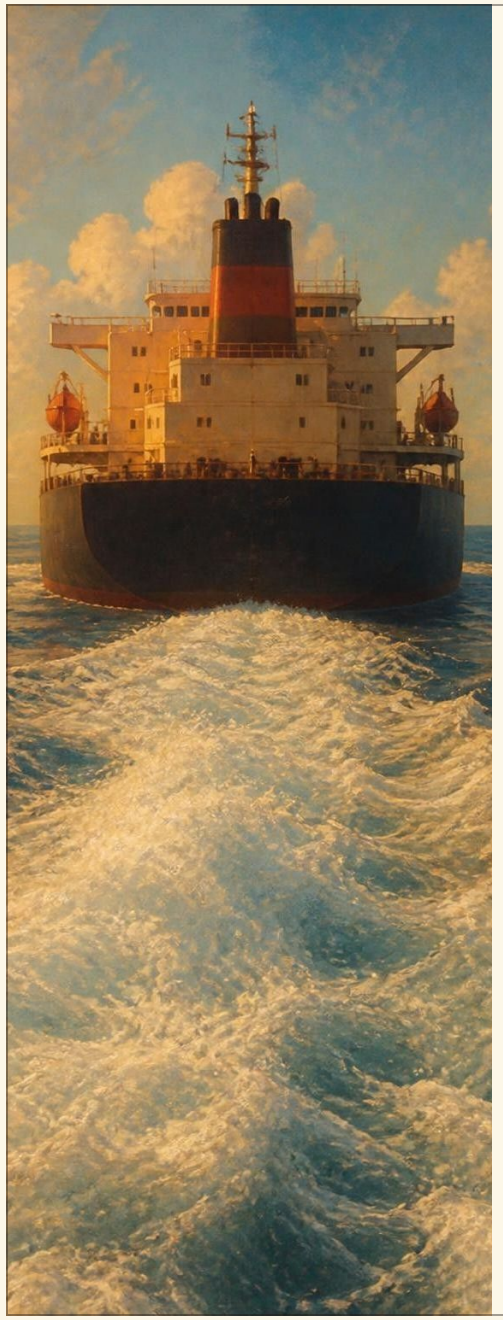
Fuel's share of voyage costs in the example

$$VC = \text{fuel} + \text{port dues} + \text{tugs and pilotage} + \text{canal dues}$$

Fuel prices rose 950% over 1970-85, lifting fuel from 13% to 34% of ship costs and strengthening the incentive to reduce consumption.

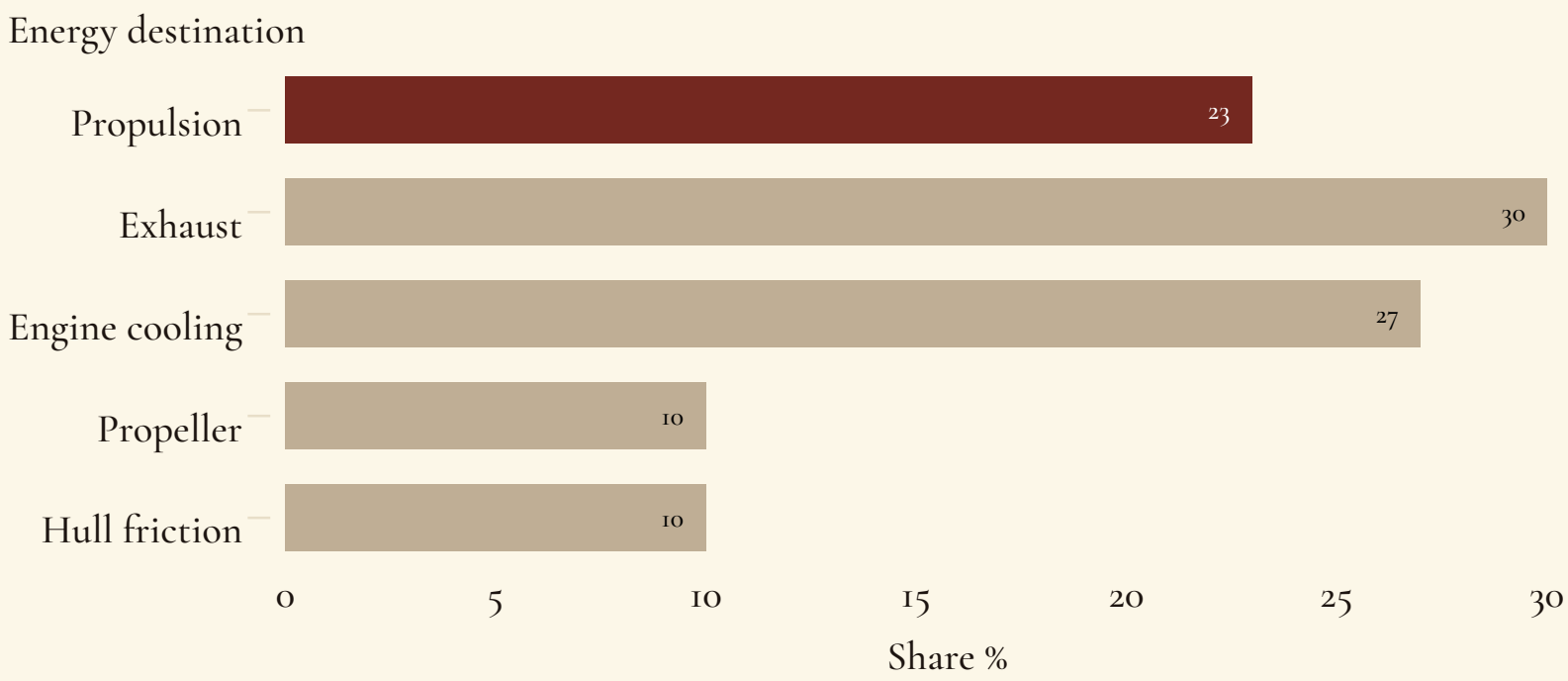
The industry responded through engine and design efficiency. Fuel must consequently be treated as both a market-price exposure and an operational variable.





Where a ship's energy goes

Only 23% of the energy burned propels the vessel: 30% leaves in exhaust, 27% in engine cooling, 10% at the propeller and 10% in hull friction.



The cube rule: slow steaming saves fuel

$$F = F^{*}\left(\frac{S}{S^{*}}\right)^{a}, \qquad a \approx 3$$

For diesel engines, fuel consumption changes approximately with the cube of speed. A modest speed reduction can therefore cut daily consumption sharply, although the ship also completes less transport work over time.

Panamax	Reference	Slow steaming	
	Speed	16 knots	11 knots
Fuel per day	44 tons	14 tons	

Condition matters too: reducing hull roughness from 300 to 50 micrometres saves 13%. The commercial decision must compare fuel savings with revenue forgone.

Port charges and canal dues

$147,000

Typical Panamax coal cargo, Australia to Europe: roughly $2 a tonne

Under a voyage charter, the owner pays vessel charges. Under a time charter, the charterer pays. The same port call can therefore affect different parties depending on the employment contract.

Canal dues require their own calculation. Suez tolls use Suez net tons and SDRs, so neither deadweight alone nor a general port-cost allowance is sufficient to establish the payment.



PART 2

II

Capital, profit and cash

The same ship can produce different financial outcomes.

Profit is not cash

Profit and cashflow answer different questions. Profit measures performance after accounting charges; cashflow records receipts and payments within the period. A profitable operation can still encounter a cash shortage.

Profit

Depreciation is deducted even though it is a bookkeeping charge, not a payment made during the period.

Cashflow

Actual receipts and payments determine whether the owner can pay suppliers, fund surveys and meet debt service.

In a recession, cash is what matters. Accounting profit cannot settle an invoice when the bank account is empty.

Exercise: cash purchase versus five-year loan

A $10m ship earns revenue of $10m, with operating costs of $5m, voyage costs of $3m and depreciation of $1m. Compare the accounting result with the payments created by each financing choice.

Measure	Cash purchase	Five-year loan at 10%
Profit	$1m each year	About 0
Cashflow	-$8m then +$2m	-$1m and -$0.8m

The ship's trading activity is unchanged, but the financing changes when cash leaves the business. Explain why depreciation affects profit while loan principal repayment affects cashflow.

Gearing: the same ship, double the daily burden

The Panamax's operating and bunker costs are only part of the cash requirement when the purchase is financed. A 20-year loan for the full price adds a fixed daily burden almost as large as the operating and bunker bill.

$11,820

Operating plus bunkers per day

+$11,155

Loan payments per day

$22,975

Total daily burden

Banks require equity because higher gearing means higher risk. The operating break-even is not the financed owner's cash break-even.

Security and tax: what banks and owners require

Banks seek security through a first mortgage, assignment of earnings, a blue-chip charter and guarantees. Equity owners remain in control while freight covers cash costs, but borrowing adds obligations and rights that constrain that control.

Bank security

The lender examines both the ship as collateral and the reliability of the income available to service the loan.

49%

World tonnage under open registry in 2005. Tonnage tax schemes followed as fiscal arrangements evolved.

Financing and tax arrangements belong in the ownership model, rather than being added after the ship is selected.

Depreciation and the life of a ship

Straight-line depreciation commonly spreads the depreciable amount over about 20-25 years. It is an accounting allocation, while market value reflects what buyers will pay and the remaining commercial prospects of the vessel.

0.93

R for the near-linear relationship between Panamax prices and age.

25

Years to scrapping in weak markets.

28-30

Years to scrapping in 2006.

Economic life changes with market conditions. A depreciation schedule should not be mistaken for a forecast of the actual scrapping date.

PART 3

III

What does the ship earn?

Employment allocates risk; productivity creates earning capacity.

Who carries which risk?

The charter form allocates market risk, operational risk and voyage costs between owner and charterer. Comparing a freight receipt with a hire receipt without adjusting for those responsibilities can give a misleading picture of earnings.

Charter	Market risk	Operational risk	Voyage costs paid by
Voyage	Owner	Owner	Owner
Time	Charterer	Owner	Charterer
Bare boat	Charterer	Charterer	Charterer

The owner bears both risks under a voyage charter, operational risk only under a time charter, and neither under the bare boat allocation shown here.

Revenue = productivity x freight rate

$$R = \frac{P \times FR}{DWT}$$

$$P = 24 \times \text{speed} \times \text{loaded days} \times \text{deadweight utilization}$$

The revenue relationship separates the market price of transport from the ship's ability to produce transport work. Speed, loaded days and deadweight utilization influence productivity; the freight rate determines what that productivity earns.

These four levers interact. Increasing speed can raise output but consume more fuel, while a higher utilization rate may come with less attractive cargo terms. The objective is the strongest financial result, not the maximum value of every operating measure.

Exercise: should the owner slow down to 11 knots?

Slow steaming is a commercial calculation. Compare the fuel saving with the revenue lost through reduced productivity, using the same period and employment assumptions for both sides.

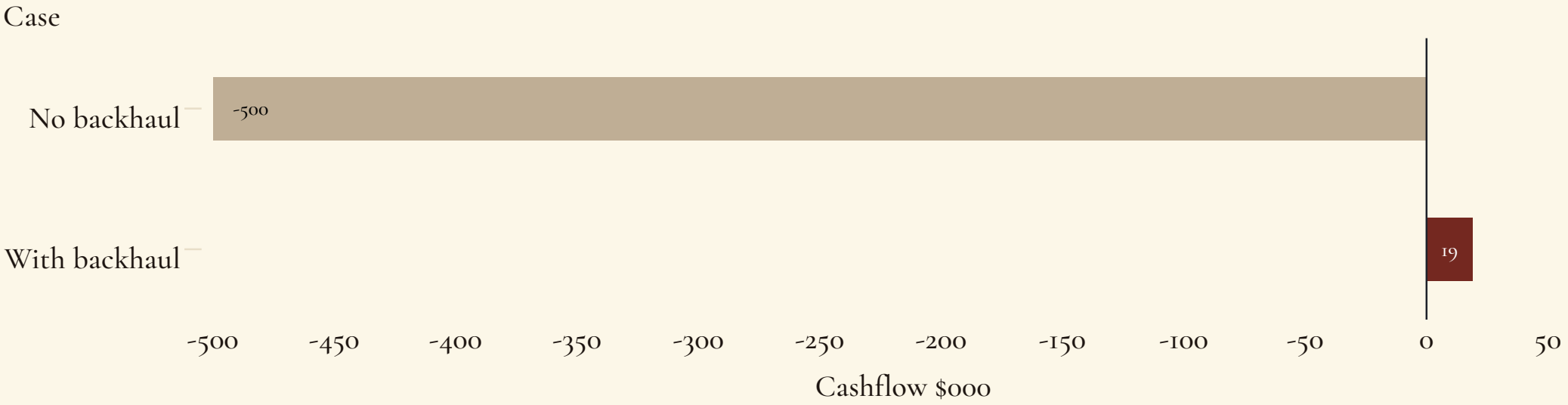
Scenario	Fuel saving	Revenue lost	Decision
Fuel $100 a ton, low freight	$1.7m	$4.3m	Keep speed
Fuel $400 a ton, low freight	$6.9m	$4.3m	Slow down
Fuel $400, high freight	Not stated	$12.9m	Keep speed

High fuel prices favour saving consumption, but high freight rates increase the opportunity cost of slower operation. Neither price can be considered alone.



Loaded days: the backhaul decides survival

Loaded days equal 365 less off-hire, port and ballast days. For the Panamax coal example in 1985, a Newcastle to Norway backhaul turns an annual loss into a small surplus by replacing otherwise unproductive time with earning employment.



Deadweight utilization: the aim is profit, not a full ship

A full ship is an operating outcome, not a profit guarantee.

Part cargoes are common in recessions. Accepting less than a full load may still be commercially sensible when the alternative is waiting, ballasting or taking a cargo on unattractive terms.

By 2007, Panamaxes had lost the US Gulf grain trade to Handymaxes, while products tankers were often optimized for 40,000 tonnes. Cargo parcel size and trading requirements can outweigh the apparent benefit of maximizing deadweight utilization.

PART 4

IV

Reading the accounts

Performance, financial position and liquidity require different statements.

Three purposes, three sets of accounts

Accounts are prepared for different users and decisions. The same business can be viewed through financial reporting, tax assessment and management information, each with its own purpose and conventions.

Financial standing

Creditors need a view of the company's financial position, now reported under IFRS.

Tax assessment

Local rules shape the calculation used to determine the company's tax obligations.

Management decisions

Management accounts support choices about employment, expenditure and financing. These are our focus.

Before interpreting a figure, establish which question the accounts were designed to answer.

Income statement: wealth created in a period

The income statement describes performance over a period, moving from revenue through expenses and other charges to net income. It does not show the amount of cash available to the owner at the end of that period.

$1.58bn

Revenue

$390m

Operating income

$177m

Net income

In the 2003 example, operating income is stated after a $90 million vessel write-off. That charge reduces the accounting result, but it is not itself a payment in the period.

Balance sheet: how the wealth is held

The balance sheet records the company's financial position at a point in time. Assets show how resources are held; debt and equity show how those resources are financed.

$3.588bn

Total assets; ships are about 70%.

$1.5bn

Long-term debt

$1.667bn

Equity

Book value of ships can differ sharply from market value. An accounting asset figure should therefore not be treated as the cash that a disposal would necessarily release.

Cashflow statement: net income of $177m, operating cash of $456m

$177m

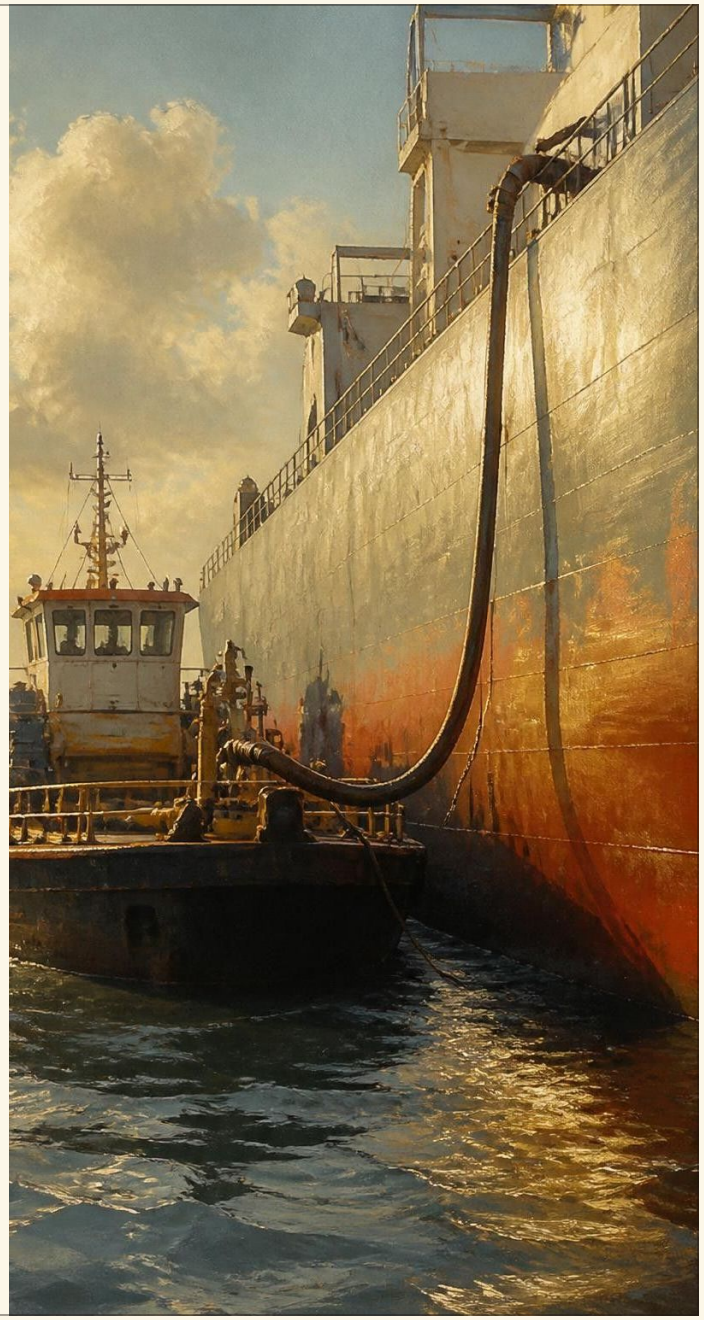
Net income

$456m

Operating cash

Depreciation and write-downs are added back when reconciling income to cash. Financing contributed +$447m while investing absorbed -$895m, leaving cash changed by only $8m.

The statement explains why a large operating cash inflow may coexist with little change in available cash. Bankruptcy often starts with an unpaid bunker bill: payments, rather than reported earnings alone, expose the immediate constraint.



PART 5

V

Four methods of cashflow analysis

Match the analytical horizon to the decision.

Four methods, four decisions

Cashflow analysis is most useful when the method matches the question. A voyage decision needs a different horizon from a fleet funding plan or an investment comparison.

Voyage cashflow

Compare cargoes and decide whether to lay up or trade.

Annual cashflow

Test whether the fleet will fund its commitments during the year.

Required freight rate

Establish what the market must pay to meet the specified costs.

Discounted cashflow

Compare projects whose receipts and payments occur at different times.

Voyage cashflow: US Gulf grain, Australia coal

The calculation follows a 75,000 dwt Panamax through the whole multi-leg voyage. Each leg contributes receipts, fuel use, time and charges; evaluating only the attractive cargo leg can hide the cost of positioning the ship.

Assumption	Value
Speed and sea margin	15 knots; 5%
Laden consumption	33 t/day
Bunkers	$338 a ton
Diesel	$531 a ton

The result required is cash generated by the whole itinerary, including ballast and port time, rather than gross freight from US Gulf grain or Australia coal alone.

Annual cashflow: scrap at the 4th survey or trade on?

Return to the same 1976 280,000 dwt tanker and compare two scenarios. The annual view brings trading cash, the survey bill and capital repayments into a single funding test.

Scrap at the survey

Release the scrap proceeds and avoid further trading and survey commitments. Recognize that the ship's future earning opportunity also ends.

Trade on

Fund the survey and retain the earning opportunity, while continuing to meet cash costs and capital repayments.

Compare the timing of commitments as well as the total expected receipts. A positive long-term prospect may still require cash the company cannot provide.

BOARD DISCUSSION

Discussion: your decision as the board

Rates cover cash costs but not debt service, and the survey bill is due. Sell, repair, or trade on? Which numbers decide?

Sell

Test disposal proceeds against debt outstanding and the cash released.

Repair

Test the survey payment against available liquidity and future earning potential.

Trade on

Test the operating surplus against debt service and the timing of the survey.

State the assumptions behind your recommendation. Distinguish an attractive asset from an investment the company can afford to keep.

DCF and NPV: when timing matters

Discounted cashflow values future receipts and payments at the cost of money, here 12%. Earlier and later cashflows are therefore not treated as equally valuable simply because their nominal amounts match.

$$NPV = \sum_{t=0}^{T} \frac{CF_t}{(1+r)^t}$$

$8m

Extra nominal cash in the Superoil contract

$64,700

NPV of that advantage after timing is considered

IRR is the discount rate at which NPV equals zero. A nominal total can look compelling while its discounted advantage is very small.

Valuing ships: market, scrap and residual value

Brokers value ships on a willing buyer, willing seller basis. In thin markets, comparable transactions may be scarce, making valuations judgemental; bankers often average several opinions rather than rely on one estimate.

Market value

The price indicated by a transaction between willing parties in the current market.

Scrap value

The disposal anchor when continued trading is no longer justified.

Residual value

The assumed value remaining at the end of the investment horizon.

Scrap and residual values anchor the end of the ship's life, but neither removes uncertainty from the investment calculation.

THE OWNERSHIP DISCIPLINE

Key takeaways: building a robust cashflow

Cash decides survival; profit alone does not. Choose the ship, its financing and its operation as one blend, because strength in one area cannot always compensate for weakness in another.

Build reserves in booms so the company can meet commitments during depressions. Strong liquidity also preserves the option to buy ships cheaply when other owners are forced to sell.

Judge every decision by the cash commitments it creates.

