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3 Shipping Market Cycles

The four most expensive words in the English language are, 'This time it's different'.

(Sir John Templeton, quoted in *Devil Take the Hindmost*, Chancellor 1999, p. 191)

3.1 INTRODUCING THE SHIPPING CYCLE

Market cycles pervade the shipping industry. As one shipowner put it: 'When I wake up in the morning and freight rates are high I feel good. When they are low I feel bad'.[1] Just as the weather dominates the lives of seafarers, so the waves of shipping cycles ripple through the financial lives of shipowners. Considering the sums of money involved, it is not surprising that they are so prominent. Take the transport of grain from the US Gulf to Rotterdam. After operating expenses a Panamax bulk carrier trading spot would have earned $1 million in 1986, $3.5 million in 1989, $1.5 million in 1992, $2.5 million in 1995 and $16.5 million in 2007! A new Panamax would have cost $13.5 million in 1986, $30 million in 1990, $19 million in 1999 and $48 million in 2007.

These shipping cycles roll out like waves hitting a beach. From a distance they look harmless, but once you are in the surf it's a different story. No sooner has one finished than another starts and, like surfers waiting for a wave, shipowners cluster in the trough, paddling to keep afloat and anxiously scanning the horizon for the next big roller. Sometimes it is a long wait. In 1894, in the trough of a recession, a shipbroker wrote: 'The philanthropy of this great body of traders, the shipowners, is evidently inexhaustible, for after five years of unprofitable work, their energy is as unflagging as ever, and the amount of tonnage under construction and on order guarantees a long continuance of present low freight rates, and an effectual check against increased cost of overseas carriage'.[2] He was right. It was 1900 before he could write: 'The closing year of the century has been a memorable one for the shipping industry. It would be hard to find any year during the century which could compare in respect of the vast trade done and the large profits safely housed'.[3]

Comments of this sort appear time and again in shipping market commentaries and they make shipping investors sound short-sighted and incompetent as they scramble to over-order ships, triggering yet another recession. But appearances can be deceptive. Despite the industry's apparent inability to learn from history, its performance in providing transport has been excellent (see Chapter 2). If we set aside the volatility, over the last century there has been an impressive reduction in shipping costs. In 1871 it cost $11.40 to ship a ton of coal from Wales in the United Kingdom to Singapore.[4] In the 1990s the average freight cost to ship a ton of coal from Brazil to Japan, a roughly similar distance, was still $9.30, both figures reported in market prices.

As far as shipowners are concerned the cycles are like the dealer in a poker game, dangling the prospect of riches on the turn of each card. This keeps them struggling through the dismal recessions which have occupied so much of the last century and upping the stakes as the cash rolls in during booms. Investors with a taste for risk and with access to finance need only an office, a telex, and a small number of buy, sell or charter decisions to make or lose a fortune.[5] They become players in the world's biggest poker game, in which the chips are valued in tens of millions of dollars, betting on ships which may or may not be needed. If trade is to be carried, somebody has to take this risk, and the analogy with poker is appropriate because both activities involve a blend of skill, luck and psychology. Players must know the rules, but success also depends on their skill in playing the shipping cycle, a game shipowners have been playing for hundreds of years. This is the model we will explore in this chapter.

3.2 CHARACTERISTICS OF SHIPPING MARKET CYCLES

The components of economic cycles

Cycles are not unique to shipping, they occur in many industries. Sir William Petty, writing in the 1660s, noticed a 7-year cycle in corn prices and commented that 'the medium of seven years, or rather of so many years as make up the Cycle, within which Derths and Plenties make their revolution, doth give the ordinary Rent of the Land in Corn'.[6] Later economists analysed these cycles more deeply, and found that they often had several components which could be separated statistically using a technique known as 'decomposition'.[7] For example Cournot, the French economist, thought that 'it is necessary to recognise the *secular* variations which are independent of the *periodic* variations'.[8] In other words, we should distinguish the long-term trend from the short-term cycle. This approach is illustrated in Figure 3.1, which identifies three components of a typical cyclical time series. The first is the *long-term cycle* (referred to by Cournot as the 'secular trend'), shown by the dashed line. The long-term trend is of importance if it is changing, and the big issue here is whether, for example, the underlying cycle is moving upwards, which is good for business, or moving downwards, which is bad. The example in Figure 3.1 shows a long-term trend with upswings and downswings lasting 60 years. The second component is the *short-term cycle*, sometimes referred to as the 'business cycle'. It is the one that corresponds more closely to most people's notion of a shipping cycle. In Figure 3.1 these short cycles are shown superimposed on the long-term trend. They fluctuate up and down, and a complete cycle can last anything from 3 to 12 years from peak to peak. This is the form economic business cycles take and they are important drivers of the shipping market cycle. Finally, there are *seasonal cycles*. These are regular fluctuations within the year. For example, in shipping the dry bulk market is often weak during July and August when relatively little grain is being shipped. Similarly, there is a seasonal cycle in the oil trade relating to stock building for the Northern Hemisphere winter. In the following subsections we will briefly review each of these three cyclical components. The techniques for identifying cycles statistically are discussed in Chapter 17.

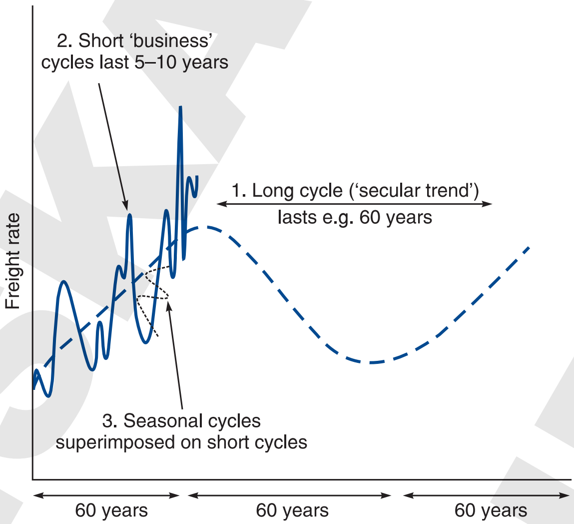


Figure 3.1
Seasonal, short and long cyclical components
Compiled by Martin Stopford from various sources

Long shipping cycles (the 'secular trend')

At the heart of the cyclical mechanism is the long-term cycle which 'ferries along with it other cycles which have neither its longevity, serenity nor unobtrusiveness'.[9] These long-term cycles are driven by technical, economic or regional change. This makes them of great importance, even if they are more difficult to detect.

The long-cycle theory of the world economy was developed by the Russian economist, Nikolai Kondratieff. He argued that in the major Western countries, between 1790 and 1916, there were three periods of slow expansion and contraction of economic activity, averaging about fifty years in length. After studying 25 statistical series, of which ten concerned the French economy, eight the British, four the US, one (coal) the German and two (pig iron and coal production) the world economy as a whole, he identified the three cycles with the initial upswings starting in 1790, 1844 and 1895. The peak-to-trough length of the cycles was 20–30 years, with an overall trough-to-trough length of approximately 50 years. Writing shortly after Kondratieff, the economist J.A. Schumpeter argued that the explanation of the long-wave cycles could be found in technological innovation.[10] He suggested that the upturn of the first Kondratieff cycle (1790–1813) was largely due to the dissemination of steam power, the second (1844–74) to the railway boom and the third (1895–1914/16) to the joint effects of the motor car and electricity. The upswing which started in the 1950s may be attributed to a combination of major innovations in the chemical industries, aircraft and the electrical/electronic industries. Unfortunately these Kondratieff cycles do not fit well with the long-term freight cycles we will review in Figure 3.5. For example, 1790 was a peak in the long shipping cycle, not the beginning of an upswing, and in general the shipping cycle looks much longer, with a downswing that lasted for the whole of the nineteenth century.

The French historian, Fernand Braudel, identified much longer cycles lasting a century or more, with peaks in the European economy occurring in 1315, 1650, 1817 and 1973. This analysis matches the cycles in Figure 3.5 more closely. Whatever the exact timing, the history of the shipping industry in Chapter 1 made it clear that the long-term technical, social and political changes we observed are precisely the sort of developments that might well drive long-term shipping cycles.[11] For example, the period from 1869 to 1914 saw a downward spiral in freight rates which was driven by the increasing efficiency of steamships and the phasing out of the much less efficient sailing ships. Similarly, from 1945 to 1995 the mechanization of the bulk and liner shipping businesses using bigger ships and more efficient cargo-handling technology produced a fall in real freight rates. So these long cycles deserve a place in our analysis, even if we cannot define them precisely.

Short cycles

The study of short economic cycles started in the early nineteenth century after a series of severe 'crises' in the UK economy in 1815, 1825, 1836–9, 1847–8, 1857 and 1866. Observers came to the conclusion that these 'crises' formed part of a wavelike mechanism in the economy and they started to refer to them as cycles.[12] These short cycles 'shoot up and down, and are easy, indeed conspicuous to see. Everyday life, today as in the past, is punctuated by the short-lived movements which must be added to the trend in order to estimate them as a whole'.[13] However, they also spoke of the 'periodicity' of cycles, by which they meant that they consisted of a sequence of phases, irrespective of duration. For example, the nineteenth-century banker, Lord Overstone, observed that 'the state of trade revolves apparently in an established cycle of quiescence, improvement, prosperity, excitement, overtrading, convulsion, pressure, stagnation and distress'.[14] This periodicity theory does not require cycles to be of equal length.

It is easy to identify Overstone's phases with the different stages in modern shipping cycles, an example of which is shown in Figure 3.2. The short cycle has four main stages (see Box 3.1): a market trough (stage 1) is followed by a recovery (stage 2), leading to a market peak (stage 3), followed by a collapse (stage 4). In this example the trough lasts 4 years, reaching a peak 7 years after the first market peak, then falling sharply. However, during the trough in year 8 the market starts to recover, but fails and slowly subsides back to recession levels in year 10. Abortive recoveries of this sort are quite common, and in shipping are often the result of counter-cyclical ordering. Investors anticipate the recovery and order large volumes of cheap ships, so that supply dampens off the recovery. A dashed line superimposed on the chart illustrates what might have happened if investors had been less aggressive. In that case the

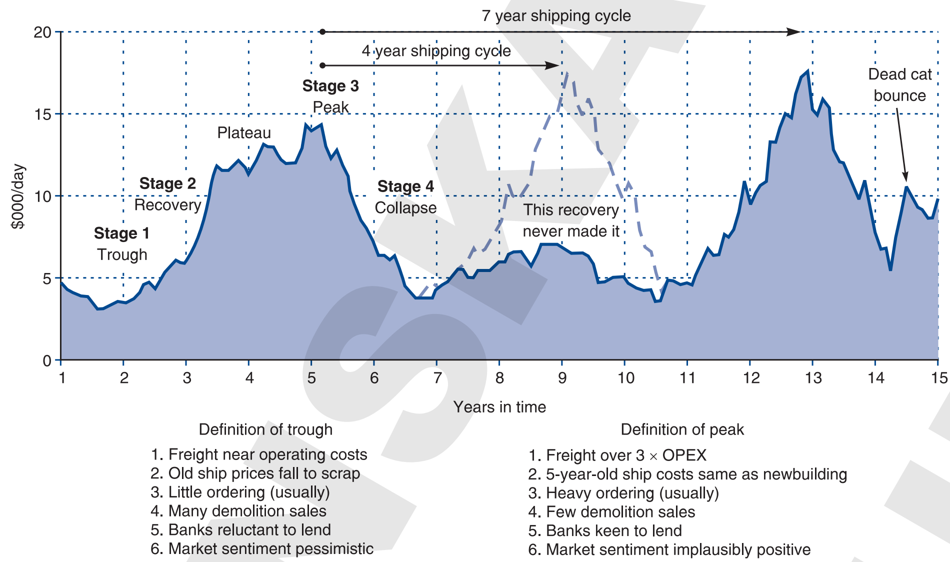


Figure 3.2
Stages in a typical dry cargo shipping market cycle
Source: Martin Stopford

shipping cycle lasts 4 years, not 7. In fact there is a strong case for supposing that the longer cycles of the sort shown in Figure 3.2 are often produced by a build-up of supply capacity during a succession of very profitable market spikes as a result of which the market ‘jumps’ a cyclical upswing, due to the pure weight of supply. Obviously the opposite effect can occur during these long recessions. These are important points we will come back to when we discuss past shipping cycles in Section 3.4. For example, does that abortive recovery in year 8 of Figure 3.2 count as a peak? And what about the ‘dead cat bounce’ in year 15? Frankly it is not easy to decide, but the cycles in Table 3.1 were compiled on the basis that neither counts.

Seasonal cycles

Seasonal cycles occur quite widely in shipping, and are the fluctuations in freight rates which occur within the year, usually at specific seasons, in response to seasonal patterns of demand for sea transport. There are numerous examples, some of which are far more prominent than others. In the agricultural trades, there is a noticeable cycle in freight rates for ships carrying grain, caused by the timing of harvests. Typically there is a surge in grain movements during late September and October as the North American harvest reaches the sea for shipment. Then there is a quieter period during the early summer as shipment of the previous season’s stock runs down. Similarly, there is a strong seasonal cycle in the reefer trade, associated with the movement of fresh fruit during the harvest in the Northern Hemisphere. Another example is the stocking up of oil for periods of peak demand in the winter.

BOX 3.1 STAGES IN A 'TYPICAL' SHIPPING CYCLE

Stage 1: *Trough*. A trough has three characteristics. Firstly, there are clear signs of surplus shipping capacity with ships queuing at loading points and sea slow-steaming to save fuel. Secondly, freight rates fall to the operating cost of the least efficient ships, which move into lay-up. Thirdly, as low freight rates and tight credit produce negative cashflow, financial *pressures* build up, leading to stagnation as tough decisions are put off, and finally distress as market pressures overwhelm inertia. In extreme cycles banks foreclose and shipping companies are forced to sell modern ships at *distress* prices well below their book value, to raise cash. The price of old ships falls to the scrap price, leading to an active demolition market and the seeds of recovery are sown. As the wave of difficult decisions passes and the market starts to correct, a state of *quiescence* sets in.

Stage 2: *Recovery*. As supply and demand move towards balance, freight rates edge above operating costs, and laid up tonnage falls. Market sentiment remains uncertain, but gradually *confidence grows*. Spells of optimism alternate with doubts about whether a recovery is really happening (sometimes the pessimists are right, as shown by the false recovery in periods 7 to 9 in Figure 3.2). As liquidity improves, second-hand prices increase and sentiment firms as markets become *prosperous*.

Stage 3: *Peak/Plateau*. As the surplus is absorbed supply and demand tighten. Only untradable ships are laid up and the fleet operates at full speed. Freight rates rise, often two or three times operating costs, or on rare occasions as much as ten times. The peak may last a few weeks (see periods 5–6 in Figure 3.2) or several years (see periods 12–15 in Figure 3.2), depending on the balance of supply–demand pressures, and the longer it lasts the more the excitement increases. High earnings generate excitement, increasing liquidity; banks are keen to lend against strong asset values; the international press reports the prosperous shipping business with talk of a 'new era'; and shipping companies are floated on the stock market. Eventually this leads to *over-trading* as second-hand prices move way above their replacement cost, modern ships sell for more than the newbuilding price and older ships are bought without inspection. Newbuilding orders increase, slowly at first, and then rapidly until the only berths left are three or four years ahead, or in unattractive shipyards.

Stage 4: *Collapse*. As supply overtakes demand the market moves into the collapse (convulsion) phase and freight rates fall precipitately. This is often reinforced by the business cycle downturn, but other factors contribute, for example the clearing of port congestion, the delivery of vessels ordered at the top of the market, and in depressions we generally find these factors reinforced by an economic shock. The oil crises of 1973 and 1979 are prominent examples. Spot ships build up in key ports. Freight rates fall, ships reduce operating speed and the least attractive vessels have to wait for cargo. Liquidity remains high and there are few ship sales since owners are unwilling to sell their ships at a discount to recent peak prices. Market sentiment is initially confused, changing with each rally in rates and reluctant to accept that the peak is over.

Analysts' views of short cycles in shipping

By the end of the nineteenth century the concept of cycles had spread to shipping and in January 1901 a broker noted in his annual report that 'the comparison of the last four cycles (10 year periods) brings out a marked similarity in the salient features of each component year, and the course of prices'. He went on to observe that the cycles seemed to be getting longer: 'a further retrospect shows that in the successive decades the periods of inflation gradually shrink, whilst the periods of depression correspondingly stretch out'.[15]

But as the understanding of the shipping market model increased, it became evident that in concentrating on length as the primary defining characteristic, analysts were 'putting the cart before the horse'. At first the perception was murky, though Kirkaldy cast some light on economic process when he defined the cycles as a succession of prosperous and lean periods which sorted out the wealthy shipowners from their less fortunate colleagues.

> With the great development of ocean transport, which commenced about half a century ago, competition became very much accentuated. As the markets became increasingly normal, and trade progressively regular, there was from time to time more tonnage available at a given port than there was cargo ready for shipment. With unlimited competition this led to the cutting of rates, and at times shipping had to be run at a loss. The result was that shipping became an industry enjoying very fluctuating prosperity. Several lean years would be followed by a series of prosperous years. The wealthy ship-owner could afford to put the good years against the bad, and strike an average; a less fortunate colleague after perhaps enjoying a prosperous time, would be unable to face the lean years, and have to give up the struggle.[16]

Viewed in this way, shipping market cycles have a Darwinian purpose. They create an environment in which weak shipping companies are forced out, leaving the strong to survive and prosper, fostering a lean and efficient shipping business.

Whilst Kirkaldy dwelt on the competition between owners and the part played by cashflow pressures, E.E. Fayle had more to say about the mechanics of the cycle. He suggested that the build-up of a cycle is triggered by the world business cycle or random events such as wars which create a shortage of ships. The resulting high freight rates attract new investors into the industry, and encourage a flood of speculative investment, thus expanding shipping capacity.

> The extreme elasticity of tramp shipping, the ease with which new-comers can establish themselves, and the very wide fluctuations of demand, make the ownership of tramp steamers one of the most speculative forms of all legitimate business. A boom in trade or a demand for shipping for military transport (as during the South African War) would quickly produce a disproportion between supply and demand; sending freight soaring upwards. In the hope of sharing the profits

> of the boom, owners hastened to increase their fleet and new owners come into the business. The world's tonnage was rapidly increased to a figure beyond the normal requirements, and the short boom was usually followed by a prolonged slump.[17]

This analysis suggests cycles consist of three events: a trade boom, a short shipping boom during which there is overbuilding, followed by a 'prolonged' slump. However, Fayle was not confident about the sequence, since he says the boom is 'usually' followed by a prolonged slump. He thought the tendency of the cycles to overshoot the mark could be attributed to the lack of barriers to entry. Once again the cycle is more about people than statistics. Forty years later, Cufley also drew attention to the sequence of three key events common to shipping cycles: first, a shortage of ships develops, then high freight rates stimulate over-ordering of the ships in short supply, which finally leads to market collapse and recession.

> The main function of the freight market is to provide a supply of ships for that part of world trade which, for one reason or another, does not lend itself to long term freighting practices … In the short term this is achieved by the interplay of market forces through the familiar cycle of booms and slumps. When a shortage of ships develops rising freights lead to a massive construction of new ships. There comes a point either when demand subsides or when deliveries of new vessels overtake a still increasing demand. At this stage freights collapse, vessels are condemned to idleness in laying up berths.[18]

This is a neat synopsis of the way cycles pump ships in and out of the market in response to changes in freight rates. However, Cufley is convinced that the pumping action is too irregular to forecast, though he thought the underlying trends were more predictable.

> Any attempt to make long-term forecasts of voyage freights (as distinct from interpreting the general trend in growth of demand) is doomed to failure. It is totally impossible to predict when the open market will move upwards (or fall), to estimate the extent of the swing or the duration of the phase.[19]

One reason the cycles are so unpredictable is that the investors themselves can influence what happens. Hampton, in his analysis of long and short shipping cycles, emphasizes this point:

> In today's modern shipping market it is easy to forget that a drama of human emotions is played out in market movements … In the shipping market, price movements provide the cues. Changes in freight rates or ship prices signal the next round of investment decisions. Freight rates work themselves higher and trigger orders. Eventually excess orders undermine freight rates. Lower freight rates stall orders and encourage demolition. At the low point in the cycle, reduced ordering and increased demolition shrink the supply and set the stage for a rise in freight rates. The circle revolves.[20]

Hampton goes on to argue that groups of investors do not necessarily act rationally, which explains why the market repeatedly seems to over-react to the price signals.

> In any market, including the shipping market, the participants are caught up in a struggle between fear and greed. Because we are human beings, influenced to varying degrees by those around us, the psychology of the crowd feeds upon itself until it reaches an extreme that cannot be sustained. Once the extreme has been reached, too many decisions have been made out of emotion and a blind comfort which comes from following the crowd rather than objective fact.[21]

All these descriptions of the shipping cycle have a common theme. They describe it as a mechanism devoted to removing imbalances in the supply and demand for ships. If there is too little supply, the market rewards investors with high freight rates until more ships are ordered. When there are too many ships it squeezes the cashflow until the owners of the oldest ships give up the struggle and ships are scrapped. Looked at in this way, the cycles last as long as is necessary to do the job. It is possible to classify them by length, but this is not very helpful as a forecasting aid. If investors decide that an upturn is due and decide not to scrap their ships, the cycle just lasts longer. Since shipowners are constantly trying to second-guess the cycle, and the crowd psychology to which Hampton refers often intervenes to drive the decision process, each cycle has a distinctive character.

Conclusions

Pulling all this together, shipping cycles are not there to irritate shipowners (though they do a good job in that respect), they are a crucial part of the market mechanism and we highlighted five points. First, shipping cycles have different components – long, short and seasonal. Second, the function of the short shipping cycle is to coordinate supply and demand in the shipping market. They are the shipping market's engine room telegraph (think about it) and as long as there are fluctuations in supply or demand there will be cycles. Third, a short cycle typically has four stages. A market trough (stage 1) is followed by a recovery (stage 2), leading to a market peak (stage 3), followed by a collapse (stage 4). Fourth, these stages are 'episodic', with no firm rules about the timing of each stage. Regularity is not part of the process. Fifth, there is no simple formula for predicting the 'shape' of the next stage, far less the next cycle. Recoveries can stall half way and slump back into recession in a few months or last for five years. Market collapses may be reversed before they reach the trough. Troughs may last six months or six years. Peaks may last a month or a year. Sometimes the market gets stuck in the middle ground between trough and recession.

3.3 SHIPPING CYCLES AND SHIPPING RISK

Since shipping cycles lie at the heart of *shipping risk*, we should now say something about what that risk involves. Technically, shipping risk can be defined as the 'measurable liability for any financial loss arising from unforeseen imbalances between the supply and demand for sea transport'.[22] In other words, we are concerned with who shoulders the financial burden if the supply of ships does not exactly match the demand and a loss results. For example, if too few ships are built and oil companies cannot supply their refineries, steel mills run out of iron ore, and manufactured exports are stranded in the ports, who pays? Or if too many ships are built and many earn nothing on their multi-million-dollar capital investment, who pays?

The answer is that the primary risk takers are the shipowners (the investors who own the equity in the ships offered for hire) and the cargo owners (also called the *shippers*) who between them perform the balancing act of adjusting supply to demand. They are on opposite sides of the shipping risk distribution, and when supply and demand get out of balance, one or the other loses money. Figure 3.3 shows how movements in freight rates (the vertical axis) over time (the horizontal axis) determine who pays. The break-even cost of transport is shown by the line T_1 – in a perfect market this should reflect the long-term cost curve for operating ships, and if supply and demand were always precisely in balance freight rates would follow this line (we discuss this in Chapter 8). But in practice supply and demand are rarely exactly in balance, so freight rates fluctuate around T_1, as shown by the short-term cycle F_1. When cargo owners get it wrong and have too many cargoes, rates shoot above the trend cost, transferring cash to shipowners who respond by ordering more ships (point A in Figure 3.3). Conversely, when the owners get it wrong and there are too many ships, rates swing below trend. Shipowners find themselves subsidizing the cargo owners and they cut back on investment (point B in Figure 3.3). In this way the cycles exert financial pressure to correct the situation and bring rates back to the trend. Eventually if business is to continue, the freight cashflow should average out at the break-even cost of transport, so across the whole market shipping risk is primarily about the *timing* of receipts.

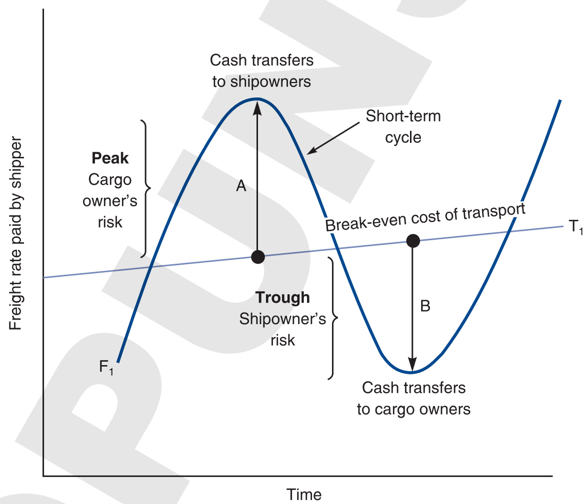


Figure 3.3
Key risk features of the shipping cycle
Compiled by Martin Stopford from various sources

Shipping risk and market structure

But that does not apply to the shipping risk of individual companies. As a group, cargo owners and shipowners face mirror-image risk distributions, so the volatility of the cycles allows individual companies to 'play the cycle' and in so doing vary their individual

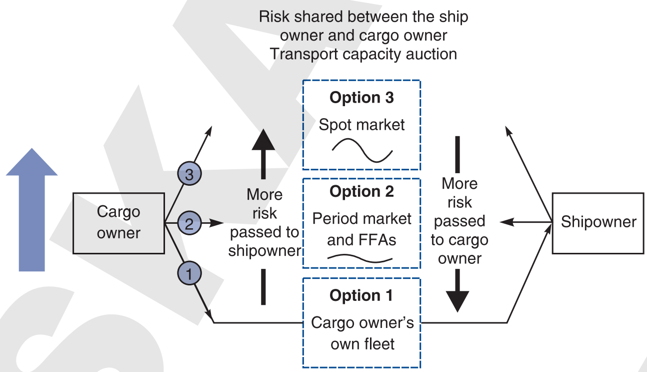


Figure 3.4
Risk management options in bulk shipping
Compiled by Martin Stopford from various sources

risk profile. As cargo owners and shipowners adjust their exposure to shipping risk they can determine who actually controls the way the supply side of the market cycle develops. We will discuss the economics of this process in Chapter 4; the point here is simply to emphasize how the supply side decision process is determined. Since the shippers have the cargo, they take the lead in this process, and the diagram in Figure 3.4 illustrates the three main 'options' open to them.

If cargo owners feel very confident about their future cargo flows and want to control the shipping, they may decide on option 1, which involves buying and operating their own ships. In doing this they cut the shipowner out of the equation (though they may use a shipping company to manage the vessels) and take all the shipping risk themselves. If all cargo owners do this, the spot market phenomenon disappears and the role of independent shipowners shrinks. There are many examples of this. For example, most LNG schemes were set up using vessels owned or leased by the project and until 1990 almost all the container-ship fleet was owned by the liner companies.

However, if they are reasonably certain about future cargo volumes, but feel independent shipowners can do the job cheaper, they may prefer option 2, which involves taking long-term charters from independent owners. They pay an agreed daily rate, regardless of whether the ship is needed, whilst leaving the cost management and the residual risk with the shipowner. For example, Japanese corporations often arrange for foreign owners to build ships in Japanese yards and charter them back on long-term contracts. These are known as 'tie-in' ships or *shikumisen*.[23] Raw materials such as iron ore, coal, bauxite, non ferrous metal ores and coal are often shipped in this way. The longer the charter, the more risk is taken by the cargo owner and the less by the shipowner, and long charters became so common that in the early 1970s that Zannetos commented: 'I know of few industries that are less risky than the oil tankship transportation business. Relatively predictable total requirements, time-charter agreements, and, because of the latter, availability of capital mitigate the risks involved in the industry'.[24] In this business the challenge is to win the contract and deliver the service at a cost which leaves the shipowner with a profit. Although the shipowner is freed from market risk, that does not remove all risk. Charterers strike a hard bargain, often leaving the owner vulnerable to inflation, exchange rates, the mechanical performance of the ship and, of course, the ability of the shipper to pay his hire. As an alternative to a physical contract, charterers could take financial cover using the derivatives market and, for example, a forward freight agreement (FFA). This form of hedging (or speculating) is discussed in Chapter 6.

Finally, cargo owners can pass all the shipping risk to the shipowner by using the spot market (option 3 in Figure 3.4). They hire the ships they need on a cargo by cargo basis, so if for some reason there is no cargo, the shipowner carries all the cost of the ships which are unemployed. However, everything has a price and when ships are in short supply, cargo owners with no cover must pay a premium. Both the period and the spot markets have cycles, but the spot cycles are the most volatile. We discuss the workings of the spot and period markets and the economics of freight rates in detail in Chapter 6.

Risk distribution and shipping strategy

These three options do not change the amount of shipping risk; they just redistribute it between the cargo owners, who take all the downside risk under option 1 and none under option 3, and the shipowners, who take no risk (except possibly as ship manager) under option 1, take time-charter risk under option 2, and become primary shipping risk takers under option 3. So shipowners have very different strategic options. They can trade on the spot market and become risk managers or become subcontractors and ship managers, focusing on cost and management. Cargo owners have strategic choices, too. The distribution of risk between the spot and period markets is a matter of policy, and the balance will change with circumstances. Oil transport provides a good example. In the 1950s and 1960s the oil companies owned or time-chartered most of the ships they needed, taking only 5–10% from the voyage charter market, so in 1973 there was 129 m.dwt of independent tanker tonnage on time charter and only 20 m.dwt on the spot market (see Figure 5.2 in Chapter 5).[25] However, after the oil crisis in 1973 the oil trade became more volatile and oil shippers, which now included many traders, started to switch to the spot market, so by 1983 the tonnage trading spot had increased to 140 m.dwt and only 28 m.dwt was on time-charter. So in 10 years tanker shipping risk was completely redistributed. One benefit of this was that with such a large spot market there was increased liquidity, making it a more viable transport source for shippers than the tiny spot market in the early 1970s.

3.4 OVERVIEW OF SHIPPING CYCLES, 1741–2007

The freight index in Figure 3.5 allows us to see how freight cycles have behaved over a 266-year period. This freight index was derived from a number of sources. Coal rates for the English trade covering the period from 1741 to 1869 were spliced together with a long dry cargo freight index compiled by Isserlis.[26] The post-1950 data came from several published sources of dry cargo data. But overall we get a reasonable indication of what was going on each year in the shipping market. Identifying the shipping cycles from these data is not entirely straightforward, since it was necessary to distinguish the many small fluctuations from the significant peaks and troughs. Over the 266-year period 22 shipping cycles were identified. The initial market peak of each of the

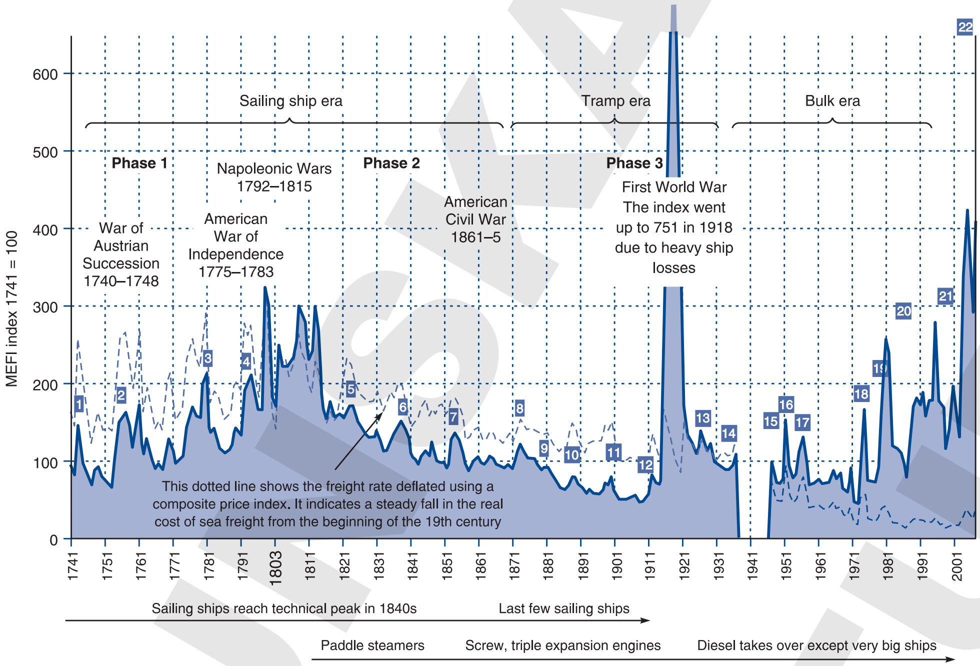


Figure 3.5
Dry cargo shipping cycles (mainly coal), 1741–2007
Source: Based on Appendix C.

22 cycles is numbered in Figure 3.5, ignoring the minor year-to-year fluctuations and focusing on major peaks. From 1869 it was possible to confirm the status of the identified peaks and troughs by referring to contemporary brokers' reports, and this resulted in 1881 and 1970 being treated as peaks although they are not prominent in statistical terms.

Table 3.1 provides a statistical analysis of the length of the 22 cycles since 1741 and shows that they vary enormously in length and severity. Between 1741 and 2007 there were 22 cycles lasting 10.4 years on average, though only one actually lasted 10 years. Three cycles were over 15 years, three lasted 15 years; one lasted 14 years; one 13 years; three 11 years; one 10 years; three 7 years; two 6 years; two 5 years; one 4 years; and one 3 years. In statistical terms, the standard deviation was 4.9 years, so with a mean of 10.4 years we can be 95% certain that cycles will last between 0 and 20 years. Table 3.1 also shows the length of the peaks and the troughs of each cycle. The start, end and total length of each cyclical peak is shown in columns 2–4, and the same information for each market trough in columns 5–7. Finally, column 8 shows the total length of each cycle, including both the peak and the trough. Finally, note that between 1741 and 2007 there were three major wars – the Napoleonic Wars, the First World War and the Second World War – and numerous lesser wars and revolutions, so it was a pretty bumpy ride. Since the major wars disrupted the market, the freight statistics for these periods are excluded from the analysis. The longest cyclical peak, defined as a period when

Table 3.1 Dry cargo freight cycles, 1741–2007

(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Peak			Trough			
Cycle Number		Start	End	Length	Start	End	Length	Total Cycle
1	Sail era 1741–1871	1743	1745	3	1746	1753	7	10
2		1754	1764	11	1765	1774	9	20
3		1775	1783	9	1784	1791	7	16
4		1791	1796	6	1820	1825	5	11
		1792	1813		Napoleonic Wars			
5		1821	1825	5	1826	1836	10	15
6		1837	1840	4	1841	1852	11	15
7		1853	1857	5	1858	1870	12	17
8	Tramp era 1872–1947	1873	1874	2	1875	1879	5	7
9		1880	1882	3	1883	1886	4	7
10		1887	1889	3	1890	1897	8	11
11		1898	1900	3	1901	1910	10	13
12		1911	1913	3	First World War			
13		1919	1920	2	1921	1925	4	6
14		1926	1927	2	1928	1937	9	11
		1939	1946		Second World War			
15	Bulk era 1947–2007	1947	1947	1	1948	1951	4	5
16		1952	1953	2	1954	1955	2	4
17		1956	1957	2	1958	1969	12	14
18		1970	1970	1	1971	1972	2	3
19		1973	1974	2	1975	1978	4	6
20		1979	1981	1	1982	1987	6	7
21		1988	1997	10	1998	2002	5	15
22		2003	2007	5				5
Average				3.9			6.8	10.4

Summary		Av. Peak	Av. Trough	Total
Sail era	1741–1871	6.1	8.7	14.9
Tramp era	1871–1937	2.6	6.7	9.2
Bulk era	1947–2007	3.0	5.0	8.0
1741–2007		3.9	6.8	10.4

Source: Complied by Martin Stopford from the data in Appendix C and other sources

the freight index was consistently above the long-term trend, was 10 years, whilst the longest trough was also 10 years. However, there were many cycles which lasted only 1 year, and 2-year troughs were particularly frequent.

Figure 3.6, which plots the cycles in chronological order by length, reveals two interesting points. Firstly, cycles were longer in the sailing ship era than during the

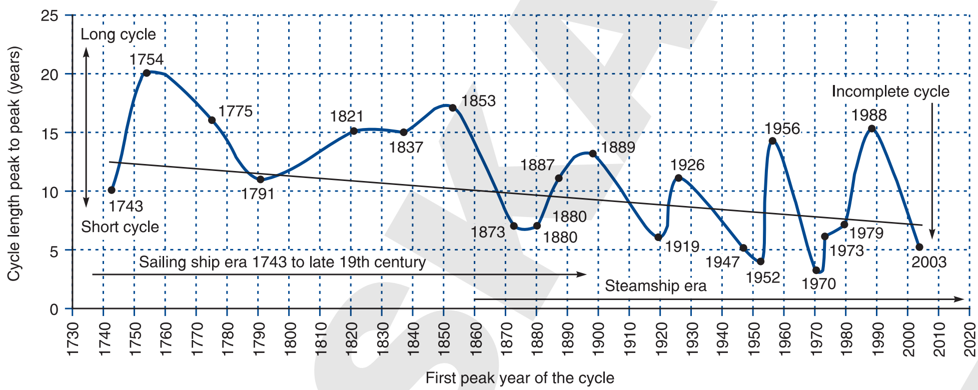


Figure 3.6
Length of shipping cycles, 1740–2007
Source: Compiled by Martin Stopford from various sources

steamship era which followed, and the average length of cycle fell from 12.5 years in 1743 to 7.5 years in 2003. This could be associated with the technology. Or possibly global communications which first appeared in 1865 could have affected the dynamic adjustment process. So for the present there may be some merit in the industry rule of thumb that shipping cycles last about 7 years. Secondly, the graph suggests that the length of cycles was itself cyclical. The long cycles of 12–15 years were generally separated by a sequence of short cycles, sometimes lasting less than 5 years. For example, the long cycle in 1956 was preceded two short cycles and the 1988 long cycle was preceded by three short cycles. Although the pattern is not regular, there could, for example, be a dynamic mechanism which produces alternating long and short cycles. But there are clearly no firm rules and the main conclusion is that shipping investors who rely on rules of thumb about the length of cycles are asking for trouble. We need to dig deeper for an explanation of what drives these cycles.

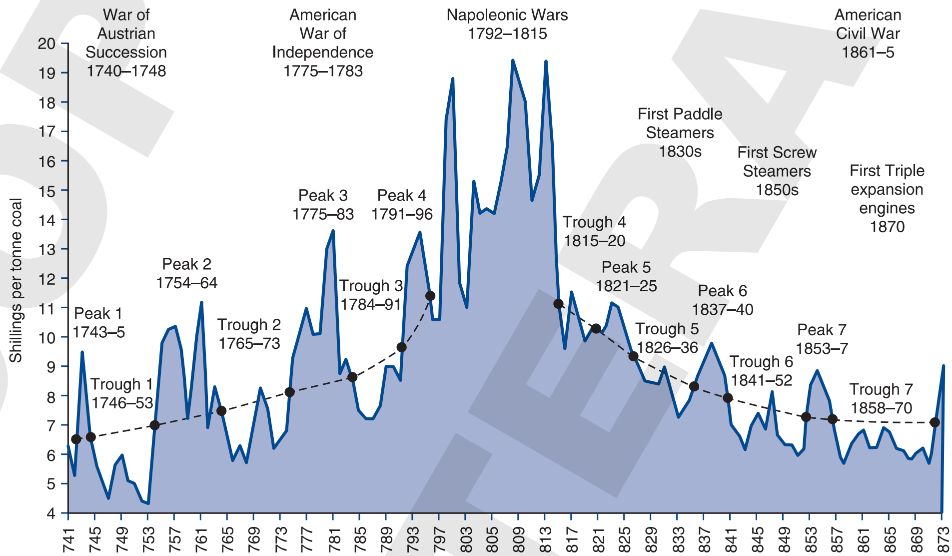
Shipping cycles in practice

Having looked at cycles from a number of different perspectives, we can take advantage of the shipping industry's long and well-documented history to see how cycles have behaved in the past. In the following sections we will review the cycles illustrated in Figure 3.5 in the context of developments in the world economy and the contemporary comments made by brokers and other commentators. The three periods taken as the basis for this review are the sailing ship era (1741–1869); the liner and tramp era which started when efficient steamships became available in the 1860s – and lasted until the Second World War; and the bulk shipping era which started after the second world war as the shipping industry transport system was mechanized and purpose-built bulk carriers started to be used. The commentary focuses on dry cargo until the third period, when the tanker market is introduced into the discussion.

3.5 SAILING SHIP CYCLES, 1741–1869

The period 1741–1869 covers the final years when sailing ships dominated sea transport. The freight index in Figure 3.7, which tracks the cycles during this period, is based on coal freight rates from Newcastle upon Tyne to London in shillings per ton. The freight increased from 6*s*. 8*d*. per ton in 1741 to 18*s*. 16*d*. in 1799, during the Napoleonic Wars, then declined to 7*s*. per ton in 1872. Most of the early increase between 1792 and 1815 was due to wartime inflation; this period has been excluded from the cycle analysis and market prices have been retained for comparability. Although this was the sailing era, there was a clear pattern of cycles over the period which was not so different from later times, though the cycles were longer. There were seven peaks, not counting the Napoleonic war period, averaging 6.1 years each, and seven troughs, which averaged 8.7 years each, so the average cycle lasted 14.9 years. Although the graph in Figure 3.7 shows a clear cyclical pattern, the cycles varied enormously in length and the number of cycles depends on how you classify them. One very obvious issue is that there were seven 'mini-peaks' which occurred mid-way through the troughs, in 1749, 1770, 1789, 1816, 1831, 1847, and 1861. These mini-peaks barely reached the dotted trend line in Figure 3.7 and for this reason were not included as market peaks. Possibly they are examples of the 'recovery that never made it' illustrated in Figure 3.6.

This was a period of continuous trade growth as the industrial revolution took hold in Britain, but it was also a politically unsettled period, with a series of wars which



The cycles during this period are based on upward movements in freight rates which at least doubled earnings and were sustained for more than a year. As a result the 'mini-peaks' which occurred 1749, 1770, 1831, 1845, 1861 etc. are not counted as peaks. The graph suggests that these half-hearted recoveries were a regular feature of the long troughs which occurred during this period.

Figure 3.7
Sailing ship market cycles, 1741–1873: coal freight rates from Newcastle upon Tyne to London
Source: Compiled by Martin Stopford from various sources

certainly affected freight rates. At the start of the period there was a seven-year trough from 1746 to 1753. This coincided with the War of Austrian Succession and the 1739–48 War of Jenkins' Ear with Spain. Davis comments that 'In 1739–48 … the armed conflict was holding back trade … The peace of 1748, therefore, found England ripe for an extraordinary increase in the volume of export trade'.[27] This increase is reflected in contemporary trade statistics which show that the volume of English commodity exports increased by 40% between 1745 and 1750.[28] Possibly this prepared the way for the boom which started in 1754 and lasted until 1764.

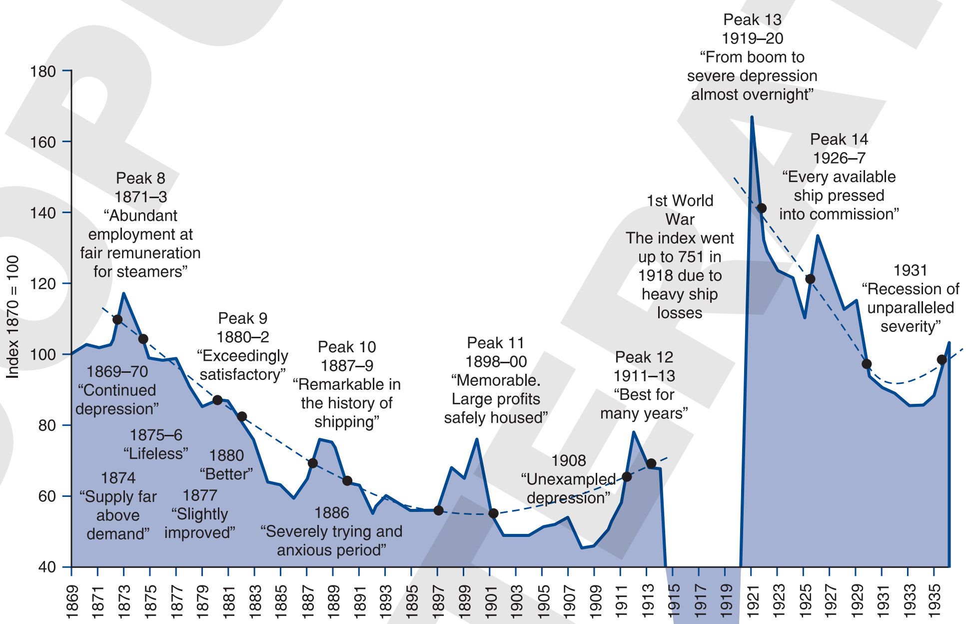
Generally this was a period of relatively strong alternating peaks and troughs. The strong boom of 1754–64 was followed by a mirror image recession from 1765 to 1773. The strength of the boom almost precisely matched the depth of the recession. After a 'mini-peak' in 1770 there was another strong boom from 1775 to 1783. In fact this coincided with the American War of Independence and between 1775 and 1881 English commodity exports fell by 30% from £15.2 million to £10.5 million.[29] The result was a nine-year recession from 1782 to 1791. This is one of the most severe recessions on record and was caused by the disruption to trade arising from the American War. Before the war there was a well-balanced three-leg trade consisting of general cargo from the UK to the Caribbean, followed by a trading leg with plantation produce, from the Caribbean to East Coast North America from where a backhaul to the UK could be obtained. It worked well, but after the American War of Independence, the backhaul cargoes completely disappeared, and the focus of trade switched from the North Atlantic to the Baltic, leaving surplus shipping capacity. The recovery came with the fourth peak, which lasted from 1791 to 1796.

From the end of the Napoleonic wars in 1815 the trend in freight rates was strongly downwards. The dry cargo freight rate started at £11 8*s*. per ton in 1815 and by 1871 it had fallen by 40% to £7 per ton. This falling trend makes it difficult to identify the cycles precisely during this period and creates a particular problem when assessing the severity of cycles. In fact the cycles were probably not particularly extreme. Although these freight rates are not adjusted for inflation, this is probably evidence that sea transport was becoming more efficient and cheaper. Some of this efficiency was certainly due to the intense competition between sailing ships, which, as we noted in Chapter 1, reached new peaks of efficiency during the first half of the nineteenth century. However, the paddle steamers became more economic with each decade and by the end of the period had evolved into screw-driven ships with more efficient steam engines. In addition, improvements in shipbuilding and greater industrial activity resulted in ship sizes increasing steadily during the period. For example, in the eighteenth century a 300 grt vessel was a good size, but by 1865, a 2,000 grt vessel built of iron was a more common size.

During the period following 1815 there were four cycles, with peaks averaging 4–5 years each and troughs averaging 10–12 years. On that basis the average length of cycle was 15 years, which is similar to the earlier period. The fifth peak from 1821 to 1825 was followed by a 10-year trough, but with a 'mini-peak' in 1831. Then there was another strong peak between 1837 and 1840 followed by an 11-year trough from 1841 to 1852, with a 'mini-peak' in 1847 when rates reached £8 14*s*. per ton. The seventh peak lasted from 1853 to 1857 with the final long trough from 1858 to 1870, again with a couple of 'mini-peaks' in 1861 and 1864. This was a period of rapidly changing technology in the coal trade as new steam colliers forced their way into the trade and the owners of old and obsolete sailing ships may have suffered badly during the troughs, whilst the owners of more modern vessels faced less pressure, due to their greater productivity. In general this was a period of well-defined cycles pushing the industry forward during an era of changing technology.

3.6 TRAMP MARKET CYCLES, 1869–1936

The next seventy years provide a fascinating example of the interplay between short-term cycles and long-term trends, with just about every shape of cycle appearing. During this period the tramp steamer dominated the freight market. At the start efficient steam-driven tramps were just beginning to appear, and they reached their peak during the Second World War with the mass production of Liberty ships. The pattern of freight rates in Figure 3.8 shows a long-term downward trend, during which the freight index fell from 94 in 1869 to 53 in 1914.[30] Onto this long-term trend was superimposed a series of five shorter cycles which averaged 9.8 years in length.



It is difficult to identify the cycles clearly in the period 1921–40. Cycle 5 started with a strong peak in 1921 and, arguably, ended with the short peak in 1926. On this interpretation cycle 6, which included the shipping depression of the 1930s, lasted 11 years. An alternative interpretation would be to count the period 1926–9 as a separate cycle.

Figure 3.8
Tramp shipping market cycles, 1871–1937
Source: Compiled by Martin Stopford from various sources

Like the cycles in the first half of the nineteenth century, it is difficult to disentangle the short cycles from the long-term trend. Once again we see rapidly falling freight rates resulting in cyclical peaks at rates which, in terms of their deviation from the trend, are in absolute terms lower than rates experienced in troughs just a few years earlier. Fortunately the availability of brokers' reports from 1869 onwards means that it is possible to validate the estimated cycles against market reports.

The cycles continued relentlessly, despite the rapid advances in technology. The best peak came in the early 1870s and there were two relatively severe troughs. The first was between 1866 and 1871, but the most severe was the trough between 1902 and 1910. Contemporary records confirm that this was indeed a very difficult time for the shipping industry, probably triggered by over-building as a result of the preceding boom in 1900. In 1902 'the result of the past year's trading, as far as 80 percent of British shipping is concerned, is an absolute loss, or at best the bare covering of out of pocket expenses' and 1904 was 'the fourth year of unprofitable work'. By 1907 the brokers noted 'the enormous difficulties which beset the shipowner in his efforts to find employment for his tonnage as will not involve him in a heavy loss', and it was not until 1909 that the reports state that, 'having passed through times of utmost stress, one can with some confidence state that the worst is over'.[31]

The technological trend in freight rates, 1869–1913

The fall in freight rates between 1869 and 1913 was driven by technical change which steadily reduced costs. This trend is well documented in both academic and shipping literature. Lecturing at Oxford in 1888, Professor James Rogers commented:

> There is perhaps no branch of human industry in which the economy of cost has been so obviously exhibited as in the supply of transit. The voyage across the Atlantic is completed in less than half the time it took forty years ago, a great saving in motive power and labour. The same is true on voyages to and from India, China and other distant places. The process of loading and unloading ships does not take a third of the time, a third of the labour and a third of the cost which it did a few years ago.[32]

Shipyards were gaining confidence in steel shipbuilding and production grew rapidly. Between 1868 and 1912 the shipbuilding output of the shipyards on the Wear trebled from 100,000 grt to 320,000 grt. The ships became bigger and more efficient. In 1871 the largest transatlantic liner was the *Oceanic*, a 3800 grt vessel with a 3000 hp engine capable of 14.75 knots. It completed the transatlantic voyage in nine and a half days. By 1913 the largest vessel was the 47,000 grt *Aquitania*. Its 60,000 hp engines drove it at 23 knots. The transatlantic voyage time had fallen to under five days. These vessels were comparable in length with a 280,000 dwt tanker and vastly more complex in terms of mechanical and outfitting structure.

Perhaps the most important technical improvement was in the efficiency of steam engines. With the introduction of the triple expansion system and higher-pressure boilers, the cargo payload of the steamships increased rapidly.[33] The economic advantage of steamships was compounded by economies of scale. The average size of merchant ships launched on the River Wear grew from 509 gross tons in 1869 to 4324 gross tons in 1913.[34] Finally, the opening of the Suez Canal in 1869 gave steamships the economic advantage they needed to oust sail as the preferred type of newbuilding.

Between 1870 and 1910 the world fleet doubled from 16.7 million grt to 34.6 million grt and the continuous running battle between the new and old technologies dominated market economics as each generation of more efficient steamers pushed out the previous generation of obsolete vessels. The first to come under pressure were the sailing ships, which were replaced by steamers. In 1870 steamers accounted for only 16% of the tonnage (Table 3.2) but by 1910 they accounted for 76% of the world merchant fleet.[35] The competition was long and hard fought. Sailing ships with their low overheads managed to survive recessions and even occasionally win back a little ground.

Table 3.2 World merchant fleet by propulsion

	Steam	Sail	Total
1870	2.6	14.1	16.7
1910	26.1	8.4	34.5
Growth pa	6%	–1%	

Source: Kirkaldy (1914 Appendix XVII).

Change is never easy, and the market used a series of short cycles to alternately draw in new ships and drive out old ones. At a time when the shipping industry was growing rapidly and making great technical strides forward, shipbrokers saw little of the current of technical progress on which the market was being swept along. Their reports focus on the charter market where each generation of marginal tonnage struggled for survival against the new-cost effective vessels. They paint a picture of almost continuous gloom as year after year the better and bigger high-technology ships drove out the obsolete tonnage.[36] Yet by the end costs had fallen, the fleet had grown and enormous volumes of cargo had been shipped. The following brief review of the cycles is drawn from several sources, but principally Gould, Angier & Co., supplemented by the details of the cycles in shipbuilding output on the River Wear, at that time one of the world's most active merchant shipbuilding areas.

Cycle 8: 1871–9

There were three good years in 1871–3. The first was described as a year with 'abundant employment at very fair remuneration for steamers, but restricted employment at very low remuneration for sailing ships'.[37] This theme of steamers driving sailing ships from the market was to persist for the next decade. The following two years were patchy, though brokers described them as better than expected.

The recession started in 1874 and lasted 5 years until 1879. By 1876 the market was 'still stagnant', but started improving in 1877, a trend that is clear from the pick-up in shipbuilding output on the River Wear. Steamers were gradually winning the battle with sail. According to McGregor '1878 can be regarded as the last year in which sail figured at the same equality as steam in the China trade'.[38] Although the market was weak, it was not a particularly severe recession. Rates were seasonal, and the words 'dull', 'lifeless' and 'stagnant' were repeatedly used in contemporary reports to describe business. Shipbuilding deliveries were running well below the peak of 1872. On the Wear launches fell from a peak of 134,825 grt in 1872 to 54,041 grt in 1876, after which they recovered to 112,000 grt in 1878.

Cycle 9: 1881–9

The next cycle also lasted 8 years, spanning most of the 1880s. The boom picked up in the autumn of 1879 when rates showed 'considerable firmness' and 'in almost every trade a fair amount of business is doing which leaves more or less profit, and there is a better state of things than could be noted during several winters past'.[39] Firm rates continued until 1882, driven by an expanding trade cycle. The strength of this boom is apparent from the sharp rise in shipbuilding launches. This was a real shipbuilding boom. Output on the Wear was 108,626 grt in 1880 and, following heavy ordering in 1880–1, doubled to a peak of 212,313 grt in 1883.

After a slow start in 1883 the recession gathered force in 1884. 'The rates at which steamers have been chartered are lower than have ever before been accepted. This state of things was brought about by the large over-production of tonnage during the previous three years, fostered by the reckless credit given by banks and builders, and over-speculation by irresponsible and inexperienced owners. The universal contraction of trade also aggravated the effect of the above causes'. It continued this way until 1887, making it a four-year trough. In fact, the recession was coming to an end, but, as so often happens, the transition from recession to boom was somewhat drawn out. Three years into the recession the volume of shipbuilding output in the UK had fallen sharply from a peak of 1.25 million grt in 1883 to a trough of 0.47 million grt in 1886.

Cycle 10: 1889–97

The third cycle was of similar length, spanning 1889–1897. The 1880s ended with a real freight boom, described as 'remarkable in the history of shipping'. In fact 1888 opened quietly, but in the autumn the freight index, which had fallen to 59 in 1886, peaked at 76, a 29% increase. In 1889 freights remained at this level and prices for completed cargo steamers rose by 50% from £6.7 to £9.9 per deadweight ton. Shipbuilding output continued to grow, with launches on the Wear in 1889 reaching 217,000 grt, higher than the previous peak of 212,000 grt in 1883. In total the peak lasted a little over 18 months.

In 1890 the market moved sharply into recession. By the end of the year observers commented on 'The sudden relapse of all freights and all values of steam property from the high points reached in 1889 to about the lowest figures touched during the long recession from 1883 to 1887 … The rates now ruling leave a heavy loss in working for all but cheaply-bought new steamers … The only sure means of improving the position was a wholesale laying-up of steamers in order to reduce the amount of trading tonnage by 25%'.[40]

The recession which followed lasted most of the decade. There was a modest recovery in 1895 and the market progressively improved during the next three years. Once again attention is focused on the shipbuilding scene, where the level of production had not fallen as sharply as in the previous recession. Launches on the Wear reached 215,887 grt in 1896, almost back to the 1889 peak.

Cycle 11: 1898–1910

The fourth and last cycle before the First World War was also the longest, lasting 12 years. After the protracted recession of the early 1890s, there was a three-year freight market boom, starting in 1898. That year opened with a distinctly firm market as 'the effect of the long stoppage of work in the engine shops and shipyards caused by the engineers' strike of 1897, and a general awakening of trade, but the actual advance in prices was so gradual that purchasers were able to get in contracts for an immense amount of tonnage at cheap rates'.[41]

The year 1899 proved less profitable than expected, but far from unsatisfactory. Bad crops in India and Russia reduced the exports from these areas, undermining the anticipated boom. Then 1900 was a memorable year for the shipping industry: 'It would be hard to find any year during the century which could compare in respect of the vast trade done and the large profits safely housed'.[42] The freight index reached the highest level since 1880 and, as a result of orders placed during this period, in 1901 shipbuilding launches on the Wear were close to 300,000 grt.

A major factor during 1900 was the large amount of government transport taken for the South African war, but also for India and China. By the last quarter the market was starting to run out of steam. 'The last quarter witnessed a general sobering down, showing distinctly that the flood tide was spent, and a gradual ebb commenced. The general conditions of the world's trade point to no sudden contraction or slump, but to a continuance of steady and widespread business for some time to come, though at gradually reducing margins of profit'.[43]

Things did not work out quite so well. By 1901 the market was back in recession. Starting from a decline of 20–30% from the best rates fixed in 1900, there was a further fall of 20–30%. By the autumn of 1901 rates were 50% below the peak levels in 1900. The year 1901 was poor and in 1902 'the result of the year's trade, as far as the 80% of British Shipping is concerned, was an absolute loss to the vast majority of ships, or at best the bare covering of out of pocket expenses. Of the remaining 20% of tonnage, consisting of "liners" proper, only the few most favoured companies have done well, viz. those with good mail contracts'.[44] The market remained more or less in depression until 1909.

Despite the recession, by 1906 shipbuilding launches on the Wear reached 360,000 grt, an all-time record. Considering the level of freight rates, the newbuilding boom is difficult to explain. It may have been triggered by the large cash reserves built up during the previous market boom and anticipation of a market upturn. Shipbuilders trying to maintain their business volume may also have contributed. Angier thought so, commenting that in 1906 'The knowledge that many fleets of steamers were owned far more by the builders than by the registered owners [has] become a commonplace, but this year we have seen a shipbuilder's syndicate entering directly into competition with shipowners and securing a mail contract from Australia. This action was received with natural annoyance on the part of the established lines'.[45]

Cycle 12: 1911–14

Finally, in 1911 the industry moved into a period of better trading conditions during which most owners made modest profits. This improvement was 'contributed to by the general improvement in the trade of the world, the cessation of building brought about by the lockout of the boiler makers by the shipbuilders, and the removal from freight markets of a number of obsolete steamers which their owners have been driven, by the prohibitive premiums demanded by underwriters, to sell for breaking up'.[46] In 1911 freights were higher than in any year since 1900, though returns on capital were not much more than 'would have been made by the investing of a like amount in first class securities, involving no labour or retention'.[47] The year 1912 witnessed a 'boom' in freights which enabled shipowners to make a real profit. The freight market collapse started again in 1913 but was interrupted by war.

Shipping cycles between the wars (1920–40)

The period between the First and Second World Wars had a very different character. It was not a particularly prosperous period for shipowners, and Jones comments: 'For most of the period between the wars it appears from the statistics of laid up tonnage that the world was over-stocked with shipping'.[48] In fact the period falls into two separate decades, the first poor and the second disastrous. The first, from 1922 to 1926, was volatile and from time to time shipping was modestly profitable. The second, from 1927 to 1938, was dominated by the great shipping depression of the 1930s.

In terms of cycles, it was a very strange period. In 1920 there was one of the most extreme market booms in the history of shipping. Freight rates went to record levels, and the General Council of British Shipping index jumped 140, four times the normal level. But the extent of the boom is best illustrated by the escalation of ship prices. A modern cargo ship, which had cost £55,000 in September 1914 at the start of the war, jumped in price from £169,000 in 1918 to 232,500 at the end of 1919. But two years later the price was back down to £60,000, where it stayed for the rest of the decade.[49] So that got the period off to a quirky start. According to Jones, the explanation of this boom was wartime reparations.

During the war, losses of merchant shipping to submarine warfare on the North Atlantic had become so severe that shipbuilding production had become a major strategic issue. In the United Kingdom, at that time the world's leading shipbuilder, capacity was expanded and between 1917 and 1921 the United States set up the first mass-production facility for merchant ships at Hog Island. The facility, which had 50 slipways, was designed to build 7800 dwt freighters for the war effort. However, it did not come into production until a few months before the end of the war, and it helped to swell surplus capacity. The result was that shipping in the 1920s was under a cloud of shipyard overcapacity, making it difficult to disentangle the cycles. The index shows little change over the 20 years, with just three short peaks and two lengthy troughs. The average length of cycle was 7.8 years. Contemporary records show that the first cyclical trough started in 1921 and continued until 1925. During this period the market was weak, though this is not fully reflected in the annual statistics. In 1926 there was a brief boom, triggered by the coalminers' strike in the UK, plus a revival in business activity. By the end of 1927 rates were slipping again and the market moved into a seven-year trough, one of the longest on record.

Cycle 13: 1921–5

The 1920s started with a boom and in 1921 the Economist freight index reached 200. After this spectacular start to the decade, the market was never really strong. By 1922 the freight index had fallen to 110. From then onwards freights fluctuated throughout the 1920s, creating conditions which, though not wildly profitable for shipowners, provided a modest living from year to year.[50] There was a brief recession in 1924–5 followed by a brief 'boom' when freight rates touched 170 in 1926, when demand was driven up by heavy coal imports from the USA to the UK during the miners' strike of that year. This is taken as the end of the fifth cycle, though the precise timing is debatable. After a spectacular start to the decade, second-hand prices were relatively stable, offering no opportunity for asset play profits. The Fairplay price index for a standard 7,500 dwt vessel opened at £258,000 in the first quarter of 1920. By spring 1921 it had fallen to £63,750, where it stayed, with the exception of a brief fall to £53,000 in 1925, until December 1929.

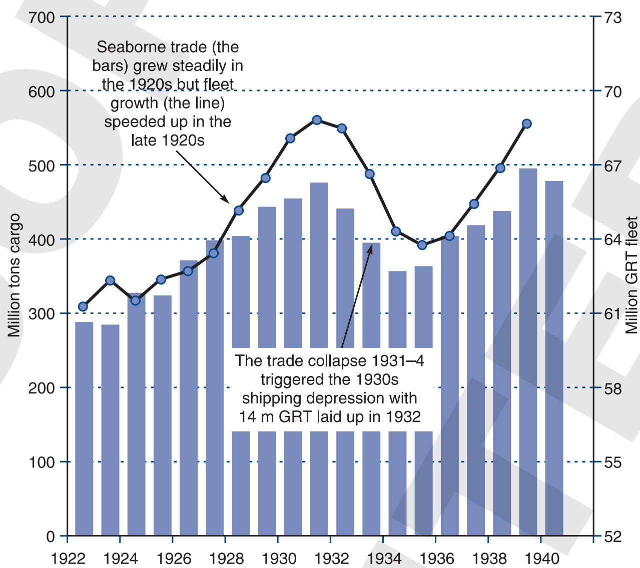


Figure 3.9
Sea Trade, 1922–38
Source: Sturmey (1962) Lloyd's Register

There were three developments which gave this period its distinctive character. By far the most important were the boom and bust cycle in sea trade. Between 1922 and 1931 the volume of seaborne trade increased by more than 50% from 290 million tons to 473 million tons, before falling precipitously to 353 million tons in 1934 (Figure 3.9). The second was shipyard overcapacity. During the First

World War the shipyards had built up capacity to replace heavy wartime losses of merchant ships, especially in the North Atlantic. The annual merchant tonnage launched during the war was 3.9 million gt, compared with only 2.4 million grt annual launches in 1901–14. After record production of 4.45 million grt in 1921, output fluctuated between 2 and 3 million grt. The lowest year was 1926, when production fell to 1.9 million grt. This was the best year of the decade for freight rates. Third, this was a period of moderate technical change. Internal combustion engines were starting to replace steam engines; oil was replacing coal as a primary fuel; and specialist ships such as tankers were being built in greater numbers.

Cycle 14: 1926–37 (The Great Depression)

A patchy market in the 1920s turned into the 1930s depression. Ironically, in 1929 some shipowners were predicting a return to more favourable market conditions, but the Wall Street Crash of October 1929 and the subsequent recession in world trade plunged the shipping industry into a major depression which lasted until the late 1930s. There is no doubt about the cause of the depression. Between 1931 and 1934 the volume of sea trade fell by 26%, and this coincided with a phase of rapid expansion of the merchant fleet, as can be seen in Figure 3.9. As a result laid-up tonnage increased from the 'normal' level of 3 million gt in June 1930, to a peak of 14 million gt by June 1932, representing 21% of the world fleet, after which heavy scrapping started to remove the surplus.

The financial consequences for the shipping industry were severe. The Economist freight index, which had averaged 110 in the 1920s and had never fallen below 85, fell to 80 points and stayed there. The fall in second-hand ship prices was even more severe, reaching a trough in the first half of 1933. Jones comments:

> Ship values fell by 50% in 1930. Similar depreciation is disclosed in the sale records of post-war vessels of every type and size. Single- and two-deck steamers built in the early post war period, which at the time were valued at between £200,000 and £280,000, were being sold for £14,000 in 1930. A number of these vessels were sold during 1933 and during the early part of the year these were changing hands for between £5,000 and £6,000. There was a slight recovery in the autumn, and in December the S.S. *Taransay*, a single-deck steamer, was sold for £11,500.[51]

By 1933 financial pressures had become so great, and market sentiment so adverse, that financially weak owners were forced to sell their ships at the distress prices which distinguish a depression from a recession. The banks played a leading role in forcing down prices and 'the market was hammered into insensibility by the ruthless and incredible course pursued by British banks in 1931 and thereafter'.[52] This trough in prices created an active speculative market and, 'values having reached such an unprecedented low level, extraordinary activity was recorded in the ship sale market. Foreign buyers recognized the opportunity to acquire tonnage at bargain prices. Greek buyers were especially prominent'.[53] Between 1935 and 1937, 5 million gt of ships were scrapped.

This was coupled with the renewed growth of sea trade, which finally passed its 1929 peak in 1937 and by January 1938 ships in lay-up had fallen to 1.3 million gt. As a result the freight index had shot up from 80, where it had been for the previous five years, to 145.

This 'boom' did not last long. The position deteriorated rapidly due to a decline in trade in 1938 and a recovery of shipbuilding deliveries to 2.9 million tons in 1937 and 2.7 million tons in 1938. Within 6 months, laid-up tonnage increased by over a million tons (on 30 June 1938, out of 66.9 million tons in existence, 2.5 million tons was laid up). Further details of the cycles during the inter-war period can be found in the discussion of shipbuilding market cycles in Chapter 15.

3.7 BULK SHIPPING MARKET CYCLES, 1945–2008

In the fifty-year period following the Second World War, the seven dry cargo freight market cycles were shorter, averaging 6.7 years each. During this period the bulk shipping markets developed, and we need to track developments in the tankers market as well as the dry cargo cycles. Dry cargo freight rates are shown in Figure 3.10 which continues the sequence of dry freight cycles, starting with cycle 15 in 1947 and ending with cycle 23 in 2003–8, whilst the tanker spot rates are shown in Figure 3.11. Although there are similarities in the timing of cycles, the shape is different. The dry cargo cycles are more clearly defined and the peaks tend to be longer, while the tanker cycles are

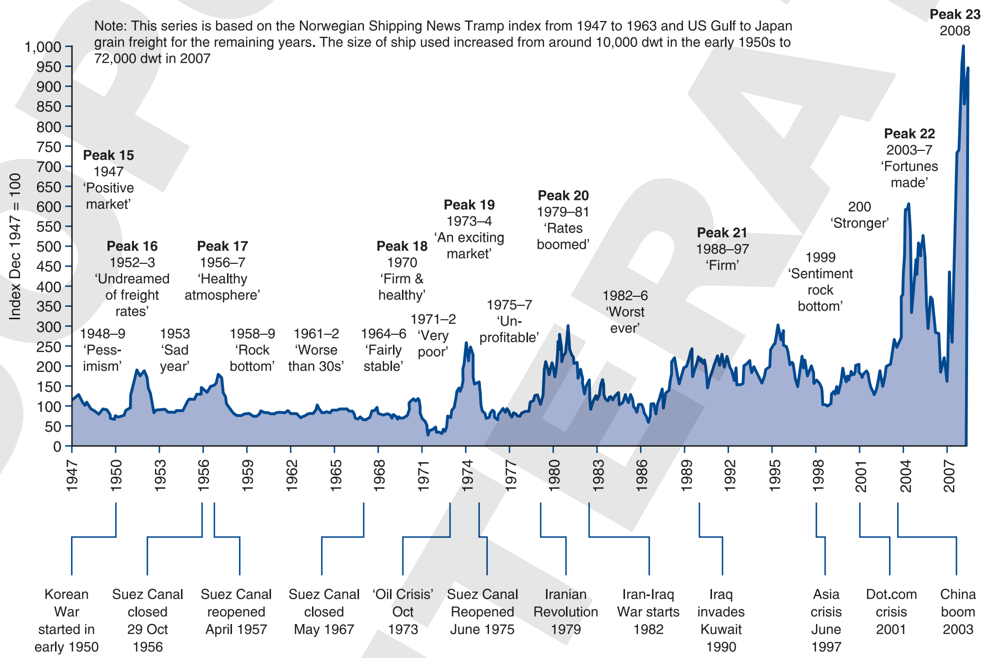


Figure 3.10
Bulk carrier shipping market cycles, 1947–2008
Source: Compiled by Martin Stopford from various sources

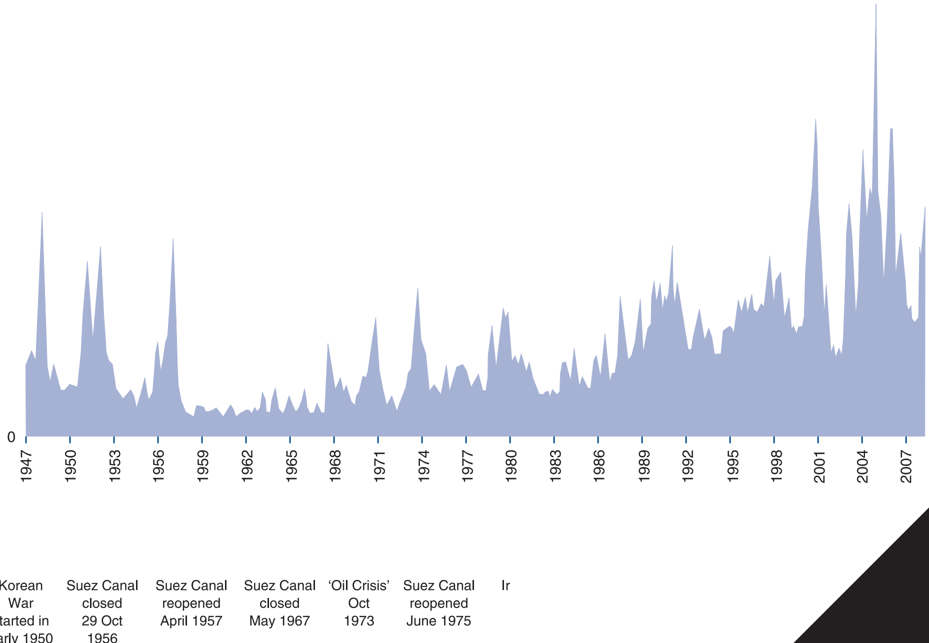


Figure 3.11
Oil tanker shipping market cycles, 1947–2008
Source: Compiled by Martin Stopford from various sources

more 'spiky'. Since freight rates do not tell the whole stor[redacted] annotated to show the terms in which shipbrokers were describ[redacted] at each point. Changing technology made new markets possible[redacted]nd tramp markets which dominated the previous period gave way [redacted]cialized bulk shipping markets. The main markets which develop[redacted]eriod were tanker, bulk carrier, LPG, LNG, container, offshore, [redacted]sticated ferries. In th[redacted] market the multi-deck tramp ships whic[redacted] the busin[redacted] progressively replaced by more effic[redacted]hi[redacted]

The technological trend[redacted]

During the post-war pe[redacted] inflation index, f[redacted] of extr[redacted] techni[redacted]s[redacted] sh[redacted], speciali[redacted]oved on-boa[redacted] combined t[redacted] freight by about two-[redacted]

The fi[redacted]ars after the Second World Wa[redacted] sea t[redacted], which increased from 500 million to[redacted] to[redacted]gain this was a period of great technical cha[redacted]

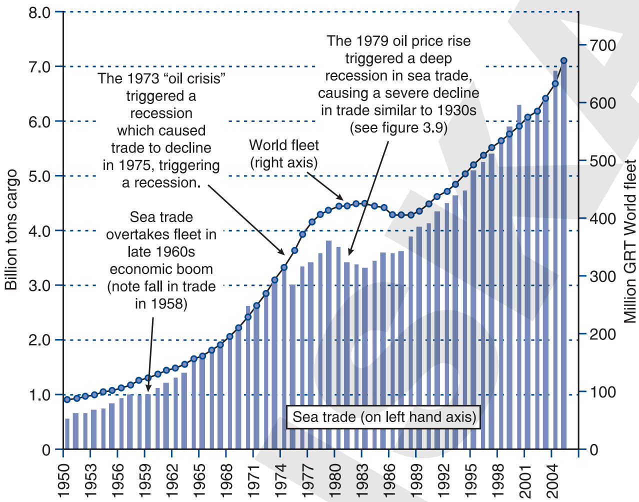


Figure 3.12
Sea Trade, 1949–2005
Source: *United Nations Yearbook* (various years)

industry, though the emphasis was on organization as much as hardware. Major shippers in the energy and metal industries took the initiative in developing integrated transport operations designed to reduce their transport costs. The trend towards specialization was continuous and pervasive. In 1945 the world merchant fleet consisted of passenger ships, liners, tramps and a small number of tankers. Few vessels used for cargo transport were larger than 20,000 dwt. By 1975 the fleet had changed out of all recognition and all the major trades had been taken over by specialized ships. Dry bulks were carried by a fleet of bulk carriers, oil by crude tanker, and general cargo for the most part by container-ships, vehicles in car carriers, forest products in open hatch lumber carriers and chemicals in chemical parcel tankers. Specialization allowed the size of ship to increase. The largest cargo ships in 1945 were not much more than 20,000 dwt. By the mid-1990s the specialist bulk fleets contained many ships over 100,000 dwt and in the liner trades the largest container-ships were four or five times the capacity of their multi-deck ancestors. Thus the familiar theme of large modern ships forcing out small obsolete vessels continued just as it had in the nineteenth century.

In addition, the market was disrupted by a series of political developments: the Korean War which started in 1950; the nationalization and subsequent closure of the Suez Canal in 1956; the second Suez closure in 1967; the Yom Kippur War in 1973; the second oil crisis in 1979; the Gulf War in August 1990; and the Iraq invasion in 2003. Although the pattern of freight peaks and troughs coincided with fluctuations in the OECD industrial trade cycle, the effects of these political influences were also apparent.

In the mid-1970s the shipping environment changed. There was a fall in sea trade, followed by a major dip in the early 1980s. The scale of this downturn in trade rivalled that of the 1930s in its severity. In the tanker market the sprint for size lost momentum and the fleet, which had previously been young and dynamic, grew old and sluggish. Shippers became less confident about their future transport requirements, and the role of tanker owners as subcontractors gave way to an enlarged role as risk takers. In other parts of the shipping market the technical evolution continued. Bulk carriers continued to increase in size, with volume cargoes such as iron ore and coal moving up into Capesize vessels of over 100,000 dwt. A fleet of car carriers was built, with the largest able to carry 6,000 vehicles. Chemical parcel tankers grew in size to 55,000 dwt.

Container-ships increased from 2,000 TEU in the early 1970s to 6,500 TEU in the mid-1990s, and by 2007 vessels of over 10,000 TEU were being delivered. Ship technology improved with the unmanned engine room, satellite navigation, anti-fouling paint finishes, more efficient diesel engines, vastly improved hatch covers and a host of other technical improvements in the design and construction of merchant ships.

Short-term cycles, 1945–2007

However, it is the short-term cycles that are of real interest. During the period 1947–2007 there were eight dry cargo cycles, and compared to previous periods their average duration was quite short: the peaks averaged 2.4 years and the troughs 3.2 years, so the average cycle was 5.6 years. However, the cycles varied in shape and intensity. Most peaks lasted 2 years but there was a long drawn-out peak from 1988 to 1997, and finally a very long one which started in 2003 and was still going on at the beginning of 2008, making it the best boom in 264 years. On the negative side, there were two very severe recessions, from 1958 to 1964 and from 1982 to 1987, the latter ranking alongside the 1930s recession as the worst of the century. On some measures it was the most extreme since 1775, which helps to put things into perspective.[54]

Cycle 15: 1945–51

The post-war market got off to a good start in 1945: 'As a result of scarcity of tonnage and the tremendous need for transportation, the freight quotations were soon at a sky high level and seemed fantastic compared with pre-war rates'.[55] The market remained firm in 1946. In 1947 it started a downward trend, reaching a trough in 1949 when 'pessimism prevailed. Generally speaking there was ample tonnage and consequently falling rates'.[56] The year 1950 was quiet until the autumn when 'there was a considerable lack of tonnage in a great many trades resulting in a sudden rise in the market'.[57]

Cycle 16: 1952–5

In 1951 anxieties raised by the Korean War sparked a wave of panic stock building. Seaborne trade grew by 16% in the year, creating a market 'undreamed of only one year ago'. The peak only lasted a year and by spring 1952 freights had fallen by up to 70% as the reaction to the panic of 1951 set in. By 1953 laid-up tonnage was increasing as import restrictions and the overstocking of 1951 continued to make themselves felt. Second-hand prices give a clear idea of the extreme nature of this cycle. The price of a reasonably prompt Liberty ship built in 1944 increased from £110,000 in June 1950 to £500,000 in December 1951. By December 1952 it was back down to £230,000.[58] The year 1954 demonstrated once again how unpredictable the shipping industry can be: 'The freight market went from bad (1953) to worse (in the first half of 1954) and then to a considerable improvement in the last half of 1954'.[59] In the autumn of 1954 the market started to tighten and by year's end rates were up 30%. The improving trend continued through 1955 and when the Suez Canal closed in November 1956, diverting

Suez traffic to the longer journey round the Cape, there was a tremendous boom in rates and time-charter activity.

Cycle 17: 1957–69

The events which followed the Suez crisis provide a case study of the 'shipping game' at its most exciting, as the 1956 boom was suddenly followed by a severe recession (see Chapter 8). Platou comments:

> The year 1957 shows how almost impossible it is to predict the future of the shipping industry. The forecasts made at the end of 1956 by leading shipping personalities were fairly optimistic. Nobody seemed to expect the recession which subsequently occurred, a depression which must be considered the worst since middle thirties. From sky high rates at the end of 1956 they fell throughout 1957 to what can only be termed an almost rock bottom level…There were few people, if any, who imagined that, with small changes, it would turn out to be a ten year depression only relieved by a second and more lasting closure of the Suez Canal in 1967.[60]

A complex range of economic and political variables conspired to produce the lengthy recession. Tugenhadt describes the part which the oil companies played in creating a tanker investment boom which drove the market down.

> It was during the 1956 Suez crisis that owners made their biggest killings. When the canal was closed and tankers had to be rerouted round the Cape of Good Hope there were not enough available to carry the oil that was needed, and charter rates rose astronomically. The companies, believing like everybody else that the Egyptians would be incapable of running the canal after it had been cleared, thought the shortage would last well into the 1960s until new ships had been built. They therefore signed contracts in which they not only hired tankers for immediate work at the high prevailing rate but also agreed to terms for chartering ships which had not yet been built for work in the 1960s. … When the Egyptians showed they could operate the canal efficiently the bottom fell out of the tanker market, but the companies were stuck with the contracts.[61]

Several other factors contributed to the over capacity which developed in dry cargo in 1958. Platou singles out stockbuilding, overbuilding, more efficient ships and the world economy:

> The reasons for this decline were many. Stockpiles in Europe at the end of 1956 made it possible to slightly reduce the demand for tramp tonnage in the early months of 1957. The rate of completion of new tramps had increased enormously and these were rapidly replacing the Liberty vessels. These new tramps, averaging 3,000 tons higher capacity than the war-built ships, and faster by four knots, were carrying considerably

> more cargo than the Liberty ships they were designed to replace. Also contributing to the decline were the restrictions on trade imposed in a number of countries caused by shortage of foreign exchange. Other contributory causes were the accelerating tendency towards self-sufficiency in shipowning, chartering, and shipbuilding in hitherto non-maritime countries, and the fact that Japan suddenly became an important supplier of tramp tonnage to the world's merchant fleet. Last, but not least, the recession in world trade helped to force rates down to well below operating levels.[62]

The severe recession in the world economy certainly played a major part. OECD industrial production fell by 4% in 1958, producing the first decline in seaborne trade since 1932 (Figure 3.12). The reopening of Suez reduced tanker demand and coincided with record deliveries of newbuildings ordered during the strong market of 1955–6. However, the cause of this long recession was not primarily a lack of demand. After the setback in 1958, seaborne trade grew from 990 million tons in 1959 to 1790 million tons in 1966, an increase of 80% in seven years. The real problem was on the supply side. After the shortages of the 1950s, shipbuilding output more than doubled, and an expanding flow of large modern vessels was largely responsible for keeping charter rates down. It was not until the closure of the Suez Canal in 1967 that tanker freight rates returned to really profitable levels. However, this second Suez crisis was not really a rerun of its predecessor because supply had become more flexible:

> So many ships were ordered in the aftermath of the 1956 crisis that for several years before the canal closed again in 1967 there was a considerable surplus of tankers, and many of them had to be converted into grain carriers to find employment. As a result, the shipowners were unable to repeat their coup. Within a few weeks of the closure some 200 tankers totalling 5 million tons had been brought back into oil carrying, and Europe's supplies were assured. The companies therefore refused to charter vessels for more than two or three voyages at a time, instead of for several years ahead. Nevertheless, the crisis was highly profitable for owners…The Norwegian Sigval Bergesen showed what this meant in overall terms when he chartered the 80,000 ton *Rimfonn* to Shell for two voyages that brought in £1m.[63]

In short, the decade following the 1956 Suez boom was less prosperous for the shipping industry. Sizeable losses were made by owners trading on the spot market during the first half and, although in the second half the market improved, demand never got sufficiently far ahead of supply to push rates to acceptable profitable levels.

Cycle 18: 1970–2

The Six Day War between Israel and Egypt in 1967 and the subsequent closure of the Suez Canal marked the start of seven prosperous years for shipowners in the charter market. There were three freight market booms, and at various times owners were able to fix time charters at highly profitable rates. Since oil was the largest cargo moving through the Suez Canal at this time, the main impact of its closure was felt in the tanker market.

The dry cargo market benefited indirectly from improved rates for ore carriers owing to combined carriers switching into oil trading but, in general, the increase in rates was less noticeable than in the tanker market. The booms of 1970 and 1973 both coincided with exceptional peaks in the industrial trade cycle, reinforced by political events such as the closure in May 1970 of Tap Line, the oil pipeline running from the Arabian Gulf to the Mediterranean, which cut back the availability of oil from Sidon by 15 million tons. Later in the year the restrictions on Libyan oil production by the new regime gave a further boost to the market. A similar pattern occurred when the nationalization of Libyan oil supplies in August 1973 made oil companies cut back their take-up of Libyan oil in favour of the more distant Middle East sources.

However, the real cause of the buoyant market was an unprecedented growth of trade. Seaborne trade increased by 78% from 1807 million tons in 1966 to 3233 million tons in 1973. The increased requirement for ships during this seven-year period was greater than in the previous 16 years. Despite rapidly expanding shipbuilding capacity, the shipyards had difficulty keeping pace with demand. There was a recession in 1971, but it proved short-lived, and many owners were covered by profitable time charters contracted in 1970. It was, therefore, a period of great prosperity and expansion in the shipping industry.

Cycle 19: (bulk carriers) 1973–8

The year 1973 was one of the great years in shipping, comparable with the 1900 boom triggered by the South African war. During the summer the time-charter rate for a VLCC doubled from $2.5 per deadweight per month ($22,000 per day) to $5 per deadweight per month ($44,000 per day). The extremity of conditions sowed the seeds for a spectacular bubble in ship prices. Hill and Vielvoye describe the price spiral in the following terms:

> The upward movement in ship prices began at the end of 1972, and during 1973 the price of all types of ships rose by between 40 and 60 per cent compared with the previous year, with the most significant increase being paid for tanker tonnage. Owners were prepared to pay vastly inflated prices as a result of premiums on ships with an early delivery … In this situation a very large crude carrier which had been ordered in 1970 or 1971 at a cost of about $26.4 million could realize a price of between $61m and $73.5m.[64]

The tanker market collapsed following the Yom Kippur War in 1973, but the dry cargo market held up through 1974 and for small bulk carriers into 1975, spurred on by buoyant economic growth, a phase of stockbuilding in the world economy as a result of commodity price inflation, and the heavy congestion in the Middle East and Nigeria resulting from the boom in these areas triggered by the increased oil revenue. This is an interesting example of a dry cargo peak outlasting a downturn in the world economy.

Between 1975 and 1995 the dry cargo market followed a different pattern from tankers. For bulk carriers the cycle 19 trough only lasted 3 years from 1975 to 1978.

The very firm market in 1973–4 allowed owners to fix time charters that yielded profits for several years after. However, the spot market moved into recession in 1975 and the 3 years from 1975 to 1978 were very depressed for all sizes of vessels. Although there was some seasonal fluctuation, on average, freight rates were not sufficient to cover running costs. By 1977 many owners were experiencing severe liquidity problems.[65]

In the autumn of 1978 the dry cargo recovery started, leading to a very firm market in 1979–80. By the end of 1978 freight rates had risen 30%, and they continued their climb through 1979 to a higher level than the 1974 peak. There were several reasons for strength of this recovery. The stage was set by a sharp improvement in the fundamentals. Trade in the major bulk commodities grew by 7.5% in 1979, but supply increased by only 2.5% due to the low ordering during the previous recession. On top of this came the knock-on effect of the 1979 oil price increase. Power utilities around the world switched from oil to coal, giving a major boost to the thermal coal trade. This effect was reinforced by congestion. According to *Fearnleys Review*, 'the backbone of the freight market in 1980 was the heavy congestion in important port areas. In the last quarter of the year the waiting time for coal carriers in US ports soared up to 100 days which in fact trebled the need for tonnage in these trades'.[66] The congestion was widespread, particularly in the Middle East and West Africa where traditional port facilities could not cope with the flood of trade. Rates climbed further in 1980 and at the end of December were 50% over the good average reached in 1979.

In the tanker market, the Yom Kippur War ushered in a structural depression which lasted until 1988, relieved by only a brief market improvement in 1979. There were essentially three problems which contributed to the depth of this recession. The first was the oversupply of tankers resulting from the speculative investment in the early 1970s. During the peak year of 1973, the operational tanker fleet was 225 million dwt, but so many new tanker orders were placed that, despite the decline in tanker demand during the next two years, the fleet actually increased to 320 million dwt, creating surplus tanker capacity of 100 million dwt. Secondly, the world shipbuilding industry was now able to build 60 million dwt of merchant ships each year. This was far more than was required to meet the demand for new ships even if the trend of the 1960s had continued. Shipyard capacity was not easily reduced and it took a decade of over-production to cut capacity to a level more in line with demand. Thirdly, the oil price rises in 1973 and 1979 dramatically reduced the demand for oil imports. The market crashed to a trough.

The transformation from boom to bust in 1973 was one of the most spectacular ever recorded in a shipping market. Over the summer rates for VLCCs soared to more than Worldscale (WS) 300, and stayed there until October. Then in October OPEC introduced a 10% embargo on all exports to the West, and the market crashed precipitately, with VLCC rates falling to WS 80 in December. The decline continued through 1974 and by April 1975 the rate for a VLCC from the Gulf to Europe had sunk to WS 15. However, it took nearly a year for the seriousness of the position to sink in. In March 1974, five months after the crisis broke, a 270,000 dwt tanker was fixed for 3 years at a firm $28,000 per day, but eight months later in November a similar fixture was reported at only $11,000 per day.[67] There was little sale and purchase activity, but by year's end prices had already fallen by more than 50%. For example, the second-hand price of a 1970-built 200,000 dwt VLCC fell from $52 million in 1973 to $23 million in 1974. This proved to be only the beginning. In 1975 the price fell to $10 million, in 1976 to $9 million in 1976 and in mid-1977 to $5 million.

After two years there was a modest recovery in the tanker market. A recovery in the world economy in 1979 started to push rates up, though only to a peak of Worldscale 62 in July 1979. Laid-up tonnage fell from 13.4 million dwt to 8.6 million dwt in 1979. However, this was a poor sort of recovery and VLCC rates did little more than cover voyage expenses. Second hand prices also edged up, and the price of a 200,000 dwt VLCC rose to $11 million. An intermission in a long recession, rather than a market peak.

Cycle 20: (bulk carriers) 1979–87 (the 1980s depression)

The dry cargo freight boom lasted until March 1981 when a sharp fall set in. The daily earnings of a Panamax fell from $14,000 per day in January to $8,500 per day in December. The initial trigger for the fall was a US coalminers' strike which caused a decline in the Atlantic market.[68] The more fundamental problem was the start of a severe recession in the world economy. Falling oil prices, a stagnant coal trade and elimination of congestion pushed rates down to levels that by 1983–4 some brokers were describing as the worst ever experienced.

The following year, 1982, brought a further halving of freight rates. By December 1982 the earnings of a Panamax bulk carrier were down to $4200 per day. In the time-charter market a great number of time charters negotiated in the previous year had to be renegotiated to allow the charterers to survive, and many charterers failed to meet their commitments altogether, which resulted in premature redeliveries and further difficulties for shipowners.[69] Freight rates improved slightly in the spring of 1983, but fell to the bottom level in the summer and stayed there. Although freight rates were very depressed, in 1983–4 large numbers of orders were placed for bulk carriers. The whole process was started by Sanko Steamship, a Japanese shipping company, which secretly placed orders for 120 ships. Their example was soon followed by a flood of orders from international shipowners, particularly Greeks and Norwegians. The explanation of this counter-cyclical ordering, which resembles a similar event in 1905–6, is complex. Shipowners had accumulated large cash reserves during the 1980 boom; banks, which had large deposits of petrodollars, were keen to lend to shipping; and ships were cheap because the shipyards still had overcapacity and no tankers were being ordered. In addition, the shipyards were offering a new generation of fuel-efficient bulk carriers which looked very attractive at the prevailing high oil price. The yen was favourable, making ships ordered in Japan look cheap. Finally, owners ordering in 1983 expected the cycle to last 6 years as its predecessor had done, so they would take delivery in the next cyclical upswing which on that calculation was due in 1985.

If so many owners had not had the same idea, this would have been a successful strategy. Expectations that trade would improve were fulfilled. In 1984 the business cycle turned up and there was a considerable increase in world trade. However, the combination of heavy deliveries of bulk carrier newbuildings, many ordered speculatively in the previous two years, and the fact that the combined carrier fleet could find little employment in the tanker market ensured that the increase in rates was very limited. Panamax bulk carrier freight rates struggled up to $6,500 per day in 1985, then collapsed under a flood of deliveries with the result that, as *Fearnleys* commented, 'shipowners lived through another year without being able to cover their costs'.[70] Just to make matters worse, by this time the yen had strengthened and bulk carriers ordered in yen but paid for in dollars cost more than expected.[71] Many shipowners who had borrowed heavily to invest in newbuildings now faced acute financial problems. Bank foreclosures and distress sales were common and second-hand prices fell to distress levels.

In financial terms the market trough was reached in mid-1986 when a five-year-old Panamax bulk carrier could be purchased for $6 million, compared with a newbuilding price of $28 million in 1980, identifying this as a depression rather than a recession.[72] As trade started to grow and scrapping increased, the dry market moved into balance, with freight rates in both markets reaching a peak in 1989–90. Freight rates for a Panamax bulk carrier increased from $4400 per day in 1986 to $13,200 per day in 1989. This stimulated one of the most profitable asset play markets in the history of the bulk carrier market.[73]

Cycle 20: (tankers) 1979–87

For the tanker market this period was a disaster. The Iranian revolution in 1979 pushed the price of oil from $11 a barrel to almost $40 a barrel, triggering a massive response from oil consumers and an appalling tanker cycle. During the previous five years much research had been devoted to finding alternative energy sources, and many power stations had taken steps to permit the use of coal as an alternative energy source. When the oil price increased, there was an immediate reaction and the seaborne trade in oil fell steadily from 1.4 billion tonnes in 1979 to 900 million tonnes in 1983. This laid the foundation for an extreme recession in the tanker market, with a surplus approaching 50% developing as this fall in demand combined with the over-building of the 1970s.

By 1981 brokers commented:

> the tanker freight market in 1981 could very well be described by two words, bleak and depressed. The previous 5 years gave an acceptable return to owners of tonnage up to 80,000 dwt, and even occasionally some encouragement to larger tankers through periodic increases in demand. However 1981 cannot have given any tanker owner with ships on the spot market anything but net losses. The rates for VLCC and ULCC tonnage showed an overall slide. At rates hovering around WS 20 the transport of crude oil is virtually subsidised by the tanker owners by hundreds of thousands of dollars per voyage.[74]

The result was a severe depression as the market squeezed cashflow until sufficient tankers had been scrapped to restore market balance. By April 1983 the rate for a VLCC trading from the Arabian Gulf to Europe had fallen to WS 17 and prices had fallen dramatically. Because there were few old tankers for scrap, especially in the bigger sizes where the surplus was concentrated, this took years to achieve and eventually many younger vessels were scrapped. For example in November 1983 the 8-year-old *Maasbracht*, a 318,707 dwt tanker, was sold for scrap at $4.65 million.

Laid-up tanker tonnage increased to 40 million dwt in 1982 and 52 million dwt in 1983. By this time tanker prices were back to scrap levels and, even at these prices, ships that were 5 or 6 years old could not always attract a bidder. In the autumn VLCCs were sold for little over $3 million. The statistics do not do justice to the difficulties faced by tanker owners trading on the charter market during this period. In 1985 sentiment hit 'rock bottom':

> The last ten years of capital drain in the tanker industry have no historical precedent and we have witnessed a decimation of shipping companies which has probably no parallel in modern economic history, even taking into account the depression of the 1930s. The surviving members of the independent tanker fleets must be akin to those of the world's endangered species whose survival appeared questionable in a changing and hostile environment, but have instead shown a remarkable ability to adapt.[75]

If nothing else, this demonstrates that in a free shipping market the adjustment of supply is a long-drawn-out, uncomfortable and expensive business, however simple it may look in theory. In 1986 the market showed the first signs of starting to pick up. Over the year freight rates increased by 70% and the price of an 8-year-old 250,000 dwt VLCC doubled from $5 million to $10 million. This was the start of a spiral of asset price appreciation, and by 1989 the vessel was worth $38 million, despite being three years older. Inevitably this triggered heavy investment in new tankers and the great tanker depression of 1974–88 ended as it had begun with a phase of speculative building.

Cycle 21: 1988–2002

After the market bottomed out for tankers in 1985 and bulk carriers in 1986, rates rose steadily to a new market peak which was reached in 1989, coinciding with a peak in the world business cycle. During the next five years the tanker and bulk carrier markets developed very differently, due mainly to the different attitudes of investors in the two markets.

In the tanker market the freight peak was accompanied by three years of heavy ordering, from 1988 to 1991, during which there were orders for 55 m.dwt of new tankers. This rush of investment was based on three expected developments in the tanker market. Firstly, the fleet of ageing tankers built during the 1970s construction boom was expected to be scrapped at 20 years of age, creating heavy replacement demand in the mid-1990s. Secondly, shipbuilding capacity had shrunk so much in the 1980s that many observers thought there would be a shortage when the replacement of the 1970s-built tanker fleet built up in the 1990s. Rapidly increasing newbuilding prices seemed to support this view. For example, in 1986 a new VLCC had cost less than

$40 million, but by 1990 the price was over $90 million. Thirdly, growing oil demand was expected to be met from long-haul Middle East exports, creating rapidly increasing demand for tankers, especially VLCCs. As it turned out none of these expectations were realized. Most of the 1970s-built tankers continued to trade beyond 20 years; by the mid-1990s shipbuilding output had more than doubled from 15 m.dwt to 33 m.dwt; and Middle East exports stagnated as technical innovation allowed oil production from short-haul sources to increase faster than expected. Delivery of the tanker orderbook pushed the market into a recession which lasted from early 1992 to the middle of 1995 when a recovery finally started and freight rates moved onto a steady improving path.

Conditions in the dry bulk market took the opposite path. This was one of the rare periods when there was no clear cycle. Dry bulk freight rates peaked along with tankers in 1989, but over the three years from 1988 to 1991 when tanker investors ordered 55 m.dwt, only 24 m.dwt of bulk carriers were ordered. When the world economy moved into recession in 1992 bulk carrier deliveries had fallen to only 4 m.dwt per annum, compared with 16 m.dwt of tanker deliveries. This tonnage was easily absorbed and, after a brief dip in 1992, dry bulk freight rates recovered, reaching a new peak in 1995. By this time five years of relatively strong earnings had triggered heavy investment in bulk carriers and, in the three years from 1993 to 1995, 55 m.dwt of bulk carriers were ordered. As deliveries built up in 1996 the dry bulk market moved into recession. Things started to go wrong for the bulk shipping market in June 1997 when the ‘Asia crisis’ triggered a recession in the Asian economies. During the first half of 1997 industrial production boomed, growing by 9% in the Pacific region. By the spring of 1998 it had slumped to −5% growth, halting inward investment into the emerging Chinese economy. It was widely expected that recovery would take several years and freight rates in both the tanker and dry bulk markets slumped. Crude tanker earnings slumped from $37,000 a day in June 1997 to less than $10,000 a day in September 1999, and bulk carriers and containerships followed suit. Brokers commented in September 1999 that the ‘last six months were memorable in shipping markets for their consistency. Just about every market segment was in recession’.[76]

As so often happens in shipping cycles, things did not develop as anticipated, and during the next two years the market experienced a classic boom and bust cycle. The Asian economies only remained in recession for a few months, and by the spring of 2000 industrial production was growing faster than ever, at up to 11% per year. Meanwhile the negative sentiment in the tanker market had triggered heavy scrapping of the 1970s tankers which were coming to the end of their life and as a result the tanker and bulk carrier fleets grew very slowly. In response tanker freight rates surged to a new peak, with VLCCs achieving earnings of $80,000 a day in December 2000. The dry bulk market also edged upwards, but less forcefully than the tanker market. But overall the shipping market saw its first real boom for 25 years. Unfortunately it did not last too long. In early 2001 the collapse of internet stocks triggered a deep recession in the Atlantic and Asian economies, and by the end of 2002 industrial production in both the Atlantic and the Pacific was declining. In response freight rates slumped, with VLCC earnings down to $10,000 a day and Capesize bulk carriers to $6000 a day.

Owners and analysts felt that this was perfectly normal, and were grateful to have had one fantastic year.

Cycle 22: 2003-7

Which brings us to the final cycle, which started with a peak which turned out to be one of the most extreme in the period under review. During the previous six years China had been developing its economy, employing an open-market model which attracted inward investment. In early 2003 it moved into a period of serious infrastructure development, and this required enormous quantities of raw materials. Between 2002 and 2007 China's steel production grew from 144 million tons a year to 468 million tons a year, adding capacity equivalent to that of Europe, Japan and South Korea. Combined with growth of oil imports and exports of minor bulks, in the autumn of 2003 this created an acute shortage of ships. Tanker and bulk carrier rates were propelled to new highs and, despite some volatility, stayed at these high levels for the following four years.

3.8 LESSONS FROM TWO CENTURIES OF CYCLES

Well, that's the history of shipping cycles since steamships and cables opened up the global market. What are the lessons? There seem to be two main conclusions to be drawn from this analysis. The first is that shipping cycles definitely exist and the shipping industry's 'rule of thumb' that cycles last 7 years is certainly supported by the statistics. Shipping cycles last 8 years if you take the last fifty years as the base. The second is that each cycle is different. None of the cycles actually lasted 7 years. Four cycles lasted only 5–6 years from peak to peak, two lasted 8 years, and six lasted over 9 years, all with 5-year troughs. So it would be hard to devise a more dangerous business decision tool. Try telling your bank manager cycles only last 7 years when you run out of cash in a nine-year cycle!

Fundamentals set the tone for good and bad decades

There is no mystery about why these cycles are so irregular. Our analysis demonstrates that they are driven by an undercurrent of economic fundamentals of supply and demand which determines the 'market tone' at any point in time, and in retrospect it is clear that each period has a very different character. To illustrate this point, Table 3.3 shows an assessment of these factors during the period under review, ranked by the relative prosperity of the shipping industry:

1. *Prosperity*. Two periods were prosperous, the 1950s and 1998–2007. In both cases rapidly growing demand coincided with a shortage of shipbuilding capacity.
2. *Competitiveness*. There were three periods of intensely competitive activity characterized by growing trade and shipbuilding capacity that expanded fast enough to keep up with demand.

3. *Weakness*. There was a weak market in the 1920s when growing demand was damped by overcapacity in the shipbuilding market.
4. *Depression*. There were two depressions, in the 1930s and the 1980s when falling trade coincided with shipbuilding overcapacity.

Table 3.3 Shipping market fundamentals analysis

	Demand growth	Supply tendency	Market tone
1998–2007	Very fast	Shortage	Prosperous
1945–1956	Very fast	Shortage	Prosperous
1869–1914	Fast	Expanding	Competitive
1956–1973	Very Fast	Expanding	Competitive
1988–1997	Slow	Expanding	Competitive
1920–1930	Fast	Overcapacity	Weak
1930–1939	Falling	Overcapacity	Depressed
1973–1988	Falling	Overcapacity	Depressed

Clearly, supply and shipbuilding capacity have a part to play in setting the tone for a decade, but are not the whole story. This 'supply-side management' is an area where maritime economists do have something to contribute. The challenge is to help the shipping industry remember the past and anticipate the future. To do this we must improve the clarity of our message, with better information, improved analysis, clearer presentation and greater relevance to the decisions made in the commercial shipping market and, most of all, an open mind. Three centuries of shipping cycles prove that just about anything is possible.

3.9 PREDICTION OF SHIPPING CYCLES

The problem is that although everyone knows about cycles, it is very difficult to believe in them. As each cycle progresses, doubts set in. This time it will be different. The fact that the cycles are never exactly the same just complicates matters. But the harsh reality is that investors who want to make an annual return of more than 4–5% per annum must be prepared to take some 'shipping risk'. They must find a strategy for dealing with the cycles we have discussed at such length. One obvious strategy is to exploit the volatility of freight rates by taking positions based on the expected development of the cycle. The strategy described, for example, by Alderton[77] is to spot-charter on a rising market and, when the peak is reached, to sell or take a time charter long enough to carry the vessel through the trough. Ship acquisitions are made at the bottom of the market when ships are 'cheap'.[78] Few would argue with the principle of buying low and selling high. The skill lies in the execution. Most analysts have been caught out too often to believe they can forecast accurately. However, there is some middle ground.

First we must restate the truth so evident from shipping history, that cycles are not 'cyclical' if by this we mean 'regular'.[79] In the real world shipping cycles are a loose sequence of peaks and troughs. Because the timing of each stage in the cycle is irregular, simple rules like the 'seven-year cycle', although statistically correct over a very long period, are far too unreliable to be worthwhile as a decision criterion. Cufley's warning that 'it is totally impossible to predict when the market will move upwards (or fall)'[80] deserves to be taken seriously. As he goes on to point out, 'Even reasoned and intelligent assessments, made by experts and covering only a few months, can be made to appear foolish by the turn of events'. So we must carefully weigh up what we can say about the future. There are a few positive factors. Our review in this chapter of the last 12 cycles demonstrates that the same explanations of cyclical peaks and troughs appear again and again. Economic conditions, the 'business cycle', trade growth and the ordering and scrapping of ships are the fundamental variables which can be analysed, modelled and extrapolated. Careful analysis of these variables removes some, but not all, of the uncertainty and reduces the risk. But to these must be added the 'wild cards' which often trigger the spectacular booms and slumps. The South African War in 1900, closure of the Suez Canal, stockbuilding, congestion and strikes in the shipyards have all played a part.

The difficulty of analysing these factors is daunting. The world economy is complex and we often have to wait years for the detailed statistics which tell us precisely what happened. Many of the variables and relationships in the model are highly unpredictable, so the prediction process should be seen as clarifying risk rather than creating certainty. In this respect shipowners are in much the same position as other specialist commodity market traders. Those playing the market must try to understand the cycles and take a risk. That is what they are paid for. An essential part of weighing up this risk is to form a realistic view of what is driving each stage in the cycle – reading the signs as the market progresses through the stages in the cycle, extrapolating the consequences and, when the facts support it, being prepared to act against market sentiment. It is not necessary to be completely right. What matters is being more right than other traders. There is a long history of ill-advised shipping investments which, over the years, have provided a welcome source of income for more experienced investors who buy ships cheap during recessions and sell expensively during booms.

The importance of market intelligence

The whole thrust of this argument is to direct our attention towards the process of obtaining information about what is going on in the shipping market and understanding the implications of any actions we take. Research suggests that successful business decisions are based upon careful consideration of all the relevant facts, while bad decisions often flow from inadequate consideration of the facts. For example, Kepner and Tregoe, in their study of business decisions, made the following comments:

> In the course of our work, we witnessed a number of decisions in government agencies and private industry that ranged in quality from questionable to catastrophic. Wondering how such poor decisions ever came to be made, we decided to look into their history. We found that most of these decisions were bad because certain important pieces of available information had been ignored, discounted or given insufficient attention. We concluded that the process of gathering and organising information for decision making needed improvement.[81]

These observations, which can hardly be at variance with most people's practical experience, emphasize the importance of collecting and interpreting information.

The challenge of successful risk management

So where does this leave us in terms of predicting freight cycles? There are three conclusions to be drawn. First, in shipping cycles, as in poker, for every winner there must be a loser. This aspect of the business is about risk management, not carrying cargo. Shipping is not quite a zero-sum game, but we will see in Chapter 8 that the financial returns average out at a fairly modest level. Second, shipping cycles are not random. The economic and political forces which drive them, although highly complex, can be analysed, and the information used to improve the odds in the players' favour. But remember that if everyone has the same idea, it will not work. Third, like poker, each player must assess his opponents, take a view on how they will play the game, and work out who will be the loser this time. In the end, no loser means no winner.

We should not be surprised that this makes shipping sound more like a gambling game than a sober transport business. It *is* a gambling game. Shippers turn to the shipping market because they do not know how much shipping capacity they will need in future. Nobody does. The job of the shipowner is to make the best estimate he can and take a gamble. If he is wrong, he loses. These decisions are complex and often require decisive action which flies in the face of market sentiment. That is why individuals are often more successful than large companies. Imagine playing poker under the direction of a board of directors. For shipowners with many years in the business, the instinct that drives their decisions probably derives from the experience of past cycles, reinforced by an understanding of the international economy and up-to-date information obtained from the international grapevine. For those without a lifetime of experience, either newcomers to the industry or outsiders, the problems of decision-making are daunting. Many bad decisions have been made because of a misunderstanding of the market mechanism. Our aim in the following three chapters is to examine the economic structure of the markets in which sea transport is traded and the fundamentals which drive them.

3.10 SUMMARY

In this chapter we have discussed the economic role of cycles in the shipping industry.

We started with the characteristics of cycles, identifying the secular trend, short cycles and seasonal cycles. Then we moved on to define shipping risk. This is the risk that the investment in the hull of a merchant ship, including the return on the capital employed, is not recovered during a period of ownership. Shipping risk can be taken by the shipper (industrial shipping) or the shipowner (shipping market risk).The market cycle dominates shipping risk. Although the existence of cycles is undisputed, their character is 'episodic' rather than regular. We identified four stages (i.e. episodes) in a cycle: a trough, a recovery, a peak, and a collapse. Although we found that cycles averaged 8 years, there are no firm rules about the length or timing of these stages. The cyclical mechanism must be flexible to do its job of managing shipping investment.

The short-term cyclical model is an important part of the market mechanism. When ships are in short supply freight rates shoot up and stimulate ordering. When there is a surplus, rates fall and remain low until enough ships have been scrapped to bring the market into balance. Each stage is periodic, continuing until its work is completed. As a result shipping cycles, like shipowners, are unique individuals. In each ‘cycle’, supply lurches after demand like a drunk walking a line that he cannot see very clearly.

There is also a longer-term cycle or secular trend driven by technology. Technical developments such as the triple expansion engine or containerization stimulate investment in new ships. As the new ships are delivered they set a new standard for efficiency. The more there are, the bigger the commercial impact. The transition from one technology to another can take 20 years to complete, during which time it affects the economics of the business. Over the last century there has been a succession of these cycles – steam replacing sail, diesel replacing steam, better boilers, containerization, and the bulk shipping revolution.

Analysis of short cycles over the period 1741–2007 illustrates the ‘work pattern’ of the shipping cycle. There were 22 cycles, averaging 10.4 years each, though when we analysed them into three periods – sail, tramp and bulk – we found the length of cycles reduced, from 14.9 years in the sail era to 9.2 years in the tramp era and 8 years in the bulk era. Each cycle developed within a framework of supply and demand, so common features such as cycles in the economy and over-ordering of ships crop up again and again. As a rule supply has no difficulty keeping up with demand, so the big freight ‘booms’ are often the result of unexpected events, such as the closing of the Suez Canal, stockpiling or congestion. Recessions tend to be driven by economic shocks which cause an unexpected decline in trade (as in 1930, 1958, 1973, 1982, 1991, 1997 and 2001). Overinvestment also plays a part.

Against this background, predicting cycles and the timing of changes is difficult, especially in the heightened sentiment that accompanies the peaks and troughs of each cycle. The framework of each cycle is set by economic fundamentals. Within this framework it is left to shipowners and market sentiment to ‘play the game’. In a low-return industry, one investor’s fortune is another investor’s loss, so the stakes are high. When outsiders look at the low average returns, they often ask: ‘Why would anyone want to invest in shipping?’ But the shrewdest and most adaptable owners know that they will survive to make massive profits the next time some unforeseen event turns the market on its head – a case of ‘devil take the hindmost’.

4 Supply, Demand and Freight Rates

The price of freight
Today is great
Because the ships, you'll understand,
Are high priced too,
Costing when new
Far more than they used to

If you'd know why
Their price is high,
Consider this, berth costs are great
Because the trade,
On which freight's paid
Grows faster than ships can be made

Only one thing left to know,
What it is that makes trade grow.
The world needs its grain and ore;
Sometimes less, but mostly more.
When judging if the price is high
What matters most is ... when you buy

(Martin Stopford 2007)

4.1 THE SHIPPING MARKET MODEL

The search for signposts

Now it is time to examine the economic mechanisms which control the shipping cycles discussed in the previous chapter. Shipowners have two jobs. One is to operate ships, a worthy task but not one that brings riches. The other is to be in the right place at the right time, to rake in the money at the peak of a cycle. Each twist of the cycle confronts shipping investors with a new opportunity or threat. In the space of a few months a shipowner's cashflow can swell from a trickle to a flood, and the market value of his fleet can change by millions of dollars. This is how the market manages investment in a difficult and uncertain world, and it presents shipping company management with quite a challenge.

The aim is to take advantage of the cycles to buy low and sell high. This is fair enough, as far as it goes, but this aspect of shipping is a game of skill and playing the cycles depends on being able to recognize – or, better still, predict – the peaks and troughs on the freight chart. Just being right is not enough. An investor may correctly predict a market peak, but if the charterers take the same view there will be no long-term contracts. Similarly, in market troughs owners may be ready to buy cheap ships, but who is willing to sell for a loss? As Michael Hampton pointed out, consensus is generally not a good signpost.[1] The best opportunities go to those who can judge when the other players in the market are wrong, and that means digging below the surface to understand the consequences of current developments (see Chapter 17 for a full discussion of forecasting).

From an economic viewpoint, each shipping cycle is unique. If we are to improve our understanding of what is going on in the market, we must now develop a theoretical explanation of how the freight market cycles are generated. To do this we will use the supply and demand model, a technique often used by economists to analyse commodity markets. The term 'model' is used here in just the same way as when we talk about a model ship – it is a smaller version of the real thing, leaving out those details that are not relevant to the present subject. The aim of the exercise, which is often referred to as 'fundamentals analysis', is to explain the mechanisms which determine freight rates in a consistent way.

4.2 KEY INFLUENCES ON SUPPLY AND DEMAND

The maritime economy is enormously complex, so the first task is to simplify the model by singling out those factors that are most important. This is not to suggest that detail should be ignored, but rather to accept that too much detail can hinder a clear analysis. In the initial stages at least we must generalize. From the many influences on the shipping market we can select ten as being particularly important, five affecting the demand for sea transport and five affecting the supply. These are summarized in Table 4.1.

Table 4.1 Ten variables in the shipping market model

Demand	Supply
1. The world economy	1. World fleet
2. Seaborne commodity trades	2. Fleet productivity
3. Average haul	3. Shipbuilding production
4. Random shocks	4. Scrapping and losses
5. Transport costs	5. Freight revenue

As far as the demand for sea transport is concerned (the 'demand function'), the five variables are the world economy, seaborne commodity trades, average haul, random shocks and transport costs. To explain the supply of shipping services (the 'supply function'), we focus on the world fleet, fleet productivity, shipbuilding deliveries, scrapping and freight revenues. The way in which these variables fit together into a simple model of the shipping market is shown in Figure 4.1. This model has three components, demand (module A), supply (module B), and the freight market (module C) which links the demand and supply by regulating the cashflow flowing from one sector to another.

How does the model work? The mechanics are very simple. In the demand module (A) the world economy, through business cycles and regional growth trends, determines

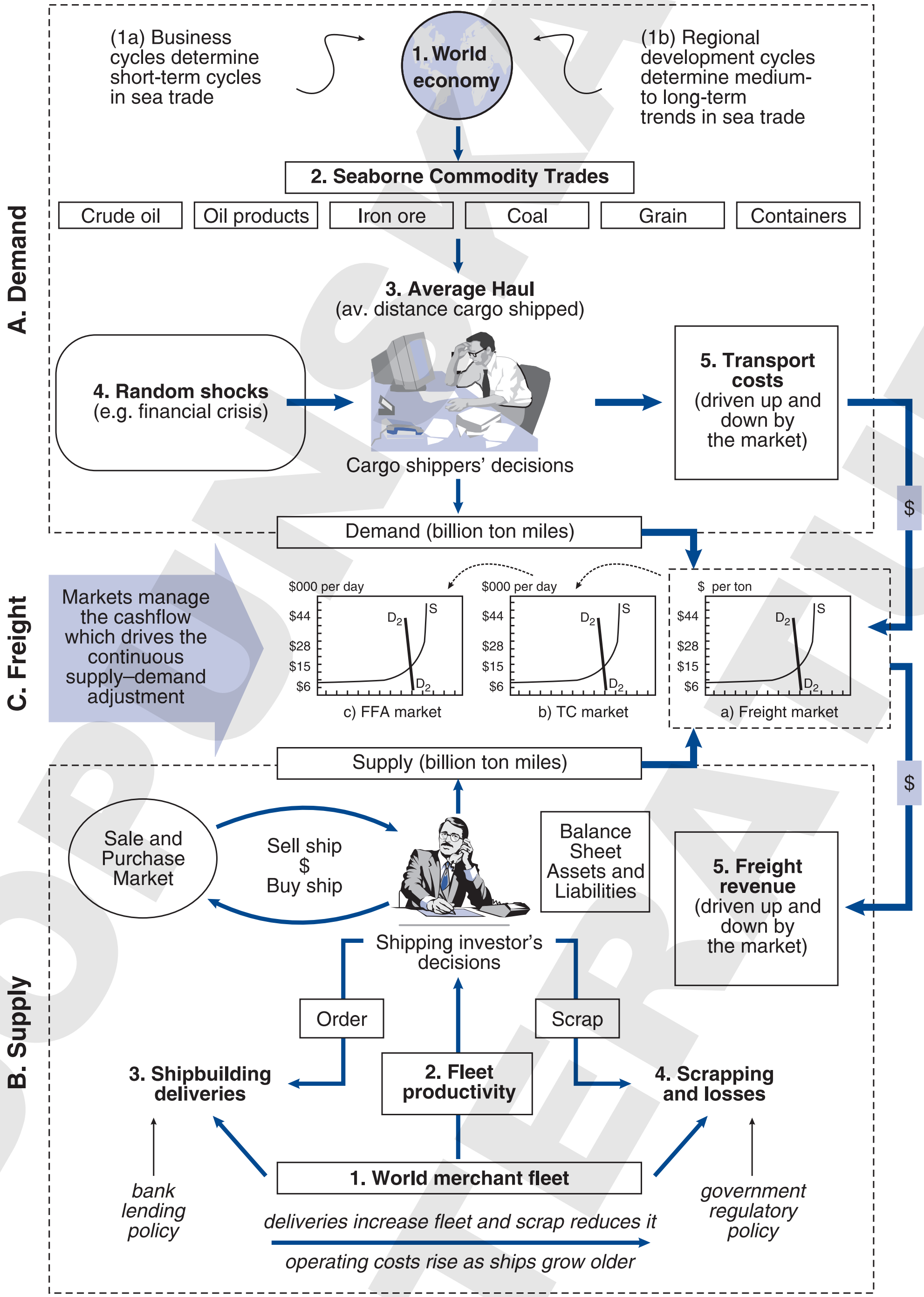


Figure 4.1
The shipping market supply and demand model
Source: Martin Stopford, 2008

the broad volume of goods traded by sea. Developments in particular commodity trades may modify the growth trends (e.g. development in the steel industry may influence the iron ore trade), as may changes in the average haul over which the cargo is transported. The final demand for shipping services measured in ton miles. (i.e. the tonnage of cargo multiplied by the average haul). The use of ton miles as a measure of demand is technically more correct than simply using the deadweight of cargo ships required, since it avoids making a judgement about the efficiency with which ships are used. That belongs more properly to the supply side of the model.

Turning to the supply module (B), in the short term, the world merchant fleet provides a fixed stock of transport capacity. When demand is low only part of this fleet may be trading and some ships will be laid up, or used for storage. The fleet can be increased by newbuilding and reduced by scrapping. The amount of transport this fleet provides also depends on the logistical efficiency with which ships are operated – in particular, speed and waiting time (see below). For example, a fleet of tankers steaming at 11 knots and returning from each cargo voyage in ballast carries less cargo in a year than the same size fleet of bulk carriers steaming at 14 knots and carrying a backhaul for all or part of its journey. This efficiency variable is generally referred to as 'fleet productivity' and is expressed in cargo ton miles per dwt per annum. Finally, the policies of banks and regulators have an impact on how the supply side of the market develops.

Dynamic links in the model

People play a central part in this shipping market model. At the heart of the demand module (A) are the *cargo shippers*. Their decisions over the sourcing of raw materials and the location of processing plant such as oil refineries determine how trade develops and, of course, they negotiate freight rates, time charters and FFAs. Many shippers are large corporations trading raw materials and manufactures, but in recent years they have been joined by commodity traders and operators who have cargo contracts for which ships are needed. The people who play a central part in supply module (B) are the *shipping investors*. The term 'shipping investor' is used because although many decision-makers will be private shipowners or shipping companies there are other important players – for example, German Kommanditgeseichllschaft (KG) companies which own containerships; oil traders which own tankers; and major oil companies with their own fleets. These shipping investors sit on the other side of the table from the cargo shippers in the freight negotiation and they also have the crucial task of ordering the new ships and scrapping old ones.

Imbalances between the supply and demand modules feed through into the third part of the model, the freight market (C), where freight rates are constantly adjusting in response to changes in the balance of supply and demand. This freight module is a 'switchbox' controlling the amount of money paid by shippers to shipowners for the transport of cargo, and it is this flow of money which drives the shipping market. For example when ships are in short supply, freight rates are bid up and the cash which flows into the bank accounts of shipowners affects the behaviour of both the cargo shippers and shipping investors (we discuss this 'behavioural' part of the model in more detail in Chapter 17). As the earnings of their ships rise, shipping investors rush to buy more second-hand ships, bidding up prices and then when second-hand ships become too expensive they turn to ordering new ships. As the new ships are delivered supply expands, but only after the time lag required to deliver the new ships – usually 18 months to 3 years. Meanwhile cargo shippers are responding to the high freight rates by looking for ways to cut transport costs by delaying cargoes, switching to closer supply sources or using bigger ships. But by this stage in the market cycle there is not a great deal they can do, and they have to grit their teeth and pay up.

When there are too many ships the process is reversed. Rates are bid down and shipowners have to draw on reserves to pay fixed costs such as repairs and interest on loans. As their reserves diminish, some owners are forced to sell ships to raise cash. If the downturn persists, eventually the price of older ships falls to a level where shipbreakers offer the best price and supply gradually reduces. Changes in freight rates may also trigger a change in the performance of the fleet, through adjustments to speed, or ships may be put into lay-up.

This model gives shipping market cycles their characteristic pattern of irregular peaks and troughs. Demand is volatile, quick to change and unpredictable; supply is ponderous and slow to change; and when the market is tightly balanced the freight mechanism amplifies even small imbalances at the margin. Thus the 'tortoise' of supply chases the 'hare' of demand across the freight chart, but hardly ever catches him. In a market with these dynamics we must expect 'balance', in the sense of steady earnings over several years, to be quite rare.

One final throught. At the heart of the model are people – shipping investors and cargo shippers. Their task is to negotiate the rate for each ship and inevitably the rates they agree vary depending on how the negotiating parties feel. A ship might be fixed for \$20,000 per day on Monday, but the sister ship might be fixed for \$30,000 per day on Tuesday because charterers got panicky overnight, perhaps due to some rumour they heard. Mathematical models cannot hope to simulate this sort of freight auction, so in the short term at least psychology is as important as fundamentals.

This, in summary, is the market model which controls shipping investment. In the remainder of this chapter we will examine the three sections of the model. Our main interest is not in the value of the variables themselves – we discuss this in later parts of the book. Rather it is to examine why each variable changes and the relationships between them. The model is dynamic in the sense that supply and demand are determined separately, with the two modules linked by the freight negotiation. But it is important to remember that the primary aim of the market mechanism is not to fix the freight rate, it is to coordinate the growth of supply and demand for sea transport in the hopelessly complex world in which shipping operates.

4.3 THE DEMAND FOR SEA TRANSPORT

We have suggested that ship demand, measured in ton miles of cargo, is mercurial and quick to change, sometimes by as much as 10–20% in a year. Ship demand is also subject to longer-term changes of trend. Looking back over the last two or three decades, there have been occasions when ship demand has grown rapidly over a sustained period, as happened in the 1960s, and others when ship demand stagnated and declined – notably, for example, the decade following the 1973 oil crisis.

The world economy

Undoubtedly, the most important single influence on ship demand is the world economy. It came up repeatedly in our discussion of shipping cycles in Chapter 3. Seventy years ago, in his review of the tramp market, Isserlis commented on the similar timing of fluctuations in freight rates and cycles in the world economy.[2] That there should be a close relationship is only to be expected, since the world economy generates most of the demand for sea transport, through either the import of raw materials for manufacturing industry or the trade in manufactured products. It follows that judging trends in the shipping market requires up-to-date knowledge of developments in the world economy. The relationship between sea trade and world industry is not, however, simple or direct. There are two different aspects of the world economy that may bring about change in the demand for sea transport: the business cycle and the trade development cycle.

The *business cycle* lays the foundation for freight cycles. Fluctuations in the rate of economic growth work through into seaborne trade, creating a cyclical pattern of demand for ships. The recent history of these trade cycles is evident from Figure 4.2, which shows the close relationship between the growth rate of sea trade and GDP over the period 1966–2006. Invariably the cycles in the world economy were mirrored by

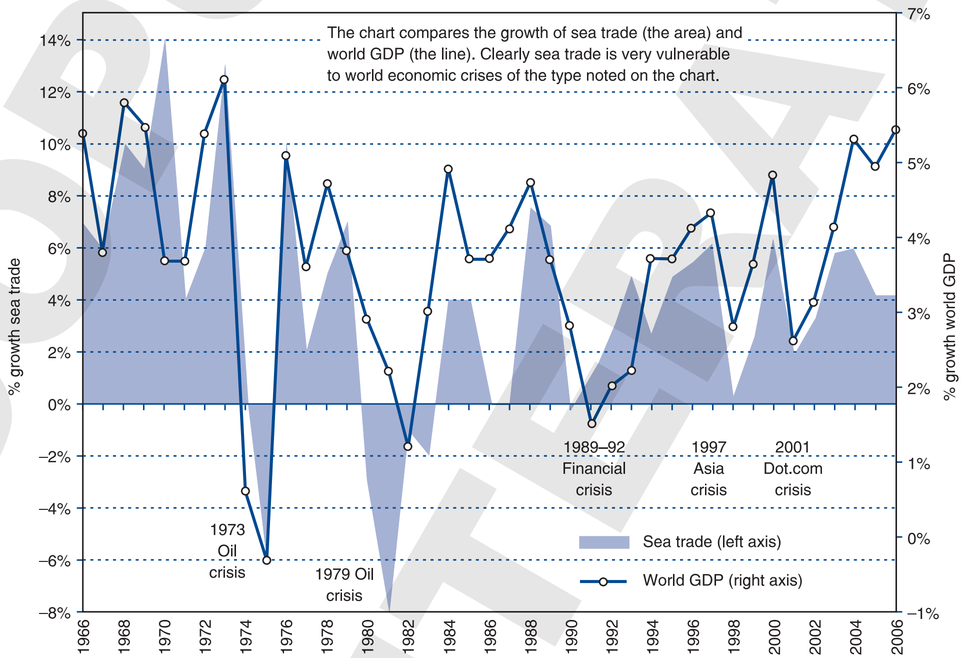


Figure 4.2
World GDP cycles and sea trade
Source: World Bank, *Fearnleys Review*

cycles in sea trade. Note, in particular, that the deep sea trade recessions in 1975, 1983 and 1988 coincided with recessions in the world economy. Since world industrial production creates most of the demand for commodities traded by sea, this is hardly surprising. Clearly the business cycle is of major importance to anyone analysing the demand side of the shipping market model.

Nowadays most economists accept that these economic cycles arise from a combination of external and internal factors. The external factors include events such as wars and sudden changes in commodity prices such as crude oil, which cause a sudden change in demand. Internal factors refer to the dynamic structure of the world economy itself, which, it is argued, leads naturally to a cyclical rather than a linear growth path. Among the more commonly quoted causes of business cycles are the following:

- *The multiplier and accelerator*. The main internal mechanism which creates cycles is the interplay between consumption and investment. Income (gross national product or GNP) may be spent on investment goods or consumption goods. An increase in investment (e.g. road building) creates new consumer demand from the workers hired. They spend their wages, creating even more demand (the investment multiplier). As the extra consumer expenditure trickles through the economy, growth picks up (the income accelerator), generating demand for even more investment goods. Eventually labour and capital become fully utilized and the economy over-heats. Expansion is sharply halted, throwing the whole process into reverse. Investment orders fall off, jobs are lost and the multiplier and accelerator go into reverse. This creates a basic instability in the economic 'machine'.[3]
- *Time-lags*. The delays between economic decisions and their implementation can make cyclical fluctuations more extreme. The shipping market provides an excellent example. During a market boom, shipowners order ships that are not delivered until the market has gone into recession. The arrival of the new ships at a time when there is already a surplus further discourages new ordering just at the time when shipbuilders are running out of work. The result of these time-lags is to make booms and recessions more extreme and cyclical.
- *Stockbuilding* has the opposite short-term effect. It produces sudden bursts of demand as industries adjust their stocks during the business cycle. The typical stock cycle, if such a thing exists, goes something like this. During recessions financially hard-pressed manufacturers run down stocks, intensifying the downturn in demand for sea transport. When the economy recovers, there is a sudden rush to rebuild stocks, leading to a sudden burst of demand which takes the shipping industry by surprise. Fear of supply shortages or rising commodity prices during the recovery may encourage high stock levels, reinforcing the process. On several occasions shipping booms have been driven by short-term stockbuilding by industry in anticipation of future shortages or price rises. Examples are the Korean War in 1952–3, the dry cargo boom of 1974–5, and the tanker mini-booms in 1979 and summer 1986, both of which were caused by temporary stockbuilding by the world oil industry.
- Some economists argue that cycles are intensified by *mass psychology*. Pigou put forward the theory of 'non-compensated errors.[4] If people act independently, their

> errors cancel out, but if they act in an imitative manner a particular trend will build up to a level where they can affect the whole economic system. Thus periods of optimism or pessimism become self-fulfilling through the medium of stock exchanges, financial booms and the behaviour of investors.

All of the above factors contribute to the cyclical nature of the world economy, but in terms of the shipping markets the peaks and troughs they produce are not generally severe enough to threaten the survival of well run businesses. The severe cycles shown in Figure 4.2 are almost all associated with 'random shocks' which fall outside the normal business cycle mechanism. From the analyst's viewpoint this distinction is important because the random shocks trigger extreme market conditions. We will discuss random shocks in more detail later in this section.

To help in predicting business cycles, statisticians have developed 'leading indicators' which provide advance warning of turning points in the economy. For example, the OECD publishes an index based on orders, stocks, the amount of overtime worked and the number of workers laid off, in addition to financial statistics such as money supply, company profits and stock market prices. It is suggested that the turning point in the lead index will anticipate a similar turning point in the industrial production index by about 6 months. To the analyst of short-term market trends such information is useful, though few believe that business cycles are reliably predictable. Two quotations serve to illustrate the point:

> No two business cycles are quite the same; yet they have much in common. They are not identical twins, but they are recognisable as belonging to the same family. No exact formula, such as might apply to the motions of the moon or of a simple pendulum, can be used to predict the timing of future (or past) business cycles.[5]
>
> A remark that can perhaps be made about industrial cycles in general is certainly applicable to the shipping industry: it is certain that these cycles exist; their periodicity – the interval from peak to peak – is variable; and their amplitude is variable; the position of the peak or of the trough of a cycle in progress is not predictable. An ad hoc explanation can usually be found for each period of prosperity and for each phase of the cycle if sufficient knowledge is available of the conditions at the time ... but it is impossible to predict the occurrence of the successive phases of a cycle which is in progress, and still more so in the case of a cycle which has not yet commenced.[6]

In conclusion, the 'business cycle' in world industry is the most important cause of short-term fluctuations in seaborne trade and ship demand. However business cycles, like the shipping cycles to which they contribute, do not follow in an orderly progression. We must take many other factors into account before drawing such a conclusion, in particular drawing a distinction between the business cycles and random shocks.

We now turn to the long-term relationship between seaborne trade and the world economy. Over a period of years does sea trade grow faster, slower, or at the same rate as industrial output? There are two reasons why, over long periods, the trade growth of individual regions will probably change.

One major reason is that the economic structure of the countries generating seaborne trade is likely to change over time – countries, like people, mature as they age! For example, changes in the industrial economies of Europe and Japan in the 1960s had a major impact on sea trade, producing a period of rapid growth from 1960 to 1970, followed by an equally sudden stagnation in the 1970s, as shown in Figure 4.3. A similar pattern occurred in the early 1990s, as South Korea and other Asian countries moved along the industrial path, producing the very high trade growth. By the early twenty-first century China was moving along the same path. These changes in trade are driven by changes in demand for bulk commodities such as iron ore. As industrial economies mature, economic activity becomes less resource-intensive, and demand switches from construction and stock-building of durables, such as motor cars, to services, such as medical care and recreation, with the result that there is a lower requirement for imported raw materials.[7] This contributed to the slower import growth of Europe and Japan during the 1970s and 1980s and will be important for China in the future. This sequential approach to development, known as the trade development cycle, is discussed in more detail in Chapter 10.

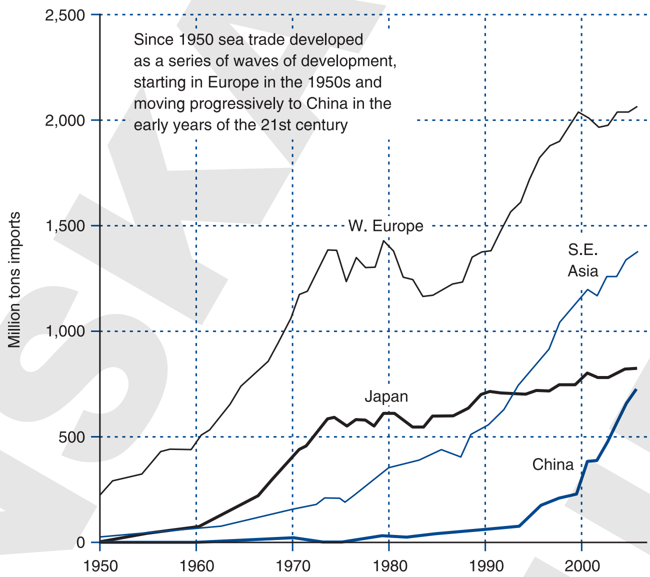


Figure 4.3
Regional trade development cycles, 1950–2005
Source: United Nations

The second influence the world economy has on trade concerns the ability of local resources of food and raw materials to meet local demand. When domestic raw materials are depleted users turn to foreign suppliers, boosting trade – for example, iron ore for the European steel industry during the 1960s and crude oil for the USA market during the 1980s and 1990s. Or the cause may be the superior quality of foreign supplies, and the availability of cheap sea transport.

Seaborne commodity trades

To find out more about the relationship between sea trade and the industrial economy we turn to the second demand variable, the seaborne commodity trades. The discussion falls into two parts: short-term and long-term.

An important cause of short-term volatility is the *seasonality* of some trades. Many agricultural commodities are subject to seasonal variations caused by harvests, notably grain, sugar and citrus fruits. Grain exports from the US Gulf reach a trough in the summer then build up in September as the crop is harvested. Trade may increase by as much as 50% between September and the end of the year. In the oil business there is also a cycle that reflects the seasonal fluctuation in energy consumption in the Northern Hemisphere, with the result that more oil is shipped during the autumn and early winter than during the spring and summer. Much the same seasonality is found in the liner trade, with seasonal peaks and troughs coinciding, for example, with major holidays such as the Chinese New Year and Christmas.

Seasonality has a disproportionate effect on the spot market. Transport of seasonal agricultural commodities is difficult to plan, so shippers of these commodities rely heavily on the spot charter market to meet their tonnage requirements. As a result, fluctuations in the grain market have more influence on the charter market than some much larger trades such as iron ore where tonnage requirements are largely met through long-term contracts. Some agricultural produce, such as fruit, meat and dairy produce, require refrigeration. For this trade, special ‘reefer’ ships and reefer containers are required.

Long-term trends in commodity trade are best identified by studying the economic characteristics of the industries which produce and consume the traded commodities. This is a topic we will examine in Chapters 11 and 12. Although every business is different, there are four types of change to look out for: changes in the demand for that particular commodity (or the product into which it is manufactured); changes in the source from which supplies of the commodity are obtained; changes due to a relocation of processing plant which changes the trade pattern; and finally changes in the shipper’s transport policy.

A classic example of *changes in demand* is the trade in crude oil, which Figure 4.4 shows is the largest individual commodity traded by sea. During the 1960s, crude oil demand grew two or three times as fast as the general rate of economic growth because oil was cheap and the economies of western Europe and Japan switched from coal to oil as their primary energy source. Imported oil replaced domestic coal, and the trade elasticity was very high. However, with the increase in oil prices during the 1970s, this trend was reversed and the

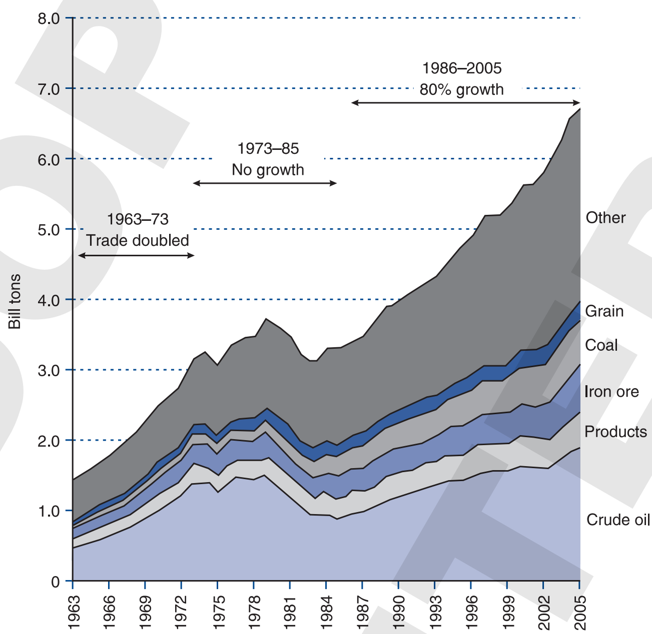


Figure 4.4
Major seaborne trades by commodity
Source: *Fearnleys Review*

demand for crude oil first stagnated and then declined. Coal regained some of its original market share and the oil trade elasticity fell.

The oil trade also provides a good illustration of the importance of *changes in supply sources*. In the 1960s the main source of crude oil was the Middle East. However, in the 1970s new oil reserves near to the market, such as the North Sea and Alaska, came on stream, reducing the need for deep sea imports. Depletion of local resources provides another example of how changing supply sources affect seaborne trade. An example is provided by Chinese iron ore imports. Until the 1990s China relied on iron ore produced locally to supply its steel industry. However, with the expansion of the steel industry in the 1990s, it became increasingly difficult to meet demand from this source and, as high-grade iron ore was shipped in from Brazil and Australia, domestic supplies were progressively replaced by imports. This run-down of local supplies, combined with rapidly growing demand, resulted in spectacular growth of iron ore imports.

Relocation of the processing of industrial raw materials can also affect the volume of cargo shipped by sea and the type of ship required. Take, for example, the aluminium industry. The raw material of aluminium production is bauxite. It takes about 3 tons of bauxite to produce 1 ton of alumina and 2 tons of alumina to produce 1 ton of aluminium. Consequently, a commercial decision to refine bauxite to alumina before shipment reduces the volume of cargo shipped by sea by two-thirds. Alumina has a higher value and is used in smaller quantities than bauxite, so the transport requirement switches from larger vessels suitable for the bauxite trade to smaller bulk carriers suitable for alumina. Another example is the refining of crude oil to products before shipment by exporters. This does not affect the volume transported, but it affects the parcel size and the tank coatings required.

Sometimes processing does not actually reduce the volume of cargo but changes the shipping requirement. In the early days of the oil trade, crude oil was refined at source and transported as oil products in products carriers. In the early 1950s, the oil companies moved towards the transport of crude oil, locating their refineries at the market. This led to the construction of very large crude carriers. Similarly, forest products were originally shipped as logs, but with developing sophistication in the industry there has been a trend towards processing logs into sawn lumber, woodchips, panels or wood pulp prior to shipment. While this did not have a major impact upon the volume of cargo, it resulted in the construction of special forest product carriers.

Finally, we come to the fourth long-term item, the shipper's *transport policy*. This is well illustrated by the oil industry. Until the 1970s the major oil companies planned and controlled the sea transport of oil. The oil companies planned their tonnage requirements, building ships or signing long-time charters with shipowners. The oil trade grew regularly and any minor errors in their planning would quickly be corrected. In this highly structured environment the role of the spot market was relegated to less than 10% of total transport requirements. It was there to cover seasonal fluctuations, minor misjudgements in the speed of trade growth and the occasional mishap such as the closure of the Suez Canal.

After the 1973 oil crisis the oil trade became more volatile and oil company policy changed. Faced with uncertainty over trade volume, the oil shippers relied more heavily on the spot market for their transport requirements. By the 1990s the spot market's share of oil shipments had increased from 10% to almost 50%. This trend was reinforced by a change in the commercial structure of the oil business. After 1973 the control of oil transport changed. Producers, oil companies in industrializing areas such as South Korea and oil traders, who had less incentive to become directly involved in oil transport, started to play a bigger part.

The commodity developments outlined above are not usually of major significance when considering short-term cycles in ship demand, since changes of this type do not take place overnight. They are, however, of considerable importance when judging the medium-term growth of demand and the employment prospects for particular ship types. As a result, any thorough medium-term analysis of the demand for sea transport needs to consider carefully the development of the commodity trades. Further discussion of the major commodity trades can be found in Chapters 10 and 11.

Average haul and ton miles

Transport demand is determined by a precise matrix of distances which determine the time it takes the ship to complete the voyage. A ton of oil transported from the Middle East to western Europe via the Cape travels five times as far as a ton of oil shipped from Ceyhan in Turkey to Marseilles. This distance effect is generally referred to as the 'average haul' of the trade. To take account of average haul, it is usual to measure sea transport demand in terms of 'ton miles', which can be defined as the tonnage of cargo shipped, multiplied by the average distance over which it is transported.

The effect on ship demand of changing the average haul has been dramatically illustrated several times in recent years by the closure of the Suez Canal, which increased the average distance by sea from the Arabian Gulf to Europe from 6,000 miles to 11,000 miles. As a result of the sudden increase in ship demand there was a freight market boom on each occasion. Another example was the closure of the Dortyol pipeline from Iraq to Turkey when Iraq invaded Kuwait in 1990. As a result 1.5 million barrels per day of oil which had previously been shipped from the East Mediterranean had to be shipped from the Arabian Gulf.

In most trades we find that the average haul has changed over the last few decades. Figure 4.5 shows the average haul of crude oil, oil products, iron ore, coal and grain during the period 1963–2005. In the crude oil trade, the average haul jumped from 4,500 miles in 1963 to over 7,000 miles a decade later, fell precipitately back to 4,500 in 1985 and then increased to 5400 miles. The products trade was stable at about 3800 miles until the early 1980s when long-haul exports from Middle East refineries pushed the average up to 5,000 miles. There was also rapid growth in the average haul in the iron ore and coal trades, both of which increased steadily from about 3,000 miles in 1963 to over 5,000 by the early 1980s.

Analysing changes in the average haul of a commodity trade can be extremely complex, requiring information in the form of detailed trade matrices, but very often the key issue is simply the balance between long-haul and short-haul suppliers.

For example, in the oil trade some oil producers are located close to the major consuming markets: Libya, North Africa, the North Sea, Mexico, Venezuela and Indonesia are all located close to their principal markets in western Europe, Japan and the United States. Oil not obtained from these sources is, of necessity, shipped from the Middle East, which is about 11,000 miles from western Europe and the USA and about 6,500 miles from Japan. Consequently, the average haul in the oil trade depends upon the balance of output from these two groups of suppliers. The rapidly increasing haul during the 1960s can be explained by the growing share of the Middle East in total oil exports, while the declining haul during the mid-1970s reflected the cut-back in Middle East supplies as new short-haul sources such as Alaska, the North Sea and Mexico came on stream against the background of a declining oil trade.

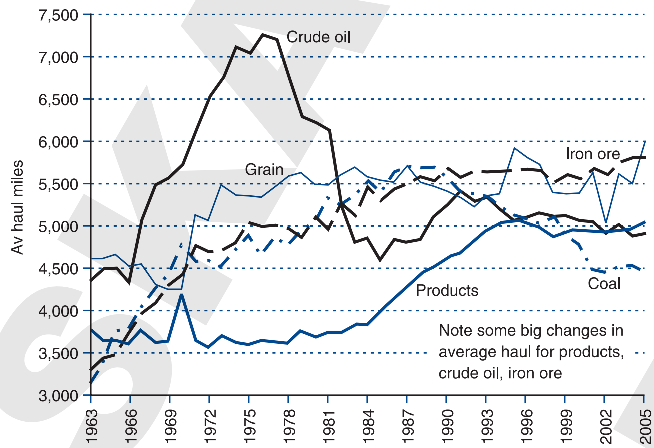


Figure 4.5
Average haul of commodity trades 1963–2005
Source: Fearnleys *World Bulk Trades*

A similar pattern can be found in the iron ore, and bauxite trades. In the early 1960s the major importers drew their supplies from local sources – Scandinavia in the case of iron ore and the Caribbean for bauxite. As the demand for imports increased, more distant supplies became available, the cost being offset to a large extent by the economies of scale obtainable from the use of large bulk carriers. Thus the European and Japanese iron ore markets came to be supplied principally from long-haul sources in Brazil and Australia and the bauxite market from Australia and West Africa.

The impact of random shocks on ship demand

No discussion of sea transport demand would be complete without reference to the impact of politics. *Random shocks* which upset the stability of the economic system may contribute to the cyclical process. Weather changes, wars, new resources, commodity price changes, are all candidates. These differ from cycles because they are unique, often precipitated by some particular event, and their impact on the shipping market is often very severe.

The most important influence on the shipping market are economic shocks. These are specific economic disturbances which are superimposed on business cycles, often with dramatic effects. A prominent example was the 1930s depression which followed the Wall Street Crash of 1929 and caused trade to decline. More recent examples, the effects of which are clearly visible in Figure 4.2, are the two oil price shocks which happened in 1973 and 1979. On both occasions, industrial output and seaborne trade suddenly declined, setting off a shipping depression. Some economists think the whole cyclical process can be explained by a stream of random shocks which make the economy oscillate at its 'resonant frequency'. The US financial crisis of the early 1990s, the Asia Crisis of 1997 and the stock market crash in 2000 are other examples. The singular feature of these economic shocks is that their timing is unpredictable and they bring about a sudden and unexpected change in ship demand.

In addition to economic shocks, from time to time political events such as a localized war, a revolution, the political nationalization of foreign assets or strikes can disrupt trade. Events of this type do not necessarily impact directly on ship demand; it is generally their indirect consequences that are significant. The various wars between Israel and Egypt had important repercussions, owing to the proximity of the Suez Canal and its strategic importance as a shipping route between the Mediterranean and the Indian Ocean. The more protracted and extensive war between Iran and Iraq had no such effect, and if anything probably reduced the demand for sea transport by encouraging oil importers to obtain their supplies from other sources, most of which were closer to the market. The impact of the Korean war in the early 1950s was felt through its effect on commodity stockpiling, while the invasion of Kuwait by Iraq in 1990 created a short tanker boom because speculators started to use tankers for oil storage.

Having made these reservations, the regularity with which political events have, by one means or another, turned the shipping market on its head is quite striking. Leaving aside the First and Second World Wars, since 1945 there have been at least nine political incidents that have had a significant influence on ship demand:

- The Korean War, which started in early 1950. Although cargo associated directly with the war was mainly transported by ships of the US reserve fleet, political uncertainty sparked off a stockbuilding boom in Western countries.
- The Suez crisis, the nationalization of the Suez Canal by the Egyptian government in July 1956 and the subsequent invasion of Egypt and closure of the canal in November. Oil tankers trading to Europe were diverted round the Cape, and this created a sudden increase in ship demand.
- The Six Day War between Israel and Egypt in May 1967 resulted in the closure of the Suez Canal. European oil imports were again diverted round the Cape.
- The closure of the Tap Line oil pipeline between Saudi Arabia and the Mediterranean in 1970 redirected crude oil previously shipped through the pipeline around the Cape.
- The nationalization of Libyan oil assets in August 1973 resulted in the oil companies turning to the more distant Middle East producers for oil supplies.
- The Yom Kippur War in October 1973 and the OPEC production cut-back triggered the collapse of the tanker market. The associated oil price rise had an effect on the world economy and the shipping market that was to last more than a decade.

- The 1979 Iran Revolution and the temporary cessation of Iranian oil exports precipitated a major increase in the price of crude oil, with significant repercussions for the world economy and the shipping market.
- The 1990–1 Gulf War which resulted in the closure of the Dortyol pipeline and a phase of short-term oil stockbuilding. Both increased tanker demand.
- The Venezuelan oil strike in 2002–3 which reduced Venezuela's exports to almost nothing for several months, requiring US imports to be sourced from more distant suppliers

Other political events have had a more localized effect on the shipping market. For example, the Falklands War in 1982 resulted in the British government chartering ships from UK owners. In the early 1960s, the Cuban crisis resulted in Cuban sugar exports being diverted to the USSR and China, while US importers obtained their supplies from other sources, again causing some disruption of the shipping market. The Iran–Iraq War of 1982 had localized effects on the tanker market.

On this evidence it is clear that any balanced view of the development of the shipping market must take account of potentially important facts of a political nature. Information of this type is often outside the experience of market analysts, with the result that few market forecasts take very much account of such factors. However, in this case, the facts speak for themselves in emphasizing the importance of this topic as a regular contributor to the mercurial behaviour of ship demand.

Transport costs and the long-run demand function

Finally, we come to the cost of sea transport. Many of the developments in sea trade of the type discussed in the previous section depend on the economics of the shipping operation. Raw materials will only be transported from distant sources if the cost of the shipping operation can be reduced to an acceptable level or some major benefit is obtained in quality of product. This makes transport costs a significant factor for industry – according to an EEC study, in the early 1980s transport costs accounted for 20% of the cost of dry bulk cargo delivered to countries within the Community.[8]

Over the last century, improved efficiency, bigger ships and more effective organization of the shipping operation have brought about a steady reduction in transport costs and higher quality of service. In fact the cost of shipping a ton of coal from the Atlantic to the Pacific, which hardly changed between 1950 and 1994, was achieved by using bigger ships (Figure 4.6). In 1950 the coal would have travelled in a 20,000 dwt vessel at a cost of \$10–15 per ton. Forty years later a 150,000 dwt bulker would be used, still at \$10–15 per ton. There can be little doubt that this has contributed materially to the growth of international trade. Developing this point, Kindleberger comments: 'what the railway did for the development of national markets in England and France the development of cheap ocean shipping has done for world trade. New channels of trade have been opened up, new links forged.'[9] Although transport costs may not appear to have such a dramatic influence upon seaborne trade as the world economy, their long-term effect on trade development should not be underrated.

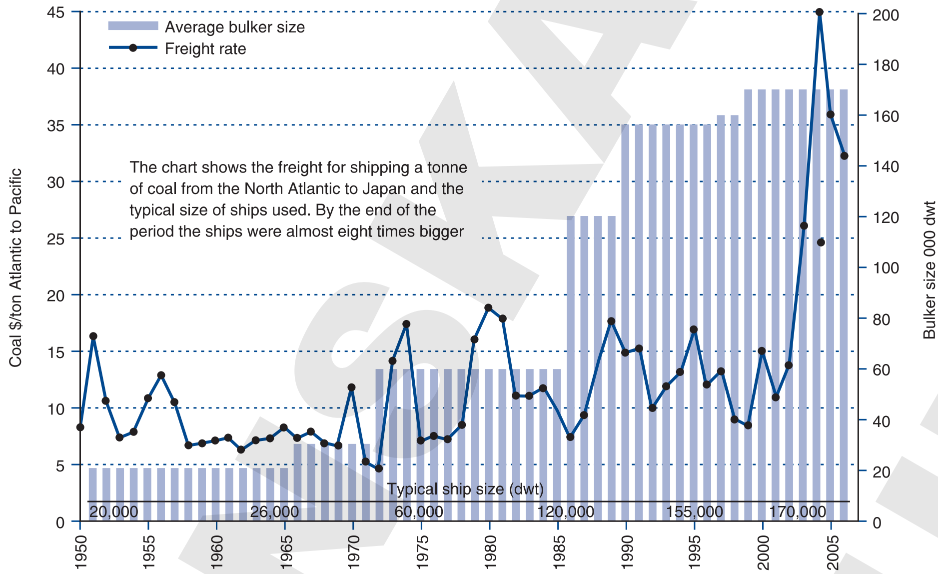


Figure 4.6
Coal transport costs from Hampton Roads to Japan, 1950–2006
Source: Compiled by Martin Stopford from various broker's reports

4.4 THE SUPPLY OF SEA TRANSPORT

In the introduction to this chapter we characterized the supply of shipping services as being slow and ponderous in its response to changes in demand. Merchant ships generally take about a year to build and delivery may take 2–3 years if the shipyards are busy. This prevents the market from responding promptly to any sudden upsurge in demand. Once built, the ships have a physical life of 15–30 years, so responding to a fall in demand is a lengthy business, particularly when there is a large surplus to be removed. Our aim in this section is to explain how this adjustment process is controlled.

The decision-makers who control supply

We start with the decision-makers. The supply of ships is controlled, or influenced, by four groups of decision-makers: shipowners, shippers/charterers, the bankers who finance shipping, and the various regulatory authorities who make rules for safety. Shipowners are the primary decision-makers, ordering new ships, scrapping old ones and deciding when to lay up tonnage. Shippers may become shipowners themselves or influence shipowners by issuing time charters. Bank lending influences investment and it is often banks who exert the financial pressure that leads to scrapping in a weak market. Regulators affect supply through safety or environmental legislation which affects the transport capacity of the fleet. For example, the update to International Maritime Organization (IMO) Regulation 13G introduced in December 2003 requires single hull tankers to be phased out by 2010, leaving shipowners with no choice over the life extension of their ships.[10]

At this point, a warning is needed. Because the supply of shipping capacity is controlled by this small group of decision-makers, the supply-side relationships in the shipping model are behavioural. If we draw an analogy with a poker game, there are many ways of playing a particular hand. The player may be cautious, or he may decide to bluff. All his opponent can do is make the best judgement he can based on an assessment of character and how he played previous hands. Exactly the same problem faces shipping analysts trying to judge the relationship between, for example, freight rates and newbuilding orders. The fact that high freight rates have stimulated orders in the past is no guarantee that the relationship will hold in future. Market behaviour cannot be explained in purely economic terms. In 1973, when freight rates were very high, shipowners ordered more tankers than could possibly have been required to meet even the most optimistic forecast of oil trade growth. Similarly, in 1982–3 and 1999 when freight rates were low, there was an ordering boom for bulk carriers. It is in situations like this that clear-sighted analysts have something to say.

The merchant fleet

The starting point for a discussion of the supply of sea transport is the merchant fleet. The development of the fleet between 1963 and 2005 is shown in Figure 4.7. Although it was a bumpy ride, this was a period of rapid growth and the merchant fleet increased from 82 m.dwt in 1963 to 740 m.dwt in 2004. It was a period of great change, and over the forty years the ship type composition of the fleet changed radically.

In the long run scrapping and deliveries determine the rate of fleet growth. Since the average economic life of a ship is about 25 years, only a small proportion of the fleet is scrapped each year, so the pace of adjustment to changes in the market is measured in years, not months. A key feature of the shipping market model is the mechanism by which supply adjusts when ship demand does not turn out as expected. Looking back over the last three decades we find examples of the merchant fleet in both expansion and contraction phases. It can be seen in Figure 4.7 that the adjustment process involved changes in the type of ship within the fleet.

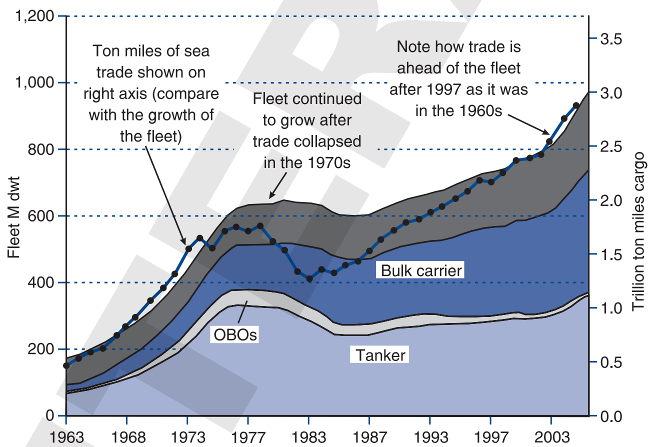


Figure 4.7
World fleet by ship type 1973–2006
Source: *Fearnleys Annual Review* (cargo)

Starting in the early 1960s, the *oil tanker fleet* went through a cycle of growth and contraction that took over 20 years to achieve. Between 1962 and 1974 the demand for seaborne oil transport, measured in ton miles, almost quadrupled and, despite the expansion of shipyard capacity, by the late 1960s supply could not keep up with demand (compare sea trade growth with fleet growth in Figure 4.7). As a result, there was an acute shortage of tanker capacity; in the early 1970s tankers were in such short supply that ships were sold 'off the stocks' for twice their original contract price – in the peak freight market of 1973 the profits on a few voyages were sufficient to pay off the investment in the ship. This led to record orders for new ships.

In the mid-1970s the whole process was thrown into reverse. Over the next decade tanker demand fell by 60% and the tanker market was confronted with the problem of bringing supply and demand into balance. It took about 10 years for supply to adjust to such a major change in demand. The fleet statistics in Figure 4.7 show what happened. After the collapse of the trade in 1975, the fleet continued to grow as the orders placed in 1973 were delivered, reaching a peak of 336 m.dwt in 1977. Scrapping did not start until the owners of the vessels became convinced that there was no future for them. This position was reached in the early 1980s when the second-hand price of VLCCs, some of which had cost $50–60 million to build in the mid-1970s, fell to $3 million. There was so little demand that sometimes ships put to auction did not attract a bid. The only buyers were shipbreakers. As scrap sales increased the fleet started to decline, reaching a trough in 1985. When the oil trade recovered in the late 1980s, supply and demand grew closer together, and freight rates increased. The whole cycle took about 14 years and by 2007 the tanker fleet was still only 354 m.dwt.

The *combined carrier fleet* links the wet and dry markets. Combination tonnage was pioneering in the early 1950s to obtain high cargo performance by carrying oil in one direction with a return load of dry cargo. However, real growth of the fleet was sparked off by the closure of the Suez Canal in 1967, when combined carrier owners, who had previously traded mainly in dry cargo, were able to take advantage of the very favourable oil freight market. Many orders were placed in the next few years and the fleet reached a peak of 48.7 m.dwt in 1978 and then declined to below 20 m.dwt in the 1990s. Most of the fleet is in the 80,000–200,000 dwt size group, which limits its activities in dry bulk to the larger bulk cargoes such as iron ore, or part cargoes of grain and coal.

Dry *bulk carriers* started to appear in the shipping market in the late 1950s, and between 1963 and 1996 the bulk fleet grew from 17 m.dwt to 237 m.dwt. The use of large bulk carriers played an integral part in the growth of major deep-sea bulk trades such as iron ore and coal, because economies of scale allowed these raw materials to be imported at very low cost. During the same period, there was a progressive switch of cargoes such as grain, sugar, minor ores, and steel products, which had previously been carried in'tweendeckers or as bottom cargo in liners, into dry bulk carriers. The market widening meant that the market share of bulk tonnage grew steadily during the 1960s and 1970s at the expense of the multi-deck fleet, with a progressive upward movement in ship size and none of the chronic overcapacity problems encountered in the oil market.

Table 4.2 The world cargo fleet at 1st January (m.dwt)

	Size of fleet (m.dwt)				% growth rate per annum		
	1980	1990	2000	2007	1980–90	1990–2000	2000–2007
Bulk carriers	140.7	203.4	266.8	369.7	4%	3%	5%
Oil tankers	339.3	262.9	307.0	363.9	–3%	2%	2%
Combined carriers	47.4	30.3	14.9	9.4	–4%	–7%	–6%
Containerships	9.9	26.3	64.7	128.0	10%	9%	10%
MPP	8.5	16.8	19.0	23.6	7%	1%	3%
Reefer	5.8	7.4	8.0	7.3	3%	1%	–1%
Car carriers	1.9	4.0	5.7	8.7	8%	3%	6%
Ro-Ro	3.7	6.6	8.1	9.5	6%	2%	2%
LPG	5.1	6.9	10.2	11.9	3%	4%	2%
LNG	2.9	3.9	7.1	15.2	3%	6%	11%
Sub total	565.1	568.6	711.6	947.2	0%	2%	4%
General cargo	—	—	42.8	38.9	—	—	–1%
Grand total	—	—	754.4	986.1	—	—	4%

Source: CRSL, *Shipping Review and Outlook*

In recent years the major change in the deep-sea liner trades was the replacement of traditional liners by cellular container ships. The first containership went into service in 1966. By 2007 the fleet had grown to 128 m.dwt, averaging 10% per annum growth during the previous 27 years (Table 4.2). The fleet of MPP vessels, which are specifically fitted for the carriage of containers, also grew at 3% per annum and the reefer fleet stayed about the same size. However, the general cargo fleet, which consists mainly of small multi-deck vessels being made obsolete by containerization, declined from 42.8 m.dwt in 2000 to 38.9 m dwt in 2007 (note that the definitions of ship type categories in Table 4.2 differ slightly from those in Table 2.5).

In practice, the different ship types discussed above do not operate in separate and self-contained markets. Although there is much specialization in the shipping market, there is also a high degree of substitution between ship types. In a volatile market, flexibility is desirable and some ships, such as'tweendeckers and combined carriers, are built with the objective of being flexible. This leads us to the important principle of lateral mobility (which is discussed further in Section 14.2): shipowners redeploy surplus vessels into more profitable applications in other sectors of the market. An example of the way this works in practice is provided by the following extract from a broker's report:

> Larger vessels of 40,000 dwt and above were particularly economical on the long hauls, and charterers now quoted substantially reduced rates for such trades. This pressed medium-sized bulk carriers of about 30,000 dwt into finding employment in trades previously serviced by vessels of 10–20,000 dwt and in the scrap trade from US to Japan units of 25–35,000 dwt were successfully introduced … with tankers and large dry cargo vessels taking care of the main part of the grain

> movements a new market was created for Liberty type vessels as barges in India and Pakistan where ports cannot accommodate large vessels.[11]

Thus ships move freely from one market sector to another. As we have noted, combined carriers are built for this purpose and were used very successfully in 1967 when the Suez Canal was closed, as the following quotation suggests:

> The improvement in freights was mainly brought about by the many combined carriers which switched to oil transportation as did the majority of tankers employed in the grain trades. Heavy demand for large conventional bulk carriers to replace the combined carriers caused a considerable number of this kind of newbuilding in the 50–100,000 dwt class to find a very favourable market when commissioned.[12]

Perhaps the most striking feature of the world merchant fleet during the last 30 years has been the rapid escalation of ship sizes, particularly in the bulk sector of the fleet. In the tanker market there was a steady increase in the average size of tankers until the early 1980s when the size structure stabilized. In bulk carriers there was a similar upward movement in ship size, but the pattern was more evenly spread between the different ship size groups with the fleets of Handy vessels (20,000–40,000 dwt), Panamax (40,000–80,000 dwt) and large bulk carriers over 80,000 dwt all expanding. Larger and more efficient ships have progressively pushed their way into the market and depressed rates for smaller sizes. At the same time investment for specialization, as in the case of car carriers and chemical tankers, played an important part in the development of the fleet. These apparently conflicting objectives emphasize the complexity of the investment decisions facing the modern shipowner.

Fleet productivity

Although the fleet is fixed in size, the productivity with which the ships are used adds an element of flexibility.[13] Past productivity statistics in Figure 4.8 show how much the productivity of the various sections of the fleet has changed over the past decade. For example, productivity expressed in terms of ton miles per deadweight reached a peak of 35,000 in 1973, but by 1985 this had fallen to 22,000; in other words, productivity had fallen by over a third. A few years later it had increased by nearly half to 32,000. The productivity in tons per deadweight shows a similar pattern, peaking at 8 in the early 1960s, falling to a trough of 4.6 in 1983, and then reaching 7.5 in 2005. The major swings in productivity in Figure 4.8 are mainly due to the deep recessions in the 1970s and 1980s when ships were very cheap and as a result were used inefficiently. In normal times the average ship carries about 7 tons of cargo per deadweight and does around 35,000 tanker ton miles.

The nature of these productivity changes becomes more apparent when we look in detail at what merchant ships actually do. Carrying cargo is just one small part of the story. As an illustration Figure 4.9 shows what the 'average' VLCC was doing during a typical year, 1991. Surprisingly, it spent only 137 days carrying cargo – little more than one-third of its time. What happened to the rest? Ballast time accounted for 111 days and cargo handling for 40 days. The remaining 21% of the time was spent in non-trading activities. This included incidents (i.e. accidents), repair, lay-up, waiting, short-term storage and long-term storage. When we analyse these activities more systematically, it becomes apparent that some are determined by both the physical performance of the fleet, and market forces. In a tight market the time on other activities would reduce, increasing supply, but even in the very tight market of 2007 an average of 200 days at sea per ship across a mixed fleet of tankers and bulk carriers was reported.[14]

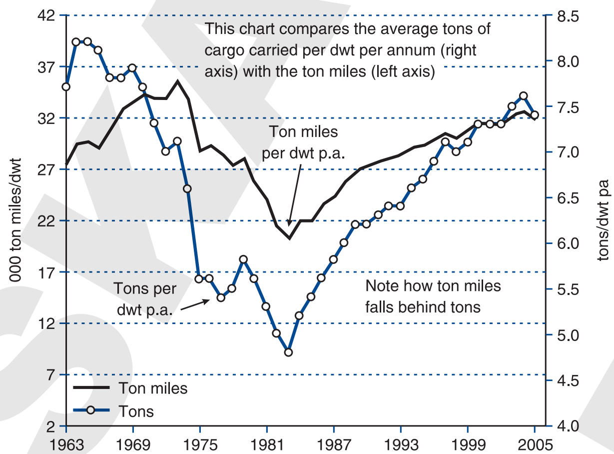


Figure 4.8
Performance of the world merchant fleet, 1963–2005
Source: *Fearnleys Review*

The productivity of a fleet of ships measured in ton miles per deadweight depends upon four main factors: speed, port time, deadweight utilization and loaded days at sea (see Section 6.5 for a more detailed discussion of productivity and its financial implications for the shipping company).

First, *speed* determines the time a vessel takes on a voyage. Tracking surveys show that, owing to a combination of operational factors, even in good markets ships generally operate at average speeds well below their design speed. For example, in 1991 the fleet of tankers over 200,000 dwt had an average design speed of 15.1 knots, but the average operating speed between ports was 11.5 knots.[15] The speed of the fleet will change with time. If new ships are delivered with a lower design speed, this will progressively reduce the transport capacity of the fleet. Similarly, as ships age,

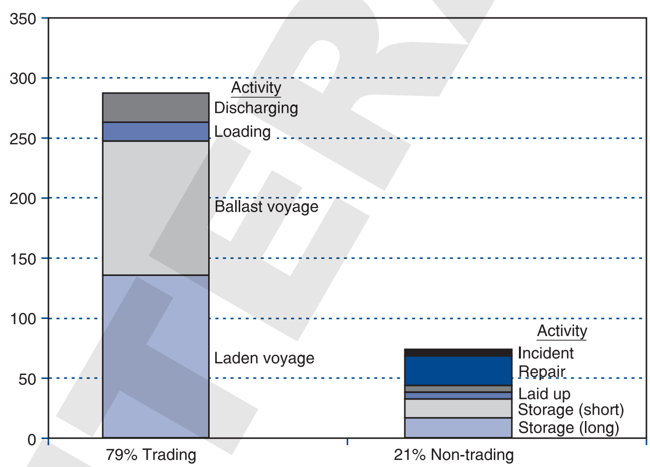


Figure 4.9
VLCC operating performance: time use of average VLCC
Source: Clarkson Research Studies, VLCC Quality Survey (1991)

unless exceptionally well maintained, hull fouling will gradually reduce the maximum operating speed.

Second, *port time* plays an important part in the productivity equation. The physical performance of the ships and terminals sets the upper limit. For example, the introduction of containerization dramatically reduced port time for liners. Organization of the transport operation also plays a part. After the oil crisis in 1973, changes in the oil industry reduced the opportunities for maximizing the efficiency of tanker operations by the transport planning departments of the major oil companies. Congestion produces temporary reductions in performance. Middle East port congestion absorbed large amounts of shipping in the mid-1970s, and in 1980 there was heavy congestion at Hampton Roads, USA, with queues of over 100 bulk carriers waiting to load coal. This congestion reduced the supply of ships available for trading.

Third, *deadweight utilization* refers to the cargo capacity lost owing to bunkers, stores, etc. which prevent a full load from being carried. A rule-of-thumb estimate of 95% for bulk carriers and 96% for tankers is derived from surveys. During the recessions of the 1970s and 1980s there was an increasing tendency for owners to carry part cargoes, reducing deadweight utilization to well below these levels. For example, *the World Tanker Fleet Review* estimated that at the end of 1986 about 16.6 m.dwt of tanker capacity was lost owing to part cargoes.

Finally, a vessel's time is divided between *loaded days at sea* and 'unproductive' days (in ballast, port, or off hire). A reduction in unproductive time allows an increase in loaded days at sea, and one can interpret changes in this variable in terms of changes in port time, etc. Vessels designed for cargo flexibility can improve their loaded time at sea because they are able to switch cargoes for backhauls. The fleet's operating performance changes in response to market conditions, as is clearly demonstrated by the changes in tanker productivity shown in Figure 4.8. Faced with a depressed freight market, the first response of the merchant fleet is generally to reduce its pace of operation. To save bunker costs, owners reduce the operating speed and, since cargoes are less readily available, waiting times increase. Eventually ships that are too expensive to operate are laid up. Tankers are frequently used for oil storage, either in port or in offshore installations. Bulk carriers may be used to store coal or grain. Some tankers in storage are on contracts lasting only a few months, after which they will become available for trading. Others used in offshore oil production may be employed on long contracts, so for practical purposes they are no longer part of the trading fleet.

Shipbuilding production

The shipbuilding industry plays an active part in the fleet adjustment process described in the previous paragraphs. In principle, the level of output adjusts to changes in demand – and over long periods this does happen. Thus, in 1974, shipbuilding output accounted for about 12% of the merchant fleet, whereas in 1996 it had fallen to 4.7%, but by 2007 it was back up to 9%. Adjustments in the level of shipbuilding output on this scale do not take place quickly or easily. Shipbuilding is a long-cycle business, and the time-lag between ordering and delivering a ship is between 1 and 4 years, depending on the size of orderbook held by the shipbuilders. Orders must be placed on the basis of an estimate of future demand and in the past these estimates have often proved to be wrong, most dramatically in the mid-1970s when deliveries of VLCCs continued for several years after demand had gone into decline. In addition, downward adjustments in shipbuilding supply may be seriously hampered by political intervention to prevent job losses.

From the point of view of the shipping industry, the type of ship built is important because peaks and troughs in the deliveries of specific ship types have an impact on their market prospects. In recent years there have been major changes in the product range of ships built by the merchant shipbuilding industry. These are illustrated graphically in Figure 4.10.

Tanker production illustrates the extreme swings which can occur in shipping investment. Tanker newbuilding dominated the period 1963–75, increasing from 5 m.dwt in 1963 to 45 m.dwt in 1975, when it accounted for 75% of shipbuilding output. The collapse of the tanker market after the 1973 oil crisis reversed this trend and tanker output fell to a trough of 3.6 m.dwt in 1984, accounting for only 1% of the tanker fleet. In the absence of VLCC orders, the tanker deliveries during the period 1978–84 were principally products tankers or 80,000–120,000 dwt crude oil tankers. As the

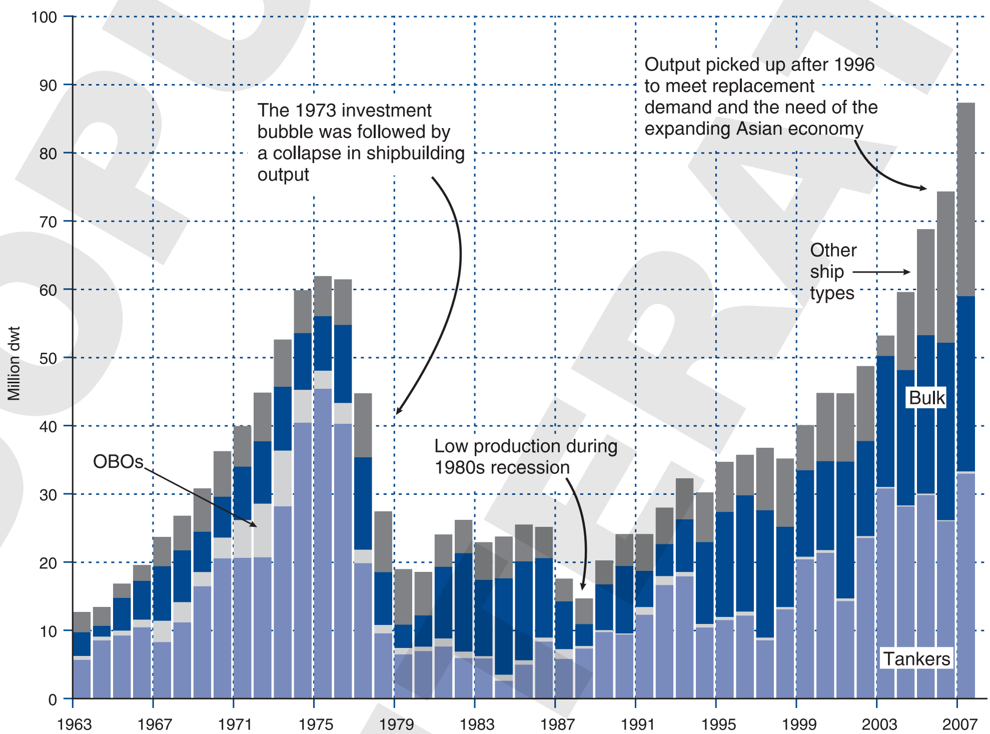


Figure 4.10
World shipbuilding deliveries by type, 1963–2007
Source: Fearnleys, Clarkson Research

tanker fleet built in the 1970s needed to be replaced the trend was again reversed, and by 2006 tanker production had increased to 25.8 m.dwt.

Compared with oil tankers, the dry bulk carrier newbuilding market has been comparatively stable since the mid-1960s. However, investment has been cyclical, with deliveries fluctuating between 5 and 15 m.dwt per annum. A very low output of 4 m.dwt in 1979 was followed by the 'mini-boom' in the dry cargo market during 1979–80. Heavy ordering resulted in peak deliveries of 14.7 m.dwt in 1985, accounting for 59% of total world shipbuilding output in deadweight tonnage terms. In a very real sense bulk carriers took over the dominant role in the shipbuilding market previously occupied by VLCCs, and by the mid-1980s were facing the same problems of overproduction and chronic surplus. One consequence of this heavy investment was a deep recession in the mid-1980s. Ordering stopped and deliveries of bulk carriers fell to 3.2 m.dwt in 1988. By 2006 deliveries were back up to 26 m.dwt, and so the cycles continued.

The remaining category of shipbuilding output comprises an enormous range of merchant cargo and service vessels – ro-ros, container ships, conventional general cargo vessels, fishing boats, ferries, cruise liners, tugs, etc. The total tonnage of deliveries in 2007 was 22.7 m.dwt, accounting for 32% of total output, and the newbuilding trend in this sector has been comparatively stable over the last two decades at about this level. Although these ship types account for only a third of the total merchant shipbuilding output in deadweight terms, in terms of work content they are much more important – for example, a deadweight ton of ferry tonnage may contain four or five times as much work as a deadweight ton of tanker tonnage. For this reason, the various ship types in this category are substantially more important to the shipbuilding industry than might appear at first sight.

Scrapping and losses

The rate of growth of the merchant fleet depends on the balance between deliveries of new ships and deletions from the fleet in the form of ships scrapped or lost at sea. This balance changed radically during the late 1970s, as can be seen from Figure 4.11. In 1973, only about 5 m.dwt of vessels were scrapped, compared with deliveries of over 50 m.dwt, with the result that the fleet grew rapidly. By 1982, scrapping had overtaken deliveries for the first time since the Second World War, accounting for 30 m.dwt compared with 26 m.dwt of deliveries. Thus scrapping, which appeared to be of little significance in 1973, was of major importance by the early 1980s.

Whilst it is clear that scrapping has a significant part to play in removing ships from the market, explaining or predicting the age at which a ship will actually be scrapped is an extremely complex matter, and one that causes considerable difficulties in judging the development of shipping capacity. The reason is that scrapping depends on the balance of a number of factors that can interact in many different ways. The main ones are age, technical obsolescence, scrap prices, current earnings and market expectations.

Age is the primary factor determining the tonnage of vessels scrapped. Ships deteriorate as they grow older and the cost of routine repairs and maintenance increases; thus the

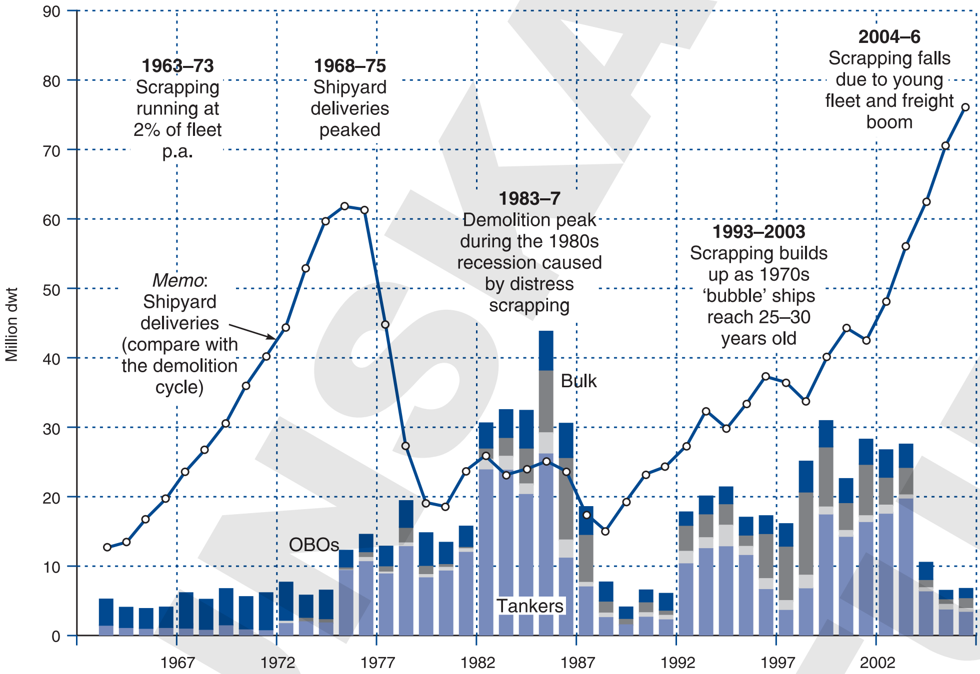


Figure 4.11
World ship demolition sales by type, 1963–2006
Source: *Fearnleys Review*, Clarkson Research

owners of elderly vessels face the combination of heavier costs and more time off hire for planned and unplanned maintenance. Because physical deterioration is a gradual process, there is no specific age at which a ship is scrapped; a look through *Lloyd's Demolition Register* generally reveals a few examples of vessels scrapped with an age of over 60 or 70 years, and at the other extreme tankers sold for demolition at as little as 10 years. In 2007, when 216 vessels were scrapped, the average scrapping age was 27 years for tankers and 32 years for dry cargo vessels. In each case there was a wide spread.

Technical obsolescence may reduce the age at which a particular type of vessel is scrapped because it is superseded by a more efficient ship type. For example, the high scrapping rate of multi-deckers in the late 1960s is attributable to these vessels being made obsolete by containerization. Obsolescence also extends to the ship's machinery and gear – tankers fitted with inefficient steam turbines were among the first to go to the scrapyard when prices rose in the 1970s.

The decision to scrap is also influenced by the scrap prices. Scrap ships are sold to shipbreakers, who demolish them and sell the scrap to the steel industry. Scrap prices fluctuate widely, depending upon the state of supply and demand in the steel industry and the availability of scrap metal from sources such as shipbreaking or the demolition of vehicles, which form the largest sources of supply. A period of extensive ship scrapping may even depress prices of scrap metal – a process that is accentuated by the fact that shipping surpluses often occur simultaneously with trade cycle downswings in the industrialized regions when demand for steel is also depressed.

Most importantly, the scrapping of a ship is a business decision and depends on the owner's expectations of the future operating profitability of the vessel and his financial position. If, during a recession, he believes that there is some chance of a freight market boom in the reasonably near future, he is unlikely to sell unprofitable ships for scrap because the possible earnings during a freight market boom are so great that they may justify incurring a small operating loss for a period of years up to that date. Naturally the oldest ships will be forced out by the cost of repairs but, where vessels are still serviceable, extensive scrapping to remove surplus capacity is only likely to occur when the shipping community as a whole believes that there is no prospect of profitable employment for the older vessels in the foreseeable future, or when companies need the cash so urgently that they are forced into 'distress' sales to shipbreakers. It follows that scrapping will occur only when the industry's reserves of cash and optimism have been run down.

Freight revenue

Finally, the supply of sea transport is influenced by freight rates. This is the ultimate regulator which the market uses to motivate decision-makers to adjust capacity in the short term, and to find ways of reducing their costs and improving their services in the long term. In the shipping industry there are two main pricing regimes, the freight market and the liner market. Liner shipping provides transport for small quantities of cargo for many customers and is essentially a retail shipping business[16], accepting cargo from a wide range of customers and a very competitive one. In contrast bulk shipping is a wholesale operation, selling transport for shiploads of cargo to a small number of industrial customers at individually negotiated prices. By standardizing the cargo units containerization has brought the two segments closer together in economic terms, and in both cases the pricing system is central to the supply of transport. In the short run, supply responds to prices as ships adjust their operation speed and move to and from lay-up, while liner operators adjust their services. In the longer term, freight rates contribute to the investment decisions which result in scrapping and ordering of ships. How this works in the bulk market is the subject of the next section. Liner pricing, which has a different economic structure, is discussed in Chapter 13.

4.5. THE FREIGHT RATE MECHANISM

The third part of the shipping market model, labelled C in Figure 4.1, is the freight market. This is the adjustment mechanism linking supply and demand. The way it operates is simple enough. Shipowners and shippers negotiate to establish a freight rate which reflects the balance of ships and cargoes available in the market. If there are too many ships the freight rate is low, while if there are too few ships it will be high. Once this freight rate is established, shippers and shipowners adjust to it and eventually this brings supply and demand into balance. We will use the perfect competition model to analyse the shipping market, and the economic concepts we will use to analyse this process more formally are the supply function, the demand function and the equilibrium price.[17]

The supply and demand functions

The *supply function* for an individual ship, shown in Figure 4.12a, is a J-shaped curve describing the amount of transport the owner provides at each level of freight rates. The ship in this example is a 280,000 dwt VLCC. When the freight rate falls below $155 per million ton miles the owner puts it into lay-up, offering no transport. As freight rates rise past $155 per million ton miles he breaks lay-up but, to save fuel, steams at the lowest viable speed of 11 knots per hour. If he trades loaded with cargo at this speed for 137 days per annum (the loaded operating days we discussed in Figure 4.9), he will supply 10.1 btm of transport in a year (i.e. $11\times24\times137\times280{,}000$). At higher freight

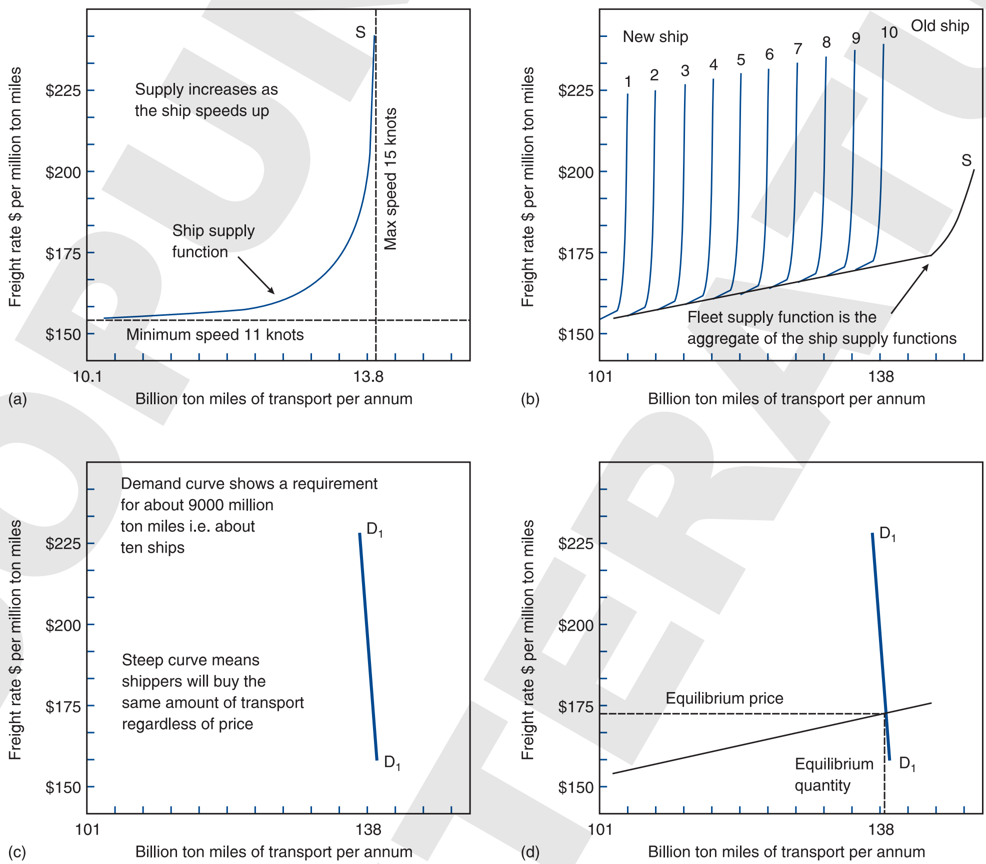


Figure 4.12
Shipping supply and demand functions: (a) supply function for single ship (VLCC); (b) supply function for fleet of ten VLCCs; (c) oil transport demand function; (d) supply–demand equilibrium
Source: Martin Stopford 2005

rates he speeds up until at about $220 per million ton miles the ship is at full speed of 15 knots and supplying 13.8 btm of sea transport per year (a lot of transport for just one ship!). Thus by increasing freight rates the market has obtained an extra 36% supply. Evidence of this process at work can be seen in Figure 4.8, which shows how the productivity of the world fleet peaked in 1973 when freight rates were very high, fell in the early 1980s when freight rates were very low, and then increased again in the 1990s as freight rates improved.

Economic theory can help to define the shape of the supply curve. Provided the market is perfectly competitive, the shipowner maximizes his profit by operating his ship at the speed at which marginal cost (i.e. the cost of providing an additional ton mile of transport) equals the freight rate. The relationship between speed and freight rates can be defined as follows:[18]

$$S = \sqrt{\frac{R}{3p.k.d}} \tag{4.1}$$

where S is the optimum speed in miles per day, R the voyage freight rate, p the price of fuel, k the ship's fuel constant, and d = distance. This equation defines the shape of the supply curve. In addition to freight rates the optimum speed depends on the price of fuel, the efficiency of the ship and the length of the voyage. We will discuss these costs in Chapter 6.

In reality the supply function is more complex than the simple speed–freight rates relationship described in the previous paragraphs. Speed is not the only way supply responds to freight rates. The owner may take advantage of a spell of low freight rates to put his ship into dry dock, or fix a short-term storage contract. At higher rates he may decide to ballast back to the Arabian Gulf through the shorter Suez Canal route rather than taking the longer 'free passage' round the Cape. All of these decisions affect supply. Similarly, freight rates are not the only way the market adjusts shipowners' revenue. During periods of surplus ships have to wait for cargo or accept small cargo parcels. This reduces the operating revenue in just the same way as a fall in freight rates, a factor often forgotten by owners and bankers doing cashflow forecasts on old ships. They may predict freight rates correctly but end up with an embarrassing cash deficit due to waiting time and part cargoes.

The next step is to show how the market adjusts the supply provided by a *fleet of ships*. To illustrate this process, the supply function for a fleet of 10 VLCCs is shown in Figure 4.12b. The fleet supply curve (S) is built up from the supply curves of individual ships of varying age and efficiency. In this example the age distribution of the fleet ranges from 2 to 20 years in intervals of 2 years. Ship 1 (the newest ship) has low daily operating costs and its lay-up point is $155 per million ton miles. Ship 10 (the oldest) has high operating costs and its lay-up point is $165 per million ton miles.

The *fleet supply function* works by moving ships in and out of service in response to freight rates. If freight rates fall below the operating costs of ship 10, it goes into lay-up and supply is reduced by one ship. Ship 9 breaks even and the other eight ships make a margin over their fixed expenses, depending on how efficient they are. If shippers only need five ships they can drop their offer to $160 per million ton miles, the lay-up point of ship 5. In this way supply responds to movements in freight rates. Over a longer period the supply can be increased by building new more efficient ships and reduced by scrapping old ones.

The slope of the short-term supply curve depends on three factors which determine the lay-up cost of the marginal ship. First, old ships generally have higher operating costs so the lay-up point will occur at a higher freight rate. We discuss this in Chapter 5. Second, bigger ships have lower transport costs per ton of cargo than small ships, so if big and small ships are competing for the same cargo, the bigger ship will have a lower lay-up point and will generally drive the smaller ships into lay-up during recessions. If the size of ships has been increasing over time, as has happened for most of the last century, the size and age will be correlated and there will be quite a steep slope to the supply curve which becomes very apparent during recessions. Third, the relationship between speed and freight rates is described in equation (4.1) above.

The *demand function* shows how charterers adjust to changes in price. The demand curve (D_1) in Figure 4.12c is almost vertical. This is mainly supposition, but there are several reasons why this shape is likely for most bulk commodities. The most convincing is the lack of any competing transport mode. Shippers need the cargo and, until they have time to make alternative arrangements, must ship it regardless of cost. Conversely cheap rates will not tempt shippers to take an extra ship. The fact that freight generally accounts for only a small proportion of material costs reinforces this argument.[19]

Equilibrium and the importance of time

The supply and demand curves intersect at the equilibrium price. At this point buyers and sellers have found a mutually acceptable price. In Figure 4.12d the equilibrium price is $170 per million ton miles. At this price buyers are willing to hire 10 ships and owners are prepared to make 10 ships available. The equation balances.

But that is not the end of the story. If our aim is to understand why freight rates behave the way they do, it is just the beginning. We must be precise about *time-frame*. It is an additional dimension present in every decision because market, prices are a blend of the present and the future expectations, the short run and the long. In the real world the price at which buyers and sellers are prepared to trade depends on how much time they have to adjust their positions. There are three time periods to consider: the *momentary* equilibrium when the deal must be done immediately; the *short run*, when there is time to adjust supply by short-term measures such as lay-up, reactivation, combined carriers switching markets or operating ships at a faster speed; and there is the *long run*, when shipowners have time to take delivery of new ships and shippers have time to rearrange their supply sources. We will look at each of these in turn.

MOMENTARY EQUILIBRIUM

Momentary equilibrium describes the freight rate negotiated for 'prompt' ships and cargoes. It is the spot market that owners and charterers deal with day by day. The ships are ready to load, the cargoes are awaiting transport and a deal must be done. The shipowner

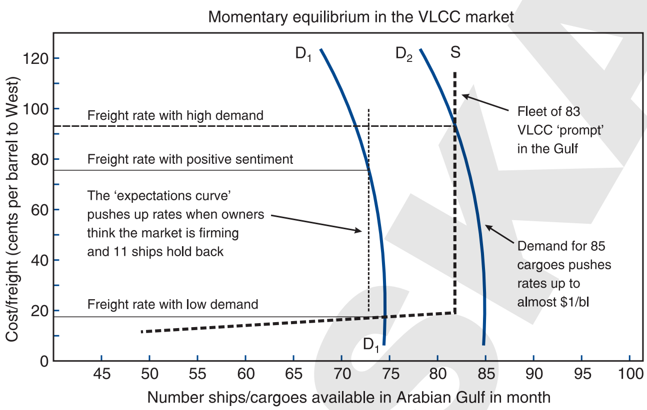


Figure 4.13
Momentary equilibrium in the VLCC market
Source: Martin Stopford 2007

is in the same position as a farmer when he arrives at market with his pig (see Section 5.8). Within this time frame the shipping market is highly fragmented, falling into the regions so familiar in brokers' reports – the Arabian Gulf, the Caribbean, the United Stated Atlantic Coast, the Pacific, and the Atlantic, etc. Local shortages and surpluses build up, creating temporary peaks and troughs which show up as spikes on the freight chart. This is the market that owners are constantly trying to anticipate when selecting their next cargo, or deciding whether to risk a ballast voyage to a better loading point.

Once these decisions are taken and the ship is in position, the options are very limited. The owner can 'fix' at the rate on offer, or sit and lose money. Charterers with cargoes face the same choice. The two parties negotiate to find a price at which supply equals demand. Figure 4.13 illustrates how this works out in practice. Suppose there are about 75 cargoes on offer in the loading zone during the month. The demand curve, marked D_1, intercepts the horizontal axis at 75 cargoes, but as the freight rate rises it curves to the left because at very high freight rates a few cargoes may be withdrawn or perhaps amalgamated to allow a different size of ship to be used.

There are 83 ships available to load and the supply curve S (the dotted line) slopes gently up from 15 cents a barrel to 21 cents a barrel until all 83 ships are contracted and then it goes vertical. In this case demand is only for 75 ships, so there are more ships than cargoes. Since the alternative to fixing is earning nothing, rates fall to operating costs, which for 75 cargoes equates to 20 cents a barrel, shown by the intersection of S and D_1. If the number of cargoes increases to 85 (D_2) there are more cargoes than ships. Charterers bid desperately to find a ship and the freight rate shoots up to almost $1 per barrel. A swing of 10 cargoes is quite common, but the effect on rates is dramatic.

But never forget that this is an auction and in this very short-term situation market sentiment is often the real driver. If there are a few more ships than cargoes, but owners believe that rates are rising, they may decide to wait. Suddenly there are more cargoes than ships and rates rise, at which point the reticent owners enter the market and fix at 'last done'. This is shown by the 'expectation curve' in Figure 4.13. Sometimes owners attempt to hide their ships from charterers by reporting the presence of only one ship in their fleet, or waiting outside the loading area. But the fundamentals have the last word. If the surplus of ships persists, the owners holding back may be unable to fix at all and as they start to haemorrhage cash, rates quickly collapse. So when supply and demand are roughly balanced the shape of the supply curve is determined by sentiment rather than fundamentals, a problem that sometimes misleads analysts and traders.

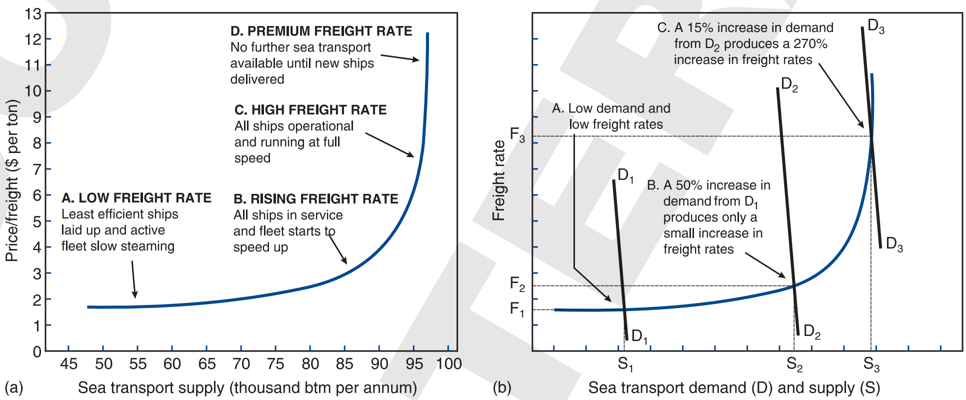
THE SHORT-RUN EQUILIBRIUM

In the 'short run' there is more time for owners and charterers to respond to price changes by moving ships in and out of lay-up, so the analysis is a little different.

The short-run supply curve shown in Figure 4.14a plots, for a given size of fleet, the ton miles of transport available at each level of freight rates. The transport supply is measured in thousands of billion ton miles per annum and the freight rate in dollars per thousand ton miles of cargo transported.

At point A, the supply offered is only 50,000 btm per annum because the least efficient ships are laid up; at point B, all ships are back in operation and the supply has risen to about 85,000 btm per annum; at point C, the fleet is at maximum speed and the whole fleet is at sea; finally, at point D, no further supply is obtained by increasing freight rates and the supply curve becomes almost vertical. Very high freight rates may tempt out a few remaining unutilized ships. For example, during the 1956 boom, 'A number of vessels half a century old and barely seaworthy obtained freights of up to five times the rate obtained a year earlier.'

If we now bring the *short-run demand curve* into the picture we can explain how freight rates are determined. The market settles at the freight rate at which supply equals demand. Consider the three different equilibrium points marked A, B and C in Figure 4.14b. At point A demand is low and the freight rate settles at point F_1. A major increase in demand to point B only pushes the freight rate up slightly because ships immediately come out of lay-up to meet increasing demand.[20] However, a small increase in demand to point C is sufficient to treble the level of freight rates because the



Note: The supply function shows the amount of sea transport offered at each freight rate

Figure 4.14
Short-run equilibrium: (a) short-run supply function; (b) short-run adjustment
Source: Martin Stopford 2007

market rate is now set by the oldest and least efficient ships which need very high freight rates to tempt them into service. Finally, with no more ships available charterers bid against each other for the available capacity. Depending on how badly they need transport, rates can go to any level. However, this is an unstable situation. Shippers look for cheaper supply sources and the high freight rates almost always trigger frenzied investment activity by owners and shippers.

THE LONG RUN

Finally, we must consider the long run during which the size of the fleet can be adjusted by ordering new ships and scrapping old ones. The longer-term adjustment mechanism balances supply and demand through the three other markets we will discuss in Chapter 5: the sale and purchase market, the newbuilding market and the demolition market. As freight rates fall during a recession, the profitability of ships – and, consequently, their second-hand value – also falls. Eventually the price of the least efficient ships falls to the scrap price. Ships are scrapped, removing them permanently from the market and reducing the surplus. Falling second-hand prices also make new uses of the surplus tonnage financially viable; the use of supertankers for oil storage and the conversion of single hull tankers to ore carriers or offshore vessels are examples. In these ways the price mechanism gradually reduces the supply of ships to the market. Conversely, when a shortage of ships pushes up freight rates this works through to the sale and purchase market. Shipowners are keen to add to their fleets and, because there is a shortage of ships, shippers may decide to expand their own shipping operations. With more buyers than sellers, second-hand prices rise until used ships become more expensive than newbuildings. Frustrated shipowners turn to the newbuilding market and the orderbook expands rapidly. Two or three years later the fleet starts to grow.

To illustrate this process we can take the example of the adjustment of the tanker market over the period 1980–1992. Figure 4.15 shows the position of the supply–demand chart in 1980 (a), 1985 (b), 1991 (c) and 1992 (d). The freight rate is shown on the vertical axis measured in dollars per day and as an indicator of transport supply the tanker fleet is shown on the horizontal axis, measured in millions of tons dead weight. Neither of these units of measurement is strictly correct[21] but they illustrate the point. Figure 4.15e is a freight chart which shows the level of freight rates in each of the four years. Our aim is to explain how the supply and demand curves moved between the 4 years. In 1980 (Figure 4.15a) freight rates were moderately high at $15,000 per day, with the demand curve intersecting the 'kink' of the supply curve. By 1985 (Figure 4.15b) the supply curve has moved to the left as heavy scrapping reduced the tanker fleet from 320 m.dwt to 251 m.dwt, but demand had fallen even more to below 150 m.dwt due to the collapse in the crude oil trade after the oil price rises in 1979. This left 60 m.dwt of tankers laid up, extensive slow steaming, and the demand curve intersecting the supply curve way down its span at D_{85}. Freight rates averaged about $7,000 per day, close to operating costs.

Between 1985 and 1991 (Figure 4.15c), despite heavy scrapping, the tanker fleet fell by only 7 m.dwt, due to increased newbuilding in the late 1980s. As a result the supply

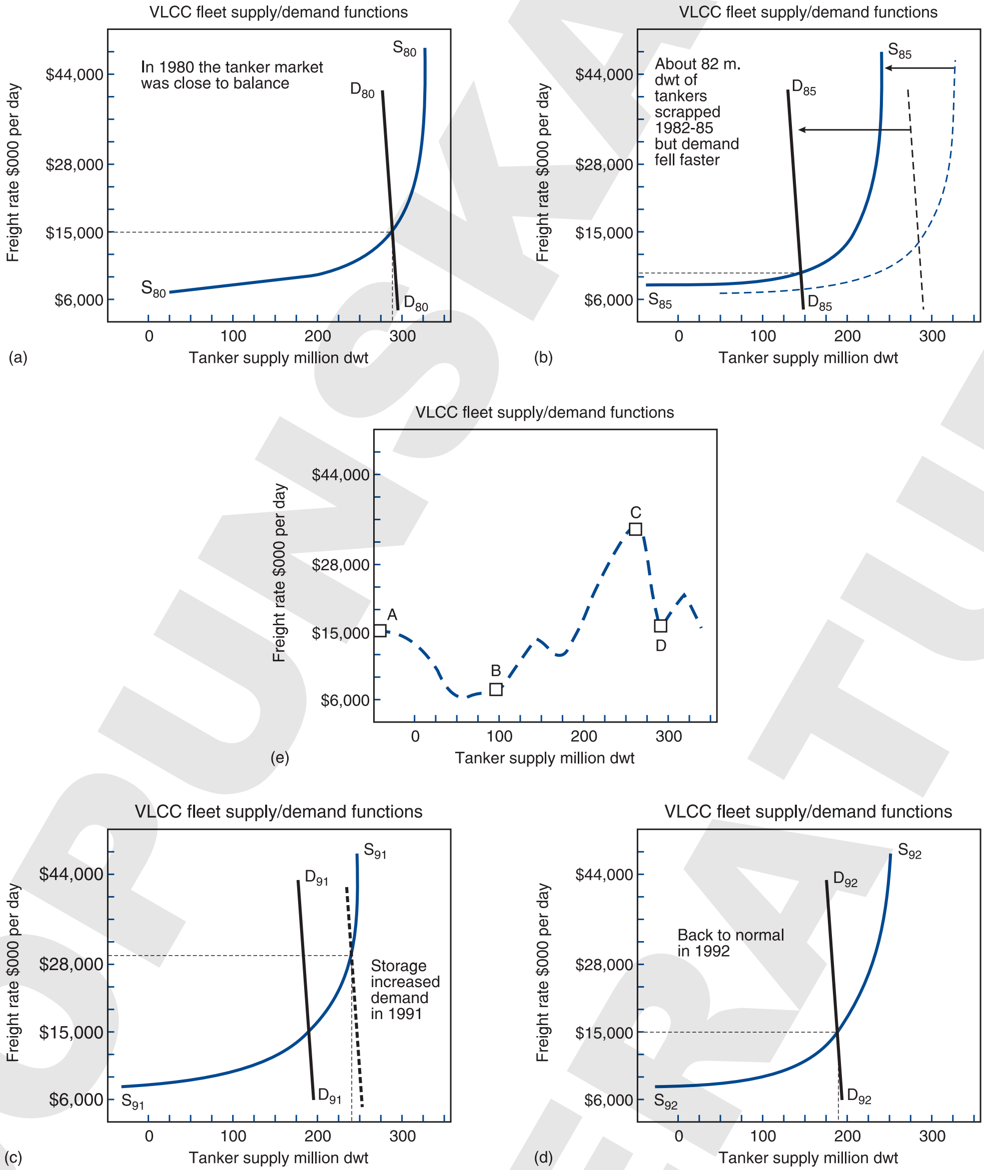


Figure 4.15
Long-term adjustment of supply and demand, 1980–92
Source: Martin Stopford 2004

curve moved very slightly to the left to S_{91}, but a growing oil trade increased demand by 30% to D_{91}, suggesting an equilibrium freight rate of about $15,000 per day. However, in 1991 another factor intervened. After the invasion of Kuwait in August 1990 oil traders used tankers as temporary storage, moving the demand curve temporarily to the right, shown by the dotted line in Figure 4.15c. Freight rates increased to $29,000 per day. Then in 1992 supply increased due to heavy deliveries and the demand curve moved back to its 'normal' position as the temporary storage market disappeared. This was enough to drive freight rates down to $15,000 per day (Figure 4.15d).

It is the combination of volatile demand and a significant time-lag before supply adjusts to demand that creates the framework for shipping market cycles. Shipowners tend to base investment on the current state of the market – they order more ships when freight rates are high and fewer when freight rates are low. The delay in delivering these ships means, however, that demand may have changed by the time the ships are delivered so any cyclical tendency is amplified.[22] Our analysis of the length of shipping cycles in Chapter 3 showed that over half a century the average cycle was about 8 years long, which is about the length you would expect in a market with the adjustment mechanism we have discussed. It takes 2–3 years for new orders to be delivered, 2–3 years for scrapping to catch up, and 2–3 years for the market to build up a head of steam for the next round of ordering. In the 1930s Jan Tinbergen noticed this relationship and thought it might be modelled using a periodic model.[23]

The effect of sentiment on the supply curve

There is a final issue to consider, the effect of sentiment on the supply function. The supply curves we have discussed so far (for example in Figure 4.15) move *horizontally* backwards and forwards, driven by the physical fundamentals as ships are scrapped and delivered. But changes in sentiment during the ongoing freight auction between charterers and shipowners can also move the curve *vertically*. For example if charterers are strong, confident and well informed they may be able to drive the curve down, whilst if owners are more confident, better informed and ready to hold back ships they may be able to drive the curve up so that for any given balance of supply and demand they get higher earnings.

To illustrate how this works in practice, Figure 4.16 plots Aframax tanker earnings against a rough estimate of the shipping capacity balance, measured as percentage surplus or deficit, between 1990 and 2007. The points are shown as diamonds, linked by a dotted line. The supply curve S1 is fitted to these points as a polynomial function. But the fit is not good. The years 1998, 1999, 2002 and 2003 (all weak years in the market) fall well below S1, whilst the good years 2000, 2005, 2006 and 2007 are way above. Linking the low points, which correspond to years of recession, produces a second supply curve S2. Similarly linking the high points, which occurred in strong markets, produces supply curve S3. It suggests that in the recession the supply curve moved down to S1, whilst in the boom it moved up to S2. Note also that in the very strong year 2004 the curves converged.

This complicates the freight model because the assumption in Figure 4.15 that earnings are uniquely defined by the percentage of surplus capacity is not necessarily correct. We now have two different supply curves S2 and S3, each giving different earnings levels for a given market balance. For example when the market is exactly in balance on the horizontal axis of Figure 4.16, S2 shows owners earning $19,000 per day whilst S3 says $37,000 per day, almost twice as much. This significant difference has a simple explanation. In years of recession the negotiation goes in the charterer's favour whilst in the boom the owners get the upper hand. During a sequence of good or

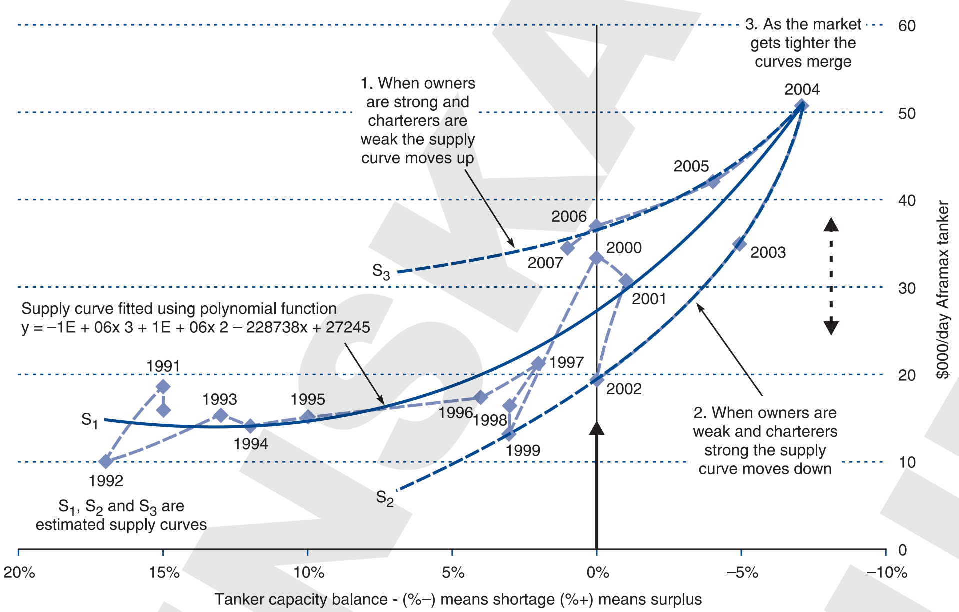


Figure 4.16
Analysis of vertical movement of the shipping supply curve
Source: Aframax earnings CRSL SRO Autumn 207; tanker capacity balance calculated by Martin Stopford for the tanker market as a whole

bad years the prevailing sentiment becomes part of the supply curve and continues to determine its shape until something changes sentiment, for example an economic shock. This happens in booms and recessions, so to predict earnings we need to know how sentiment has moved the supply curve. Unfortunately this makes forecasting freight rates a much more complex task because sentiment is harder to predict and changes much more quickly than the physical supply and demand fundamentals

The shipping cycle model

Although periodic cyclical models of the type proposed by Tinbergen are theoretically attractive, the review of almost three centuries of cycles in Chapter 3 and the underlying economics make it unlikely that this sort of model will be very helpful in practical situations. In the course of this discussion we mentioned many of the factors which contemporaries thought were important. The same factors tend to appear time and again but rarely in the same form. Business cycles in the world economy, economic shocks, misjudgements by shipowners, shipyard overcapacity, and most importantly sentiment. Our task as economists is to reduce this apparently disorganized jumble of causes and effects to a more structured form which will help us to analyse the influences on cycles, and if we are lucky predict what might happen next.

One of the main reasons why shipping cycles are irregular is that they are not driven by a single economic model; they are produced by the interaction of five separate models, described in Figure 4.17. We will describe this as the shipping cycle

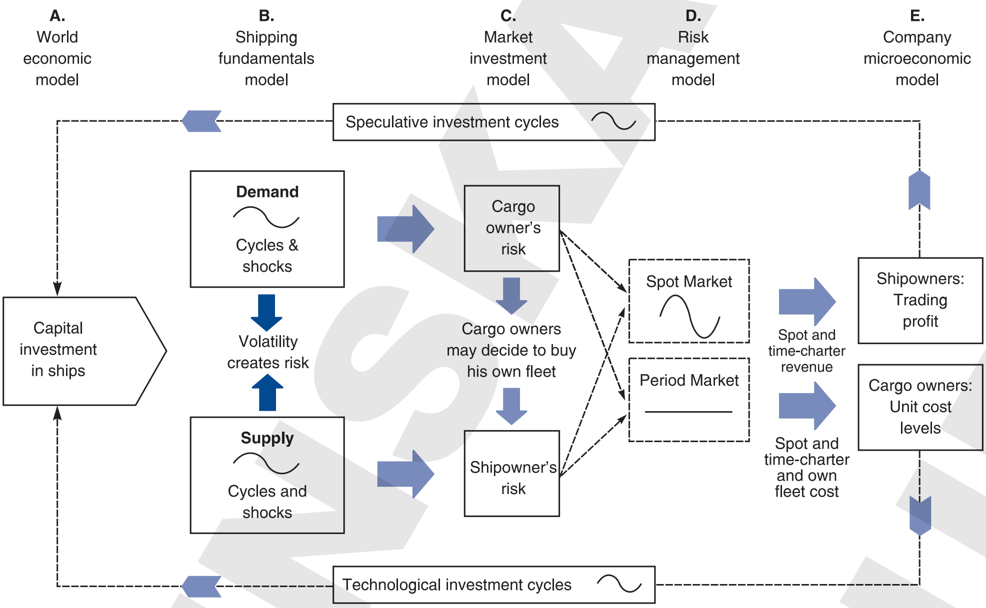


Figure 4.17
The shipping cycle composite mode
Source: Martin Stopford 2007

composite model. Segment A is the world economic model, segment B the shipping fundamentals model; segment C the market investment model; segment D the risk management model and Segment E the company microeconomic model. We will briefly discuss each of these in turn to show how it fits into the composite model.

The world economic model provides the main stimulus to the shipping cycles. Shipping is about sea transport, and the main purpose of the shipping cycle, as was discussed in Section 4.1, is to adjust the fleet to changes in the volume and composition of world seaborne trade. Thus segment A of the model simply recognizes that if we are to come to terms with shipping cycles, we must recognize the factors which may change demand for the product. This is a micro-economic model, and so we are less interested in the finer points of demand, which are dealt with in segment B, than with the overall changes. It is convenient to divide these changes into three types. Firstly there are business cycles. Unfortunately (or fortunately for shipping, depending on how you look at it) the world economy does not go in a straight line, as we saw in Figure 4.2. Over the last century it has experienced cycles rather similar to those in shipping, with periods of boom alternating with periods of bust. This gives rise to short-term changes in the demand for sea transport, and is a major contributor to shipping cycles. Secondly, there are economic shocks. These are important because they generally produce major changes of trend, and extreme changes in shipping demand. Wars, political crisis, and sudden changes in the economics of some major commodity such as oil have all contributed to major shifts in the demand for sea transport. Finally, there are the 'secular trends'. These are the major economic changes of direction which may accompany the development of a new technology (steam, electricity, information technology) or the emergence of a new major region (e.g. Japan, South Korea, China), so secular trends are the ones which underlie the long-term cycles and are perhaps the most neglected of the three. Partly it is because such trends are concealed due to their slow development. All three of these contributors to the changes in sea trade represent major topics in their own right, and they often seem too distant from the more specialist world of shipping to be of great importance. However, ultimately this is the focal point of the shipping cycle. Its purpose is to compensate for these changes in the world economy, so understanding this segment is a task that must be taken seriously.

Segment C of the model brings together the economic forces which press cargo owners and ship owners to adjust their behaviour in response to market circumstances with sentiment which, in the absence of reliable forecasts, is one of the main business drivers. This section of the shipping cycle composite model is well defined, and forms the main subject of Chapter 5 where we will discuss the factors which contribute to demand, supply and the all-important freight rates model. Parts of this model are so well documented in terms of shipping data that it is possible to develop a deterministic model which shows how the variables interact. But the role of sentiment is not well documented.

Finally stage D in the model introduces risk management. Of course shipping risk is intimately connected with the market investment model discussed under segment C, but it is such an important area that it deserves separate attention in the discussion of shipping cycles. Because the world economy generates uncertainty about how much trade will be carried in future years, somebody has to carry that risk. To take an extreme case, between 1979 and 1983, as we will see in Chapter 11 page 437, the demand for crude oil tankers fell by almost 50%. Such events do not occur frequently, but when they do they are very expensive. Who should take the risk, and how should they be rewarded for doing so? These are the issues which the shipping risk model addresses. If, for example, charterers decided that it is cheaper to take the risk themselves, they may decide to purchase large fleets and award secure time charters to shipowners. That reduces the size of the spot market, and creates a business which is more concerned with 'industrial shipping' than shipping market cycles. However, if charterers decide that they do not want a long-term commitment to shipping, then they may decide to use the charter market. During the 1990s the tonnage of container ships chartered by the 30 top liner companies increased from 15% to almost 50% of the fleet. This resulted in the rapid growth of the charter market for container ships, and a completely different market structure. Segment D is concerned with explaining these structural shifts which take place from time to time in the shipping market.

The dynamic adjustment process

Although this is straightforward, there are four aspects of the adjustment process which result in a complex process. First, the shipbuilding time-lag complicates the adjustment process. Orders placed at the top of the cycle, when rates are very profitable, have no effect on current rates, so investors keep on ordering. But when the ships are delivered a couple of years later the surge of supply drives down rates, encouraging owners to under-order. Second during the delivery time-lag ship demand often changes direction in a way investors did not anticipate when they placed their orders, so by the time the new ships hit the market they upset the balance even more. Third, the peaks and troughs of the cycles are fraught with emotion, leading to a tendency for investors to react to the violent and often unexpected swings in freight rates. Fourth, every so often a major crisis creates the need for a much greater adjustment in the supply of ships than can be achieved by these minor adjustments in the tonnage of ships delivered or scrapped. This dynamic economic adjustment model is well known to economists.

Long-run prices and costs

What determines the long-run freight rate in the shipping market? Where will earnings average out? Will the average be high enough to pay for a new ship? This is a matter of great interest to investors who, quite reasonably, want to know what return they can expect in the long term, taking one cycle with another.

The early economists argued that there is a built-in tendency for prices to cover costs. For example, Adam Smith distinguished between the *market price*, which could be very variable, and the *natural price* which just covered the cost of production. He argued that the natural price is 'the central price towards which the prices of all commodities are continually gravitating'.[24] This is a comforting idea for investors, since it suggests that if they wait long enough the market will ensure that they will earn a proper return. It is, however, a very dangerous concept.

Marshall warned against placing too much faith in the idea of a 'natural' price which, in the long run, covers costs. It is not that the theory is wrong, but that it only works 'if the general conditions of life were stationary for a run of time long enough to enable [economic forces] to work out to their full effect.[25] The natural price is unlikely to prevail because the world is constantly changing. Demand and supply schedules are constantly on the move as technology and events change and the unexpected intervenes long before the 'natural' price has been achieved. This is the common-sense view. The world is far too mercurial for the concept of a long-run equilibrium price to be significant in an industry where the product has a life of 20 years or more. Investors cannot expect any comfort from this quarter. They must back their judgement that on this occasion prices will cover their real costs. Economic theory offers no guarantees, and, as we saw in Chapter 2, the returns have, on average, tended to be rather low. This discussion of the Return on Shipping Investment (ROSI) model is developed in Chapter 8, pages 325–338.

4.6 SUMMARY

We started this chapter with the idea that shipping companies should approach the shipping market from a competitive viewpoint, 'i.e. playing other players'. The rules of the shipping market game are set by the economic relationships which create freight cycles. To explain them we discussed the economic 'model' of the shipping market. This model has two main components, supply and demand, linked by freight rates which, through their influence on the actions of shippers and shipowners, bring supply and demand into balance. Because the demand for ships changes rapidly but supply is slow and ponderous, freight cycles are generally irregular.

We identified five key demand variables: the world economy, commodity trades, average haul, political events and transport costs. The demand for ships starts with the world economy. We found that there is a close relationship between industrial production and sea trade, so close scrutiny of the latest trends and lead indicators for the world economy provide some warning of changes in the demand for ships. The second important demand variable is the structure of the commodity trades, which can lead to changes in ship demand. For example, a change in the oil price in the 1970s had a major impact on the oil trade. Distance (average haul) is the third demand variable and here again we found that there have been substantial changes in the past. Political events were the fourth variable, since wars and disturbances often have repercussions for trade. Finally transport costs play an important part in determining the long-term demand.

On the supply side we also singled out five variables: the world fleet, productivity, shipbuilding production, scrapping and freight rates. The size of the world fleet is controlled by shipowners who respond to the freight rates by scrapping, newbuilding and adjusting the performance of the fleet. Because the variables in this part of the model are behavioural, the relationships are not always predictable. Market turning points depend crucially on how owners manage supply. Although the orderbook provides a guide to the size of the world fleet 12–18 months ahead, future ordering and scrapping are influenced by market sentiment, and are very unpredictable. Because shipping investors sometimes do things which economists find difficult to understand, relying too much on economic logic can be dangerous.

Freight rates link supply and demand. When supply is tight freight rates rise, stimulating shipowners to provide more transport. When they fall, it has the opposite effect. We looked in detail at the dynamics of the mechanism by which freight rates are determined and found that time-scale is important in reaching an equilibrium price. Momentary equilibrium describes the day-to-day position as 'prompt' ships in a particular loading area compete for the available cargoes. Short-run equilibrium describes what happens when ships have time to move around the world, adjust their operating speed or spend time in lay-up. In shipping the long-term is set by the time taken to deliver new ships – say, 2–3 years. This characteristic certainly influences the 7–8 year duration of freight cycles.

Our analysis of supply–demand charts showed that the short-term supply function has a characteristic J shape, and in the short term demand is inelastic. Freight cycle peaks and troughs are produced by the inelastic demand curve moving along the supply curve. When it arrives at the 'kink' of the supply curve, freight rates move above operating costs and become very volatile. Beyond this point economics can tell us little about the level of freight rates; it is entirely based on the auction between buyers and sellers for the available capacity.

In the long term the volatile freight cycles ought to average out at a 'natural' freight rate which gives investors a fair return on capital. Although this is true in theory, Alfred Marshall warned that we should not rely on it. In a constantly changing world long-term average earnings are not subject to rules. In the past the over-eagerness of shipping investors has tended to keep market returns low, as we saw in Chapter 2, yet enough shipping fortunes have been made to keep hopeful investors in the business. We will discuss the return on shipping assets more fully in Chapter 8, where we introduce the risky assets pricing (RAP) model.

No amount of statistical analysis can reduce this complex economic structure to a simple predictive 'rule of thumb'. The requirements of success in the shipping cycle game are a lifetime's experience in the shipping industry, a direct line to the world economic and political grapevine, and a sharp eye for a bargain. Decision-makers without the advantage of experience must rely on what they can glean from books.

5 The Four Shipping Markets

Economists understand by the term Market, not any particular market place in which things are bought and sold, but the whole of any region in which buyers and sellers are in such free intercourse with one another that the prices of the same goods tend to equality easily and quickly.

(Antoine-Augustin Cournot, *Researches Into the Mathematical Principles of the Theory of Wealth*, 1838 (Trans. N.T. Bacon 1897))

5.1 THE DECISIONS FACING SHIPOWNERS

A shipowner had a difficult decision to make. He was about to take delivery of two 300,000 dwt VLCCs which an oil company was prepared to charter for 5 years at $37,000 per day each. This would guarantee revenue to cover his finance costs for the 5 years of the ship's life, but the return on his equity worked out at only 6% per annum. Not much for the risk he had taken in ordering the ships. In addition, the time charter would shut him out from the tanker boom he felt sure would happen in the next few years.

He decided to wait and trade the ships on the spot market, but because of the high level of debt service for those two years he entered into some VLCC forward freight agreements (FFAs) to hedge his earnings at $40,000 per day for those two years. This turned out to be a good decision, since the ships were delivered into a falling market and the positive settlement of the FFAs topped up his falling spot market income. Unfortunately the next three years proved to be very poor and the vessels earned only $25,000 per day each. To meet bank payments the owner was forced to sell two old Suezmax tankers. Since there were no offers from trading buyers he eventually sold them to a breaker for $5 million each. Two years earlier they had been valued at $23 million each.

In this example the shipowner trades in four different markets:

- the *newbuilding market* where he ordered the ships;
- the *freight market* where he chartered them and concluded FFAs;
- the *sale and purchase market* where he tried to sell the Suezmax tankers;
- the *demolition market* where he finally sold them.

BOX 5.1 GLOSSARY OF CHARTERING TERMS

Shipper Individual or company with cargo to transport.

Charterer Individual or company who hires a ship.

Charter-party Contract setting out the terms on which the shipper contracts for the transportation of his cargo or the charterer contracts for the hire of a ship.

Voyage charter Ship earns freight per ton of cargo transported on terms set out in the charter-party which specifies the precise nature and volume of cargo, the port(s) of loading and discharge and the laytime and demurrage. All costs paid by the shipowner.

Consecutive voyage charter Vessel hired to perform a series of consecutive voyages between A and B.

Contract of Affreightment (COA) Shipowner undertakes to carry quantities of a specific cargo on a particular route or routes over a given period of time using ships of his choice within specified restrictions.

Period charter The vessel is hired for a specified period of time for payment of a daily, monthly or annual fee. There are three types, time charter, trip charter and consecutive voyage charter.

Time charter Ship earns hire, monthly or semi-monthly. The shipowner retains possession and mans and operates ship under instructions from charterer who pays voyage costs (see Chapter 3 for definition).

Trip charter Fixed on a time charter basis for the period of a specific voyage and for the carriage of a specific cargo. Shipowner earns ‘hire’ per day for the period determined by the voyage.

Bare boat charter The owner of the ship contracts (for a fee, usually long-term) to another party for its operation. The ship is then operated by the second party as if he owned it.

Laytime The period of time agreed between the party to a voyage charter during which the owner will make ship available for loading/discharging of cargo.

Demurrage The money payable to the shipowner for delay for which he is not responsible in loading and/or discharging beyond the laytime.

Despatch Means the money which the owner agreed to repay if the ship is loaded or discharged in less than the laytime allowed in the charter-party (customarily demurrage).

Common abbreviations

c.i.f. The purchase price of the goods (by importer) includes payment of insurance and freight which is arranged by the exporter.

f.o.b. Goods are purchased at cost and the importer makes his own arrangement for insurance and freight.

The aim of this chapter is to explain how these four markets work from a practical viewpoint and to identify the differences between them. In Chapter 4 we discussed the bare bones of supply–demand analysis, showing how the supply and demand curves interact to determine freight rates and prices, so now we will put some flesh on the bones. How are ships actually chartered? How can FFAs be used to manage freight market risk? How does the sale and purchase market operate and what determines the value of a ship at a particular point in time? What is the difference between buying a new ship and buying a second-hand one? How does selling a ship for scrap differ from selling it for continued trading? And how do these markets interact? An understanding of these practical questions should provide a deeper insight into how the market economics really work. A list of the more important specialist terms often used in these markets is provided in Box 5.1.

5.2 THE FOUR SHIPPING MARKETS

Definition of a market

Markets play such a big part in the operation of the international sea transport business that we must start by clarifying what a market actually is. Jevons, the nineteenth-century economist, provided a definition which, a century later, still serves very well for shipping:

> Originally a market was a public place in a town where provisions and other objects were exposed for sale; but the word has been generalized, so as to mean any body of persons who are in intimate business relations and carry on extensive transactions in any commodity. A great city may contain as many markets as there are important branches of trade, and these markets may or may not be localized. The central point of a market is the central exchange, mart or auction rooms where traders agree to meet and transact business … But this distinction of locality is not necessary. The traders may be spread over a whole town, or region or country and yet make a market if they are … in close communication with each other[1]

Although the scale of markets has changed and communications have freed traders from the need for physical contact, the basic principles described by Jevons are still valid, though we can refine the model.

Shipping's four market places

Today sea transport services are provided by four closely related markets, each trading in a different commodity: The freight market trades in sea transport; the sale and purchase market trades second-hand ships; the newbuilding market trades new ships; and the demolition market deals in ships for scrapping. Beyond this there is no formal structure. This is an important point which calls for a warning. Although this chapter provides guidance on how the markets operate, we are not dealing with immutable laws. The fact that traders behaved in a particular way in the past is no guarantee that they will do so in future. Because markets consist of people going about their business, the best commercial opportunities often arise when the market behaves inconsistently. For example, ordering ships at the top of the market cycle is usually bad business, but if for some reason few ships are ordered, the rule will not apply. Commercial judgements must be based on an understanding of market dynamics, not economic principles taken out of context.

How the four shipping markets integrate

Because the same shipowners are trading in all four markets their activities are closely correlated. When freight rates rise or fall the changing sentiment ripples through into the sale and purchase market and from there into the newbuilding market, with the balance sheets of the companies trading in the different markets acting as a link. The way this works is illustrated in Figure 5.1. The focal point is the industry balance sheet, shown at the centre of the chart, which is the consolidation of individual company balance sheets. Cash flows in and out of the balance sheets of the various shipping companies as they trade in the four shipping markets (represented by the squares) which respond to the cycles in trade.

The freight market (market 1) provides *freight revenue*, the main source of cash for shipping companies. In fact there are three sectors to this market: the *voyage market* which trades transport for a single voyage; the *time-charter market* which hires out the ship for a defined period; and the *freight derivatives market* which deals in forward contracts settled against an index. Freight rates earned in these markets are the primary motivating force driving the activities of shipping investors. The other cash inflow comes from the demolition market (market 4). Old or obsolete vessels sold to scrap dealers provide a useful source of cash, especially during recessions. The sale and purchase market (market 2) has a more subtle role. Investing in a second-hand ship involves a transaction between a shipowner and an investor. Because the investor is usually another shipowner, money changes hands but the transaction does not affect the amount of cash held by the industry. The sale of a tanker for $20 million just transfers $20 million cash from one shipping bank account to another, leaving the aggregate cash balance unchanged.[2] In this sense the sale and purchase market is a zero-sum game. For every winner there is a loser. The only real source of wealth is trading cargo in the freight market.[3] In the case of the newbuilding market (market 3) cash flows in the opposite direction. Cash spent on new ships flows out of the shipping industry because the shipyard uses it to pay for materials, labour and profit.

These waves of cash flowing between the four markets drive the shipping market cycle. At the beginning of the cycle freight rates rise and cash starts to pour in, allowing shipowners to pay higher prices for second-hand ships. As prices are bid up, investors turn to the newbuilding market which now looks better value. With the confidence created by bulging wallets they order many new ships. A couple of years later the ships arrive on the market and the whole process goes into reverse. Falling freight rates squeeze the cash inflow just as investors start paying for their newbuildings. Financially weak

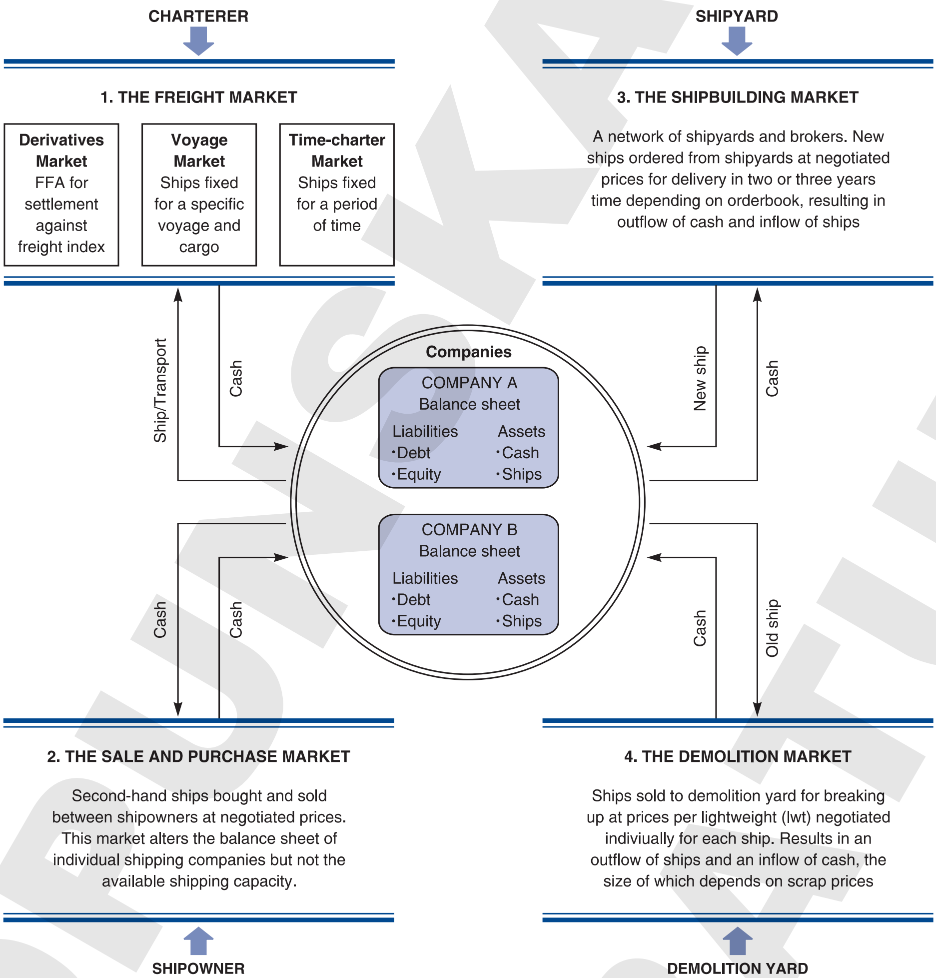


Figure 5.1
The four markets that control shipping
Source: Martin Stopford, *Maritime Economics* 3rd edition 2007
Note: This diagram shows how the four shipping markets are linked together by the cash flowing through the balance sheets of the companies in the middle. The freight market generates cash; the sale and purchase market moves it from one balance sheet to another; the newbuilding market drains it out of the market in return for new ships; and the demolition market produces a small inflow in return of old ships

owners who cannot meet their day-to-day obligations are forced to sell ships on the second-hand market. This is the point at which the asset play market starts for those shipowners with strong balance sheets. In extreme circumstances, – such as those of 1932 or 1986 – modern ships change hands at bargain prices, though shipowners pursuing the strategy of 'buying low and selling high' are often disappointed because in short recessions there are few bargains. For older ships there will be no offers from trading buyers, so hard-pressed owners are obliged to sell for demolition. As more ships are scrapped the supply falls, freight rates are bid up and the whole process starts again.

The whole commercial process is controlled and coordinated by cashflow between markets. Cash is the 'stick and carrot' which the market uses to drive activity in the required direction. Whether they like it or not, shipowners are part of a process which controls the price of the ships they trade and the revenue they earn. An important aspect of this competitive process is the continuous movement of companies in and out of the markets. One of the main purposes of the market cycle is to squeeze out the inefficient companies, and allow new and efficient companies to enter the market and gain market share. This is how the market mechanism steadily improves efficiency, and in most markets the top companies are continuously changing.

The different characters of the four markets

The markets we discuss in this section share some very distinctive characteristics. Because of the international nature of the shipping business and the mobility of assets, they are globally competitive and very close to the perfect competition model described by classical economists (see Chapter 8, Section 8.2 for a discussion of this point). However the markets are not homogeneous. Over time various sub-market segments have developed trading specialist cargoes and the ships that carry them (we discuss these trades in Chapter 12). These markets have a different business character, but there is still competition between them for cargo. Finally there are many small entrepreneurial companies and it is easy for companies to enter and leave the market, making the whole structure very cost-effective and responsive to changes in shippers' needs. In all, a fascinating case study of market economics at work.

5.3 THE FREIGHT MARKET

What is the freight market?

The freight market is one of the markets Jevons must have had in mind when he wrote the definition cited in the previous section. The original freight market, the Baltic Shipping Exchange, first started to trade as a commodity and shipping exchange in the mid-nineteenth century, though as we saw in Section 1.5 its functions had long been performed, in a less organized way, by the Baltic Coffee House. The Baltic operated in exactly the way Jevons described. At this institution merchants looking for transport met ships' captains looking for cargo. The freight market today remains a market place in which sea transport is bought and sold, though the business is mainly transacted by telephone, e-mail and messaging services rather than on the floor of the Baltic. Nowadays there is a single international freight market but, just as there are separate sections for cows and pigs in the country market, there are separate markets for different ships in the freight market. In the short term the freight rates for tankers, bulk carriers, container-ships, gas tankers, and chemical tankers behave quite differently, but because it is the same broad group of traders, what happens in one sector eventually ripples through into the others. For example, combined carriers switch between tanker and bulk markets. Also, because it takes time for ships to move around the world, there are separate regional markets which are only accessible to ships ready to load cargo in that area. We discussed how this influences the theory of short-term and long-term freight rate determination in Section 6.4.

The freight market has two different types of transaction: the *freight contract* in which the shipper buys transport from the shipowner at a fixed price per ton of cargo; and the *time charter* under which the ship is hired by the day. The freight contract suits shippers who prefer to pay an agreed sum and leave the management of the transport to the shipowner, while the time charter is for experienced ship operators who prefer to manage the transport themselves.

Arranging employment for a ship

When a ship is chartered or a freight rate is agreed, the ship is said to be 'fixed'. Fixtures are arranged in much the same way as any major international hiring or subcontracting operation. Shipowners have vessels for hire, charterers have cargo to transport, and brokers put the deal together. Let us briefly consider the part played by each of these.

The shipowner comes to the market with a ship available, free of cargo. The ship has a particular speed, cargo capacity, dimensions and cargo-handling gear. Existing contractual commitments will determine the date and location at which it will become available. For example, it may be a Handymax bulk carrier currently on a voyage from the US Gulf to deliver grain to Japan, so it will be 'open' (available for hire) in Japan from the anticipated date at which the grain has been discharged, say 12 May. Depending upon his chartering strategy, the shipowner may be looking for a short charter for the vessel or a long charter.

The shipper or charterer may be someone with a volume of cargo to transport from one location to another or a company that needs an extra ship for a period of time. The quantity, timing and physical characteristics of the cargo will determine the type of shipping contract required. For example, the shipper may have a cargo of 50,000 tons of coal to ship from Newcastle, New South Wales, to Rotterdam. Such a cargo might be very attractive to a bulk carrier operator discharging coal in Japan and looking for a cargo to reposition into the North Atlantic, because he has only a short ballast leg from Japan to Australia and then a full cargo back to Europe. So how does the shipper contact the shipowner?

Often the principal (i.e. the owner or charterer) will appoint a shipbroker to act for him. The broker's task is to discover what cargoes or ships are available; what expectations the owners/charterers have about what they will be paid or pay; and what is reasonable given the state of the market. With this information they negotiate the deal for their client, often in tense competition with other brokers. Brokers provide other services, including post-fixture processing, dealing with disputes, and providing accounting services in respect of freight, demurrage, etc. Some owners or shippers carry out these tasks themselves. However, this requires a staff and management structure which only very large companies can justify. For this reason most owners and charterers use one or more brokers. Since broking is all about information, brokers tend

Table 5.1 Voyage charter, time charter and bare boat cost distribution

1. Voyage Charter ***Master instructed by:-*** **Owner**	**2. Time charter** ***Master instructed by:-*** **Owner for ship and charterer for cargo**	**3. Bare boat** ***Master appointed by:-*** **Charterer**
***Revenue depends on*:** **Quantity of cargo & rate per unit of cargo**	***Revenue depends on*:** **Hire rate, duration and off-hire time**	***Revenue depends on*:** **Hire rate & duration**
Costs paid by owner:	**Costs paid by owner:**	**Costs paid by owner:**
1. Capital costs Capital Brokerage	*1. Capital costs* Capital Brokerage	1. *Capital costs* Capital Brokerage
2. Operating costs Wages Provisions Maintenance Repairs Stores & supplies Lube oil Water Insurance Overheads	*2. Operating costs* Wages Provisions Maintenance Repairs Stores & supplies Lube oil Water Insurance Overheads	Operating costs: note that under bare boat these are paid by the charterer
3. Port costs Port charges Stevadoring charges Cleaning holds Cargo claims *4. Bunkers, etc* Canal transit dues Bunker fuel	Voyage costs: note that under time-charter and bare boat contracts these costs are paid by the charterer	
4. Contract of Affreightment (COA): cost profile same as voyage charter		

Source: Compiled by Martin Stopford

to gather in shipping centres. London remains the biggest, with other major centres in New York, Tokyo, Hong Kong, Singapore, Piraeus, Oslo and Hamburg.

Four types of contractual arrangement are commonly used, each of which distributes costs and responsibilities in a slightly different way, as shown in Table 5.1. Under a *voyage charter*, the shipowner contracts to carry a specific cargo in a specific ship for a negotiated price per ton which covers all the costs. A variant on the same theme is the *contract of affreightment*, in which the shipowner contracts to carry regular tonnages of cargo for an agreed price per ton, again covering all the costs. The *time charter* is an agreement between owner and charterer to hire the ship, complete with crew, for a fee per day, month or year. In this case the shipowner pays the capital costs and operating expenses, whilst the charterer pays the voyage costs. The owner continues to manage the ship, but the charterer instructs the master where to go and what cargo to load and discharge. Finally the *bare boat* charter hires out the ship without crew or any operational responsibilities, so in this case the owner just pays the capital costs – it is really a financing arrangement, requiring no ship management expertise on the part of the owner.

The voyage charter

A voyage charter provides transport for a specific cargo from port A to port B for a fixed price per ton. For example, a grain trader may have 25,000 tons of grain to transport from Port Cartier in Canada to Tilbury in the UK. So what does he do? He calls his broker and tells him that he needs transport for the cargo. The broker will fix (i.e. charter) a ship for the voyage at a negotiated freight rate per ton of cargo, say $5.20. The terms will be set out in a charter-party and, if all goes well, the ship arrives on the due date, loads the cargo, transports it to Tilbury, discharges and the transaction is complete.

If the voyage is not completed within the terms of charter-party then there will be a claim. For example, if laytime (i.e. port time) at Tilbury is specified as 7 days and the time counted in port is 10 days, the owner submits a claim for 3 days' *demurrage* to the charterer. Conversely, if the ship spends only 5 days in port, the charterer will submit a claim for 2 days' *despatch* to the owner. The rates for demurrage and despatch are stated in dollars per day in the charter-party.

The calculation of demurrage and despatch does not normally present problems, but cases do arise where the charterer disputes the owner's right to demurrage. Demurrage becomes particularly important when there is port congestion. During the 1970s there were delays of up to 6 months in discharging cargo in the Middle East and Lagos, while during the coal boom of 1979–80 bulk carriers had to wait several months to load coal at Baltimore and Hampton Roads. These are extremes, but during very strong markets such as 2007 when Capesize bulk carriers were earning over $200,000 a day and iron ore ports were congested, even a few days demurrage can be significant. In cases where the demurrage cannot be accurately predicted it is important to the shipowner that he receives a demurrage payment equivalent to his daily hire charge.

The contract of affreightment

The contract of affreightment is a little more complicated. The shipowner agrees to carry a series of cargo parcels for a fixed price per ton. For example, the shipper may have a contract to supply 10 consignments of 50,000 tons of coal from Colombia to Rotterdam at two-monthly intervals. He would like to arrange for the shipment in a single contract at an agreed price per ton and leave the details of each voyage to the shipowner. This allows the shipowner to plan the use of his ships in the most efficient manner. He can switch cargo between vessels to give the best possible operating pattern and consequently a lower charter rate. He may also be able to arrange backhaul cargoes which improve the utilization of the ship. Companies who specialize in COAs sometimes describe their business as 'industrial shipping' because their aim is to provide a service. Since a long-term contract is involved, COAs involve a greater commitment to servicing the shipper and providing an efficient service.

Most COA business is in the major dry bulk cargoes of iron ore and coal, and the major customers are the steel mills of Europe and the Far East. The problem in negotiating COAs is that the precise volume and timing of cargo shipments are not generally known in advance. Cargo volume may be specified as a range (e.g. 'minimum *x* and maximum *y* tons'), while timing may rely on generalizations such as 'The shipments under the contract shall be evenly spread over the contract period'.

The time charter

A time charter gives the charterer operational control of the ships carrying his cargo, while leaving ownership and management of the vessel in the hands of the shipowner. The length of the charter may be the time taken to complete a single voyage (*trip* charter) or a period of months or years (*period* charter). When on charter, the shipowner continues to pay the operating costs of the vessel (i.e. the crew, maintenance and repair as detailed in Table 6.2), but the charterer directs the commercial operations of the vessel and pays all voyage expenses (i.e. bunkers, port charges and canal dues) and cargo-handling costs. With a time charter, the shipowner has a clear basis for preparing the ship's budget, since he knows the ship operating costs from experience and is in receipt of a fixed daily or monthly charter rate (e.g. $5,000 per day). Often the shipowner will use a long time charter from a major corporation, such as a steel mill or an oil company, as security for a loan to purchase the ship needed for the trade.

Although simple in principle, in practice time charters are complex and involve risks for both parties. Details of the contractual agreement are set out in the charter-party. The shipowner must state the vessel's speed, fuel consumption and cargo capacity. The terms of hire will be adjusted if the ship does not perform to these standards. The charter-party will also set out the conditions under which the vessel is regarded as 'off-hire', for example, during emergency repairs, when the charterer does not pay the charter hire. Long time charters also deal with such matters as the adjustment to the hire charge in the event of the vessel being laid up, and will set out certain conditions under which the charterer is entitled to terminate the arrangement – for example, if the owner fails to run the ship efficiently.

There are three reasons why subcontracting may be attractive. First, the shipper may not wish to become a shipowner, but his business requires the use of a ship under his control. Second, the time charter may work out cheaper than buying, especially if the owner has lower costs, due to lower overheads and larger fleet. This seems to have been one of the reasons why oil companies subcontracted so much of their transport in the 1960s. Third, the charterer may be a speculator taking a position in anticipation of a change in the market.

Time chartering to industrial clients is a prime source of revenue for the shipowner. The availability of time charters varies from cargo to cargo and with business circumstances. In the early 1970s about 80% of oil tankers owned by independent shipowners were on time charter to oil companies. Figure 5.2 shows that twenty years later the position had reversed and only about 20% were on time charter. In short, there had been a major change of policy by the oil companies, in response to changing circumstances in the tanker market and the oil industry.

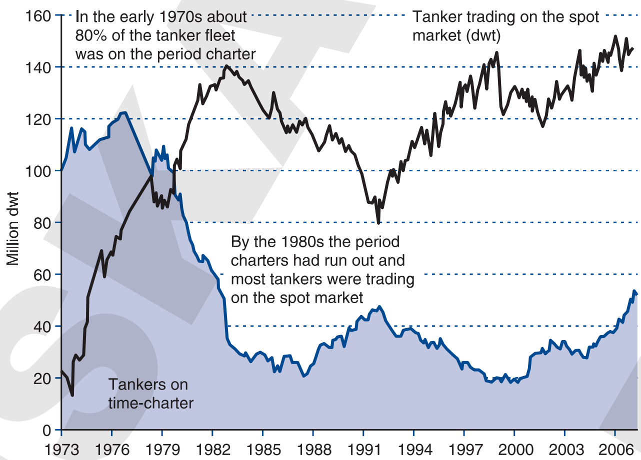


Figure 5.2
Independent tanker fleet trading on time charter and spot
Source: Drewry, CRSL 2007

The bare boat charter

Finally, if a company wishes to have full operational control of the ship, but does not wish to own it, a bare boat charter is arranged. Under this arrangement the investor, not necessarily a professional shipowner, purchases the vessel and hands it over to the charterer for a specified period, usually 10–20 years. The charterer manages the vessel and pays all operating and voyage costs. The owner, who is often a financial institution such as a life insurance company, is not active in the operation of a vessel and does not require any specific maritime skills. It is just an investment. The advantages are that the shipping company does not tie up its capital and the nominal owner of the ship may obtain a tax benefit. This arrangement is often used in the leasing deals discussed in Chapter 7, page 307.

The charter-party

Once a deal has been fixed, a charter-party is prepared setting out the terms on which the business is to be done. Hiring a ship or contracting for the carriage of cargo is complicated and the charter-party must anticipate the problems that are likely to arise. Even on a single voyage with grain from the US Gulf to Rotterdam any number of mishaps may occur. The ship may not arrive to load at the time indicated, there may be a port strike or the ship may break down in mid-Atlantic. A good charter-party will provide clear guidance on precisely who is legally responsible for the costs in each of these events, whereas a poor charter-party may force the shipowner, the charterer or the shipper to spend large sums on lawyers to argue a case for compensation.

For the above reasons the charter-party or cargo contract is an important document in the shipping industry and must be expertly drawn up in a way that protects the

1. Shipbroker	RECOMMENDED THE BALTIC AND INTERNATIONAL MARITIME COUNCIL UNIFORM GENERAL CHARTER (AS REVISED 1922, 1975 and 1994) (To be used for trades for which no specially approved forms is in force) CODE NAME: "GENCON" Part I
	2. Place and date
3. Owner's/Place of business (Cl. 1)	4. Charters/Place of business (Cl. 1)
5. Vessel's name (Cl. 1)	6. GT/NT (Cl. 1)
7. DWT all told summer load line in metric tons (abt.) (Cl. 1)	8. Present position (Cl. 1)
9. Expected ready to load (abt.) (Cl. 1)	
10. Loading port or place (Cl. 1)	11. *Discharging port or place (Cl. 1)*
12. Cargo (also state quantity and margin in Owners' option, if full and complete cargo not agreed state "part cargo" (Cl. 1)	
13. Freight rate (also state whether freight prepaid or payable on delivery) (Cl. 4)	14. Freight payment (state currency and method of payment, also beneficiary and bank account) (Cl. 4)
15. State if vessel's cargo handling gear shall not be used (Cl. 5)	16. Laytime (if separate laytime for load, and disch. is agreed, fill in a) and b). If total laytime for load. and disch. fill in c) only (Cl. 6)
17. Shippers/Place of business (Cl. 6)	(a) Laytime for loading
18. Agents (loading) (Cl. 6)	(b) Laytime for discharging
19. Agents (discharging) (Cl. 6)	(c) Total laytime for loading and discharging
20. Demurrage rate and manner payable (loading and discharging)(Cl. 7)	21. Cancelling date (Cl. 9)
	22. General date (Cl. 12)
23. Freight Tax (state if for the Owners' account (Cl. 13 (c))	24. Brokerage commission and to whom payable (Cl. 15)
25. Law and Arbitration (state 19 (a), 19 (b) or 19 (c) of Cl. 19; if 19 (c) agreed also state Place of Arbitration) (if not filled in 19 (a) shall apply) (Cl. 19)	
(a) State maximum amount for small claims/shortened arbitration (Cl. 19)	25. Additional clauses covering special provisions, if agreed

It is mutually agreed that this Contract shall be performed subject to the conditions contained in this Charter Party which shall include PartI1 as well as Part II. In the event of a conflict of conditions, the provisions of part I shall prevail over those of Part II to the extent of such conflict.

Signature (Owners)	Signature (Charterers)

Printed and sold by FR. G. Knudtzons Bogtrykken A/S, 61 Vallensbaekvej, DK-2625 Vallensbaek,
Telex +45 43 66 07 08 by authority of The Baltic and International Maritime Council (BIMCO), Copenhagen

Figure 5.3
BIMCO Gencon charter-party form, Part I

position of the contracting parties. It would be too time-consuming to develop a new charter-party for every contract, particularly voyage charters, and the shipping industry uses standard charter-parties that apply to the main trades, routes and types of chartering arrangement. By using one of these standard contracts, proven in practice, both shipper and shipowner know that the contractual terms will cover most of the eventualities that are likely to arise in that particular trade.

An example of a basic general charter-party is the BIMCO 'Gencon'. This consists of two parts, Part I which sets out details of the charter, shown in Figure 5.3, and Part II which contains notes and is not reproduced. These templates used to be filled in by hand, but today are generally created using an electronic template, with any additional clauses typed up separately.

It is usual to specify the standard charter-party to be used at the time when the order is quoted – this avoids subsequent disputes over contractual terms, a very important point in a market where freight rates can change substantially over a short period and one of the contracting parties may look for a legitimate loophole. Because there are so many variants there is no definitive list of charter-party clauses.[4] Taking the Gencon charter-party as an example, the principal sections in the charter-party can be subdivided into six major components:

1. Details of the ship and the contracting parties. The charter-party specifies:
   - the name of the shipowner/charterer and broker;
   - details of the ship – including its name, size and cargo capacity;
   - the ship's position;
   - the brokerage fee, stating who is to pay.
2. A description of cargo to be carried, drawing attention to any special features. The name and address of the shipper is also given, so that the shipowner knows whom to contact when he arrives at the port to load cargo.
3. The terms on which the cargo is to be carried. This important part of the voyage charter-party defines the commitments of the shipper and shipowner under the contract. This covers:
   - the dates on which the vessel will be available for loading;
   - the loading port or area (e.g., US Gulf);
   - the discharging port, including details of multi-port discharge where appropriate;
   - laytime, i.e. time allowed for loading and discharge of cargo;
   - demurrage rate per day in US dollars;
   - payment of loading and discharge expenses.

     If loading or discharge is not completed within the time specified the shipowner will be entitled to the payment of liquidated damages (demurrage) and the amount per day is specified in the charter-party (e.g. $5,000/day).
4. The terms of payment. This is important because very large sums of money are involved. The charter-party will specify:
   - the freight to be paid;
   - the terms on which payment is to be made.

There is no set rule about this – payment may be made in advance, on discharge of cargo or as instalments during the tenure of the contract. Currency and payment details are also specified.

5. Penalties for non-performance – the notes in Part II contain clauses setting out the terms on which penalties will be payable, in the event of either party failing to discharge its responsibilities.
6. Administrative clauses, covering matters that may give rise to difficulties if not clarified in advance. These include the appointment of agents and stevedores, bills of lading, provisions for dealing with strikes, wars, ice, etc.

Time charter-parties follow the same general principles, but include boxes to specify the ship's performance (i.e. fuel consumption, speed, quantity and prices of bunkers on delivery and redelivery) and equipment, and may exclude the items dealing with the cargo.

Efficient business depends upon shippers and shipowners concluding the business quickly and fairly without resorting to legal disputes. In view of the very large sums of money involved in shipping cargo, this goal can be achieved only by detailed charter-parties that provide clear guidance on the allocation of liability in the event of many thousands of possible mishaps occurring during the transport of cargo across the world.

Freight market reporting

The rates at which charters are fixed depend on market conditions, and the free flow of information on the latest developments plays a vital part in the market. Since the starting point for the charter negotiations is 'last done', shipowners and charterers take an active interest in reports of recent transactions. As an example of the way in which charter rates are reported we will take the daily freight market report published in *Lloyd's List*. Figure 5.4 shows a typical dry cargo market report, while Figure 5.5 shows a typical tanker chartering report.

DRY CARGO MARKET REPORT

The report consists of a commentary on market conditions followed by a list of reported charters under the headings grain, coal and time charters. Not all charters will be reported. On this particular day the report comments: 'With a surfeit of cargoes and continued port congestion in Australia the capesize market has continued to surge this week and shows little sign of slowing'.

In the fixture report, the details of the charter are generally summarized in a specific order. For voyage charters we can illustrate this point by referring to the first example of an ore charter as follows:

> Seven Islands to Rotterdam – Rubena N, 180,000t, \$19.50 per tonne, fio 7 days sc, 20-30 May. (TKS)

The vessel *Rubena N* has been chartered to load cargo at Seven Islands in Canada and transport it to Rotterdam. The cargo consists of 180,000 tonnes of iron ore, at a freight

Capesize market milestone in sight

WITH a surfeit of cargoes and continued port congestion in Australia the capesize market has continued to surge this week and shows little sign of slowing, writes Keith Wallis in Hong Kong.

One Hong Kong broker said: "There are plenty of cargoes and the market is flying up. We expect it to break $60 per tonne soon."

Asked if the milestone could be broken next week, he would only say it would be "very soon", adding: "It is unbelievable".

Port congestion in eastern Australia has continued to play a key role in pushing rates higher. Officials at Newcastle in New South Wales said 70 ships were queuing last week to load while the average waiting time was nearly 26 days.

Brokers believed the present high rates could continue indefinitely.

Brazilian iron ore mining company CVRD postponed several cargoes from May to June, loading suggesting there are plenty of cargoes still to come.

Fearnleys said a modern 172,000 dwt vessel was fixed at $110,000 a day for a round trip transatlantic voyage, while a 2001-built, 172,000 dwt vessel was chartered at $130,000 a day for a trip from Brazil to China.

The broker said there was also strong activity in the Pacific where a 2000-built, 170,000 dwt vessel achieved $106,000 a day for a round trip voyage to Australia .

But brokers also introduced a note of caution into the long-term sustainability of such high rates.

They pointed out that owners, especially European operators, were seeking long period charters of five to 10 years at rates of around $100,000 a day amid cautious sentiment that the market was reaching a peak.

One Hong Kong broker pointed out the Capesize sector could be heading for overcapacity in the next two or three years and questioned whether demand could meet the supply of capesize bulk carriers.

He said the large number of newbuildings in 2009 and 2010, coupled with the arrival of several very large ore carriers and the possible conversion of very large crude carriers into bulkers, could bring overcapacity in the market.

This week's fixtures included time charter business such as the 1999-built, 171,000 dwt Anangel Dynasty which was fixed by K Line at about $140,000 dwt a day, higher than $130,000 quoted in some reports.

In period business, the 1996-built, 180,000 dwt Quorn was fixed and failed by Oldendorff for 11 to 13 months at $100,000 a day.

EDF fixed the 2004-built, 176,00 dwt KWK Providence for four to six months at a daily rate of $110,000.

ORE

Seven Islands to Rotterdam — Rubena N, 180,000t, $19.50 per tonne, fio 7 days sc, 20-30 May. (TKS)

Saldanha to Pohang - vesserl to be nominated, 160000t, $38,25 per tonne, fio scale/55000sc, 16-30 Jun. (Posco)

TIME CHARTERS

Mineral Hong Kong (175,000 dwt, 14/54.7L 14.5/47.3B, 2006 built) delivery worldwide 1 Nov-31 Dec 2008, redelivery worldwide, 3 years, $52,500 daily. (Glory Wealth)

Fertilia (171,565 dwt, 13/62L 13.75/59B, 1997-built) delivery HongKong 14-16 May, redelivery Taiwan, $100,000 daily. (China Steel)

Anangel Dynasty (171,101 dwt, 14.5158L 15/58B, 1999-built) delivery Cape Passero 15-17 May, redelivery Japan, $130,900 daily. (K Line)

Marijeannie (74,540 dwt, 14/34.5L 14128.5B, 2001-built) delivery worldwide 1-30 Jun, redelivery worldwide, 2 years, $40,000 daily. (Hanjin)

Theodoros P (73,800 dwt, 14/34L 14.5/34B, 2002-built) delivery Qingdao 10-15 May, redelivery South East Asia,
$44,500 daily. (Louis Dreyfus)

Figure 5.4
A dry cargo market report
Source: *Lloyd's List*, 11 May 2007

rate of $19.50 per tonne. According to the *Clarkson Bulk Carrier Register*, the *Rubena N* is 203,233 dwt, so this not quite a full cargo. The charter is free in and out (fio), which means the owner does not pay the cargo-handling costs which would have to be paid if it was a ‘gross load’. Seven days are allowed for loading and discharge, Sundays and holidays included (sc). The vessel must present itself ready to load between 20 and 30 May and the charterers are Germany’s ThyssenKrupp Steel (TKS).

The layout for time charters is slightly different, as we can see taking the first example:

> **Mineral Hong Kong** (175,000 dwt, 14/54.7L 14.5/47.3B, 2006 built) delivery worldwide 1 Nov-31 Dec 2008, redelivery worldwide, 3 years, $52,500 daily. (Glory Wealth)

This is a period charter. The ship's details are given in brackets after its name, and in this case the vessel is a new 175,000 dwt bulk carrier delivered in 2006. The speed and fuel consumption are quoted, since these are significant in determining the charter rate. Operating at 14 knots loaded the ship burns 54.7 tons per day and in ballast at 14.5 knots it consumes 47.3 tons per day. The vessel is to be delivered to the charterer between 1 November and 31 December 2008 and to be redelivered 3 years later. Since this is a long charter the delivery and redelivery locations are just specified as 'worldwide'. For a shorter charter a specific port or geographical range would be specified in the charter-party. The charter rate is $52,000 per day, and the charterer is Glory Wealth.

Often the redelivery location is specified. For example, the next time charter for the *Fertilia* specifies 'delivery Hong Kong' 14–16 May, redelivery Taiwan. Note that the daily charter rate for the shorter *Fertilia* charter is twice the charter rate for the *Mineral Hong Kong*. Several of the time charters reported in Figure 5.4 are for a single round voyage, emphasizing the fact that the time charter is not exclusively a means of fixing vessels for long periods.

TANKER MARKET REPORT

The tanker charter report in Figure 5.5 follows a similar pattern to that for the dry cargo market, though in this case the main division in the reported charter is between 'clean' and 'dirty'. The clean charters refer to products tankers carrying clean oil products such as gasoline, diesel fuel and jet fuel, while the dirty charters refer to crude oil and black products. Details of individual product volumes can be found in Table 11.7 (page 445). In this case the market commentary notes that Suezmax rates are under pressure, but are expected to improve.

Tanker fixtures for a single voyage are generally in Worldscale, an index based on the cost of operating a standard tanker on the route. However, the first item reported in the commentary is an exception to this rule. The 105,000 dwt *Galway Spirit* has fixed a 90,000 tonne parcel of clean products for a lump sum of $2.25 million for a voyage from the Middle East Gulf to the UK. This usually happens when the load and discharge ports are specified in the charter-party. The details reported for each charter follow a similar pattern to dry cargo. For example:

Middle East Gulf to Japan —**Falkonera**, 257,000t, W80, May 30 (Idemitsu)

This means that the motor ship *Falkonera* has been fixed for a voyage charter from Middle East Gulf to Japan. The cargo is 257,000 tonnes. Checking in the *Clarkson Tanker Register*, we see that *Falkonera* is a 1991-built single hull tanker of 264,892 dwt. The charter rate is Worldscale 80 and commences on 30 May. The charterer is Idemitsu. Note that the charter rate of WS 80 for this 257,000 tonne parcel is half the rate of WS 175 paid for the 52,000 tonne parcel of products shipped in the *BW Captain* on the same route, but the cargo is five times bigger, illustrating economies of scale.

Suezmax rates live up to dire predictions

AS PREDICTED, Suez-max rates have continued their steady decline for a third week running, writes Mike Grinter in Hong Kong. However, indications are that the trade may be turning the corner. The threat of political unrest in the Bras River region of Nigeria led charterers to hold off, thereby precipitating another fall in Suezmax trade out of West Africa to The US Gulf and Europe.

The already dismal rates of the previous week that peaked at W117.5, plunged to W100, only recovering slightly to W107.5 as the week progressed.

A Norwegian broker insisted that the trade will probably move sideways until next week when there will be some potential for increases. Suezmax business cross-Mediterranean and on the Black Sea remains healthier with rates settling at around W125.

Here there is much more potential for improvement if only temporarily. Between May 20 and 25, a window has opened due to a number of Aframax cargoes faced with a lack of vessels in the region. Suezmax currently in the Mediterranean will get better rates for these cargoes when charterers stop seeking alternatives.

The worst performers this week were Suezmax running transatlantic. Owners struggled to achieve W100.

CLEAN

Middle East Gulf to UK Continent — **Galway Spirit,** 90,000t, $2,250,000 lumpsum May 24. (Fleet)

Middle East Gulf to Japan - **BW Captain**, 52,000t, W175, May 20. (St Shipping)

Middle East Gulf to Taiwan — **Promise,** 55,000t, W190, May 12. (CPC)

Black Sea to Mediterranean — **Indra**, 30,000t, W285, May 15. (Sibneft)

Black Sea to Mediterranean — Pride A, 26,000t, W275, May 12. (Palmyra)

DIRTY

Middle East Gulf to Ulsan - **Sunrise,** 260,000t, W80, Jun 7. (SE Corp)

Middle East Gulf to Japan — **Falkonera,** 257,000t, W80, May 30 (Idemitsu)

Middle East Gulf to Yosu - **Takayama,** 257,500t, W77.5, May 26. (GS Caltex)

Primorsk to UK Continent — **Lovina,** 100,000t, W150, May 20. (Sibneft)

Tuapse to Mediterranean - Thenamaris vessel to be nominated, 80,000t, W210, May 26. (Sibneft)

Sidi Kerir to Italy — **Iran Amol**, 80,000t, W220, May 18. (Eni)

Ceyhan to UK Continent - **Popi P**, 80,000t, W230, May 15. (Statoil)

Enfield to Philippines - **Lion City River**, 80,000t, W110, May 23. (Sietco)

TG Pelepas to Philippines - **South View**, 40,000t, $400,000 lumpsum May 10. (Vitol)

Figure 5.5
A tanker market report
Source: *Lloyds List* 11 May 2007

Liner and specialist ship chartering

The biggest international charter market is in tanker and dry bulk tonnage, but there is also a significant and growing market for liner and specialist vessels. In the early days of containerization companies tended to own and operate their own fleets of container-ships, occasionally chartering additional ships to meet the requirements of an upswing in trade or to service the trade while their own vessels were undergoing major repairs. But as the business developed the major companies started to time-charter vessels from operators, often German KG companies, and by 2007 more than half the fleet of the top 20 service operators was provided in this way. For this reason there is an active charter market in ’tweendeckers, ro-ros and container-ships. The markets for the specialist vessels are reviewed in Chapter 12.

Freight rate statistics

Shipowners, shippers and charterers take great interest in statistics showing trends in freight rates and charter rates. Three different units of measurement are commonly used. *Voyage rate statistics* for dry cargo commodities are generally reported in US dollars per tone for a standard voyage. By convention this is a negotiated rate covering the total transport costs. This measurement is commonly used in the dry cargo trades where, for example, brokers such as Clarksons report average rates on many routes each week, for example, $12 per tonne for grain from the US Gulf to Rotterdam or $5.50 per tonne for coal to Queensland to Japan etc. In contrast, *time-charter rates* are generally measured in thousand of dollars $000s per day. Time charterer rates are commonly reported for 'trip' (i.e. round voyage), 6 months, 12 months and 3 years.

The Worldscale index

A third and more complex measure of freight rates is *Worldscale*. The tanker industry uses this freight rates index as a more convenient way of negotiating the freight rate per barrel of oil transported on many different routes. The concept was developed during the Second World War when the British government introduced a schedule of official freight rates as a basis for paying the owners of requisitioned tankers. The schedule showed the cost of transporting a cargo of oil on each of the main routes using a standard 12,000 dwt tanker. Owners were paid the rate shown in the schedule or some fraction of it. The system was adopted by the tanker industry after the war and has been progressively revised over the years, the last amendment being in January 1989 when 'New Worldscale' was introduced.

The Worldscale index is published in a book that is used as the basis for calculating tanker spot rates. The book shows, for each tanker route, the cost of transporting a tonne of cargo using the standard vessel on a round voyage. This cost is known as 'Worldscale 100'. Each year the Worldscale Panel meets in New York (which covers the Western Hemisphere) and London (which covers the rest of the world) and updates the book. The standard vessel has, from time to time, been updated. The one in use in 2007 is shown in Table 5.2. The Worldscale system makes it easier for shipowners and charterers to compare the earnings of their vessels on different routes. Suppose a tanker is available spot (i.e. waiting for a cargo) in the Gulf and the owner agrees

Table 5.2 Worldscale basis tanker

Total capacity	75,000 tonnes
Average service speed	14.5 knots
Bunker consumption	
steaming	55 tonnes per day
other	100 tonnes per round voyage
in port	5 tonnes per port
Grade of fuel oil	380 centistokes
Port time	4 days for a voyage from one loading port to another discharging port
Fixed hire element	$12,000 per day
Bunker price	US$116.75 per tonne
Port costs	Most recent available
Canal transit time	30 hours per Suez transit

Source: Worldscale Association, London

a rate of WS 50 for a voyage from Jubail to Rotterdam. To calculate how much money he will earn he first looks up the rate per tonne for WS 100 from Jubail to Rotterdam. Consulting the appropriate entry he finds that it is $17.30 per tonne. Since he has settled at WS 50 he will receive half of this amount, i.e. $8.65 per tonne. If his ship carries 250,000 tonnes, the revenue from the voyage will be $2,162,500. It is an equally simple matter to make the same calculation for a voyage to Japan.

5.4 THE FREIGHT DERIVATIVES MARKET

Shipping markets have changed surprisingly little over the centuries. The issues raised in the 2000-year-old bill of lading discussed in Chapter 1 (Box 1.1) are not so very different from the charter–parties reviewed in Section 5.3. But occasionally a radical innovation appears, and the freight derivatives market is one of these. Derivatives can be pretty confusing, so we will start with the basics. A *derivatives contract* is a legally binding agreement in which two parties agree to compensate each other, with the compensation depending on the outcome of a future event. These contracts are used to hedge risk by compensating for the cost of a large adverse movements in the variable being hedged.

To illustrate the principle, suppose a shipowner has a racehorse which is favourite to win a race with a $1 million prize and a bookmaker has accepted $1 million bets that the horse will win. If the horse wins, the owner gets $1 million and the bookmaker loses $1 million, but if the horse comes second the owner gets nothing and the bookmaker makes $1 million. Neither is very happy with this ‘all or nothing’ situation, so they draw up a contract to share some of their risk. If the horse wins, the shipowner pays the bookmaker $0.5 million out of his winnings, and if it comes second the bookmaker pays the shipowner $0.5 million out of his profit. Thanks to the contract they both get $0.5 million regardless of whether the horse comes first or second. Basically that is what the FFAs discussed in this section do. They share the risk that freight rates (and hence the costs incurred by cargo shippers and the revenue received by shipowners) may go up or down unpredictably. Different derivatives markets specialize in different types of risk (e.g. currency, interest rates, commodities, oil prices etc). In this section we are concerned with the derivatives market for sea freight.

The freight derivative contract

The freight derivatives market is used to arrange contracts settled against an agreed future value of a freight market index. This works because cargo owners and shipowners face opposite risks – when rates go up shippers lose and owners gain, when they go down the reverse happens. By contracting to compensate each other when rates move away from an agreed settlement rate shippers and owners can remove this volatility risk.

An example illustrates the process. Suppose a European trader buys 55,000 tonnes of maize in July 2002 for shipment from the US Gulf to Japan in March the following year.

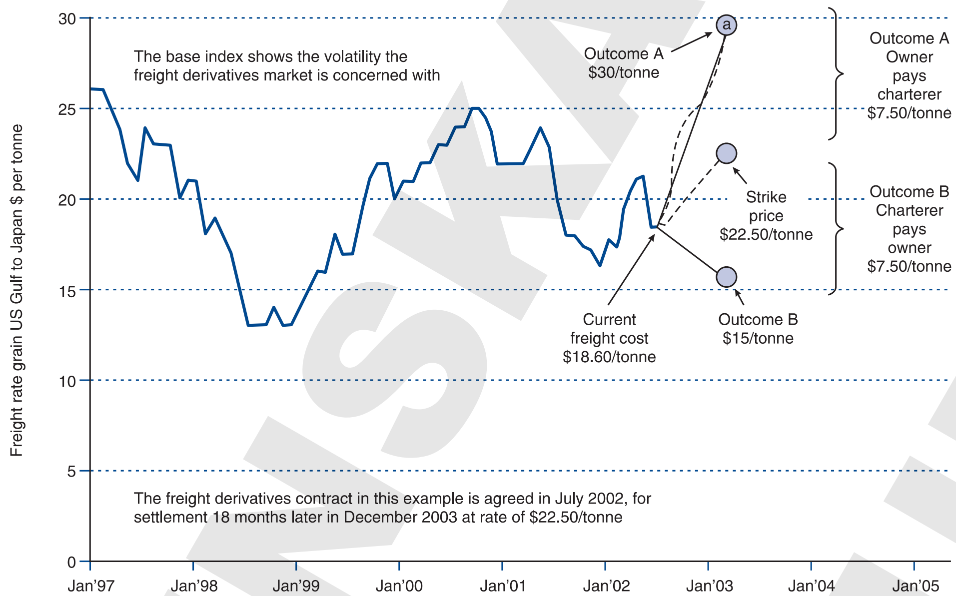


Figure 5.6
Example of freight derivative contract for charterer and shipowner
Source: Martin Stopford 2007

Although the grain price is fixed, by March the freight rate could easily double, wiping out his profit. So what are his options? One is to fix a ship for March loading, but owners may be unwilling to commit so far ahead. Anyway, if the trader sells the cargo before then he is left with a physical freight contract he does not want.

The alternative is to arrange a freight derivatives contract to hedge his spot market risk. In July 2002 the freight rate for grain from US Gulf to Japan was $18.60 per tonne, as shown in Figure 5.6. The trader calls his broker who finds a counterparty prepared to enter into a contract for settlement in March 2003 at $22.50 per tonne, with settlement against the US Gulf Japan freight index (the base index). The way the contract works is illustrated by the two possible outcomes illustrated in Figure 5.6. If on 31 March the base freight index is $30 per tonne (outcome A) the owner pays the trader $7.50 per tonne, but if the freight settlement index has fallen to only $15 per tonne (outcome B) the trader pays the owner $7.50 per tonne. This is a *freight derivative* contract because the amount of money which changes hands is 'derived' from the underlying market, as represented by the base freight index used for settlement. The idea is that both parties end up with $22.50 per tonne, since the financial payment covers the trader's extra freight if rates go up or the shipowner's loss if rates go down. In fact the actual freight rate in March 2003 was exactly $30 per tonne (you can just see it as the bendy dotted line in Figure 5.6), so the trader would have received $7.50 per tonne, which works out at $412,500 million for the 55,000 tonnes cargo. That sounds like a disaster for the owner, but provided the base index is accurate, the ship earns the extra $7.50 per tonne trading spot, so the owner still gets $22.50 per tonne, just as he planned. He may regret playing safe and missing out on the boom, but that's life.

Finally, we should note the difference between *hedging* and *speculating*. Hedging uses a derivatives contract to secure the cost of a physical position. If there is no physical position, the derivatives contract is a speculation on the shipping cycle.

Requirements for a freight derivatives market

Because of the large sums involved and the risks, making derivatives work in practice is not easy. There are three practical problems which must be overcome. *Firstly* a reliable base index is required for settling the contract – suppose the charterer's broker claims the actual rate on the settlement day was $30 per tonne, but the owner's broker says it was only $29 per tonne. Which is correct? *Secondly* the market must be liquid enough to allow contracts to be placed reasonably quickly. In the physical market this is not a problem because the ships have to be fixed, but trading freight derivatives is optional. There is no guarantee that anyone will want to trade, so lack of counterparties can be a real problem. *Thirdly* there is a credit risk, which is much greater than in the physical market where time-charter contracts can be terminated if the charterer does not pay his hire. Some system is needed to ensure that on the settlement date the contracting parties can meet their obligations.

Freight indices

Freight derivatives rely on indices which accurately reflect the risk being swapped. Any index can be used provided both parties agree, but there is a strong case for using indices developed by an independent party which are demonstrably representative of the freight being hedged and which cannot be manipulated. This service is provided by the Baltic Exchange in London. In 1985 the Baltic Exchange started to compile the Baltic Freight Index (BFI) shown in Figure 5.7. This index was designed as a settlement index based on a weighted average of 11 different trade routes (grain (four routes), coal (three routes), iron ore, and trip charter (three routes)) collected daily from a panel of brokers.

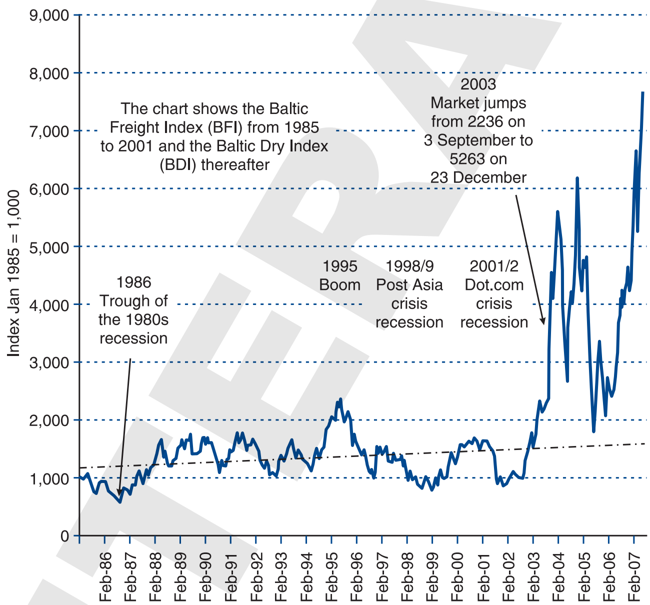


Figure 5.7
The Baltic Freight Index (BFI) and the Baltic Dry Index (BDI)
Source: Baltic Exchange

In October 2001 the single index was replaced by four dry cargo indices – the Baltic Exchange Capesize Index (BCI), the Baltic Exchange Panamax Index (BPI), the Baltic Exchange Handymax Index (BHMI) and the Baltic Exchange Dry Index (BDI) – all based on the weighted average of representative routes. For example the, BCI has ten routes which are weighted by their importance in the trade when calculating the average. The Baltic indices and the underlying route assessments from which they are compiled rely on estimated rates provided by independent competitive shipbrokers acting as panellists. They are given a standard ship specification and loading and cargo conditions are specified. The original BFI was discontinued in October 2001, but after this date the BDI can be used in its place, and this series is shown in Figure 5.7. Over the two decades 1987–2005 the average value of the index was 1787 and the standard deviation of the weekly index was 1210 points, showing a high degree of volatility. By 2007 the Baltic Exchange had expanded the range of indices published to 53 dry bulk and tanker routes with rates supplied by 47 panellists, all large companies, in 14 countries.[5]

Development of the freight derives market

The freight derivatives market started when the BFI was first published in 1985. Initially it operated as a *freight futures* market, in which standard contracts could be bought and sold, and later as a market in FFAs, a more bespoke system which started to take over in the late 1990s.

Freight futures trading

The first attempt at freight derivatives trading was through the Baltic International Freight Futures Exchange (BIFFEX) set up in 1985. In this market traders could buy and sell standard contracts for settlement against a 'base index', which in this case was the BFI. To deal with the credit risk issue, all traders were registered with a clearing house and their portfolio was 'marked to market' at the close of trading each day. If the account was in deficit, the trader had to deposit the difference in his account, reducing the credit risk to one day's trading. The BIFFEX market operated as a pool where contract units could be bought and sold, with units traded ahead for settlement at three-monthly intervals. The contract units were priced at $10 per BIFFEX index point and all trades were cleared. Shippers and owners could use contracts purchased through the exchange to hedge their freight risk. For example, an owner might sell contracts for settlement in July the following year at 1305. If by July the BIFFEX Index has fallen below 1305, he makes a profit on the transaction that compensates for the losses he will be making on chartering his ship at the lower freight rate, as described at the beginning of the section.

Forward freight agreements

In the late 1990s FFAs took over from futures contracts as the main form of freight derivative, and by 2006 FFA market volume had reached an estimated $56 billion, with 287,745 lots traded over the counter and 32,200 cleared through clearing houses.[6] The key feature of FFAs (also known as freight *swaps*) is that they are principal-to-principal contracts, usually arranged by a broker, though they can also be traded on screens provided by a number of freight derivatives brokers. The process for arranging an FFA is similar to the way shipping has traditionally arranged time charters, but no physical commitment is involved. For example, the cargo owner wishing to hedge the freight on his cargo of ore calls his broker and outlines his requirements, which will include an indication of five parameters – the route (e.g. Richards Bay to Rotterdam); the price he would be willing to trade at (e.g. $33 per tonne); the contract month; the quantity required (e.g. 150,000 tonnes) and the period; and the settlement index (e.g. BCI C4). The broker will give him an idea of the depth of the market and the likely pricing, which may be quite specific if the broker has suitable counter-parties available, or vague if there have been no trades on those particular terms recently.

If the principal decides to proceed, the broker calls around to find a counter-party at the quoted terms. Market liquidity varies and the broker may take some time to come back with an offer, or may respond immediately – short periods on common routes are generally easier to place than longer contracts. However, this is also a matter of price, since somebody will generally step in if the price is right. FFAs can be tailor-made with customized cargo size and settlement dates, but trading standard contracts is now more common and offers more liquidity. In 2006 and 2007 the practice of passing FFA trades to clearing houses gathered momentum in response to growing concern about the credit risk inherent in the pure over-the-counter market for FFAs. In these circumstances, at the time of accepting the order, or during the trade process, the broker is advised that the trade is intended for clearing. Subsequent to execution the transaction is passed to a clearing house, usually via an intermediary ‘clearing broker’ with whom the principal has an account. During the term of the contract each party’s portfolio is marked to market at the end of the day’s trading, and margin calls are made as required. Often the clearing broker handles the day-to-day administration.

As a basis for marking contracts to market and for general guidance the Baltic Exchange publishes a daily ‘forward rate assessment’ for each of the settlement indices. An example of a report of trading on 31 August 2007 is shown in Table 5.3, covering the rate for the C4 Capesize bulk carrier route from Richards Bay to Rotterdam, and the

Table 5.3 Baltic forward rate assessment examples

	Capesize		VLCC
Parcel t	150,000		250,000
Route	C4		TD3
Unit	$/ton		WS
Period/Route	CS RBAY-RDM		ME Gulf JAPAN
Spot	**35.20**		**57.94**
Oct ‘07	35.28	Oct ‘07	72.80
Nov (07)	35.02	Nov (07)	87.20
Dec (07)	34.55	Dec (07)	87.00
Jan (08)	32.83	Jan (08)	80.00
Feb (08)	31.85	Feb (08)	76.60
Mar (08)	31.09	Q1 (08)	76.80
Apr (08)	30.29	Q2 (08)	67.00
Jul (08)	28.69	Q3 (08)	70.00
Cal 08	28.79	Cal 08	74.00
Cal 09	23.87	Cal 09	69.80
Cal 10	18.66	Cal 10	

Source Baltic Exchange

This BFA mark-to-market data is published daily

TD3 VLCC route from the Arabian Gulf to Japan. This shows that on the day in question the actual rate for the Richards Bay–Rotterdam index was $32.50 per tonne, with contract units for settlement at the end of November being traded at $35.02 per tonne, and for the full year 2008 the average was $28.79 per tonne. This implies a strong market continuing, but with some weakening, in 2008. For tankers the TD3 route was trading at WS 57.94 on 31 August, but contracts for January 2008 were trading at WS 80, suggesting that the market expects a seasonal improvement. These provide price guidelines at which buyers and sellers might start negotiating a trade and they are also used by the clearing houses to mark cleared contracts to market.

5.5 THE SALE AND PURCHASE MARKET

What the sale and purchase market does

We now come to the sale and purchase market. In 2006 about 1,500 deep-sea merchant ships were sold, representing an investment of $36 billion. The remarkable feature of this market is that ships worth tens of millions of dollars are traded like sacks of potatoes at a country market. There are many bigger commodity markets, but few share the drama of ship sale and purchase.

The participants in the sale and purchase market are the same mix of shippers, shipping companies and speculators who trade in the freight market. The *shipowner* comes to the market with a ship for sale. Typically the ship will be sold with prompt delivery, for cash, free of any charters, mortgages or maritime liens. Occasionally it may be sold with the benefit (or liability) of an ongoing time charter. The shipowner's reasons for selling may vary. He may have a policy of replacing vessels at a certain age, which this ship may have reached; the ship may no longer suit his trade; or he may think prices are about to fall. Finally, there is the 'distress sale' in which the owner sells the ship to raise cash to meet his day-to-day commitments. The *purchaser* may have equally diverse objectives. He may need a ship of a specific type and capacity to meet some business commitment, for example a contract to carry coal from Australia to Japan. Or he may be an investor who feels that it is the right time to acquire a ship of a particular type. In the latter case his requirements may be more flexible, in the sense that he is more interested in the investment potential than the ship itself.

Most sale and purchase transactions are carried out through *shipbrokers*. The shipowner instructs his broker to find a buyer for the vessel. Sometimes the ship will be given exclusively to a single broker, but it is common to offer the vessel through several broking companies. On receipt of the instruction the broker will telephone or email any client he knows who is looking for a vessel of this type. If the instruction is exclusive, he will call up other brokers in order to market the ship through their client list. Full details of the ship are drawn up, including the specification of the hull, machinery, equipment, class, survey status and general equipment. Simultaneously the broking house will be receiving enquiries from potential purchasers. For example an owner may be seeking a 'modern' 76,000 dwt bulk carrier. The broker may have suitable vessels for sale on his own list, and would not pursue enquiries through other brokers. If no suitable candidates can be found, he may look for suitable candidates and approach their owners to see if there is any interest in selling.

The sales procedure

Broadly speaking the procedure for buying/selling a ship can be subdivided into the following five stages:

1. *Putting the ship on the market*. The first step is for the buyer or seller to appoint a broker – or he may decide to handle the transaction himself. Particulars of the ship for sale are circulated to interested parties in the market.
2. *Negotiation of price and conditions*. Once a prospective buyer has been found the negotiation begins. There are no hard and fast rules. In a buoyant market the buyer may have to make a quick decision on very limited information. In a weak market he can take his time, inspecting large numbers of ships and seeking detailed information from the owners. When agreement has been reached in principle, the brokers may draw up a 'recap' summarizing the key details about the ship and the transaction, before proceeding to the formal stage of preparing a sale contract.
3. *Memorandum of Agreement*. Once an offer has been accepted a Memorandum of Agreement is drawn up setting out the terms on which the sale will take place. A commonly used pro forma for the Memorandum of Agreement is the Norwegian Sales Form (1993), though the shorter 1987 version is still in use. The memorandum sets out the administrative details for the sale (i.e. where, when and on what terms) and lays down certain contractual rights, such as the right of the buyer to inspect class society records. A summary of the key points covered in sales form documents is given in Box 5.2. At this stage the memorandum is not generally legally binding, since it will include a phrase to the effect that it is 'subject to …'
4. *Inspections*. The buyer, or his surveyor, makes any inspections which are permitted in the sales contract. This will generally include a physical inspection of the ship, possibly with a dry docking or an underwater inspection by divers to ensure that when delivered it complies with the requirements of its classification society. The buyer, with the seller's permission, will also inspect the classification society records for information about the mechanical and structural history of the ship. Sales often fail at this stage if the buyer is not happy with the results of the inspections, but much depends on the market. If the buyer has other offers, there may be no time for inspections and the bidder must take a chance, but in a depressed market any defects found during the inspection may be used to renegotiate the price.

BOX 5.2 SALE AND PURCHASE MEMORANDUM OF AGREEMENT (MOA): EXAMPLE: NORWEGIAN SALES FORM 1993

This seven page pro-forma contract has 16 clauses covering the issues which can be problematic in selling a ship. The following summary refers to the Memorandum of Agreement as drafted. Individual clauses are generally modified during the negotiation, with terms added or removed.

Preamble: At the top of the form are spaces to enter the date, the seller, the buyer and details of the ship, including the name, classification society, year of build, shipyard, flag, registration number, etc.

1. Purchase Price: The price to be paid for the vessel.
2. Deposit: A 10% deposit to be paid by the purchaser; when it must be paid and where.
3. Payment: The purchase money (amount and bank details stated) must be paid on delivery of the vessel, but not later than three banking days after the buyer has received the Notice of Readiness stating that the vessel is ready for delivery.
4. Inspections: The buyer can inspect the vessel's class records and two options are provided, depending on whether this has already taken place. It also authorizes a physical inspection of the ship, stating where and when the vessel will be available for inspection and restricts the scope of the inspection (no 'opening up'). After inspection the buyer has 72 hours to accept in writing, after which, if not accepted, the contract is null and void. (*N.B.* In practice buyers generally inspect the ship before the Memorandum is drawn up, in which case this clause does not apply.)
5. Notices, place and time of delivery: States where the vessel will be delivered (usually a range of ports over a period of time); the expected delivery date; and the date of cancelling (see clause 14). The seller must keep the buyer well informed of the vessel's itinerary before delivery and its availability for drydock inspections (see clause 6). The seller must provide a written Notice of Readiness confirming that the vessel is ready for delivery. If the ship is not delivered by the cancellation date, the buyer can cancel the purchase or agree a new cancelling date.
6. Drydocking/Divers Inspection: This is a complex area and two alternative clauses are provided. Under clause a) the seller drydocks the vessel at the port of delivery, a bottom inspection is carried out by the Classification Society and the seller rectifies any defects which affect its Class. Clause b) applies if the ship is delivered without drydocking and permits the buyer to arrange an inspection by divers approved by the Classification Society. The buyer pays for the divers but any defects affecting Class must be put right by

BOX 5.2—cont'd

the seller. A lengthy clause c) sets out the rules if the ship is drydocked. The buyer can ask for tailshaft inspection, even if the Classification does not require it, and has the right to observe the drydocking and to carry out hull cleaning and painting work as long as it does not interfere with the survey. Costs for the drydocking and any tailshaft inspection are distributed between the buyer and seller depending on whether defects which affect Class are discovered.

7. Spares/Bunkers etc: Names moveable items included in the sale and those which the seller can take ashore. Bunkers and lubricating oils are handed over at the market price in the delivery port.
8. Documentation: The seller must provide a bill of sale which is legal in the (named) country where the ship is to be registered. Other documents include a certificate of ownership; confirmation of Class within 72 hours of delivery; a certificate stating that the vessel is free from registered encumbrances; a certificate demonstrating that the vessel has been deleted from its current registry; and any other documents the new owners require to register the vessel.
9. Encumbrances: The seller warrants that the vessel is free from any third party claims which could damage its commercial value.
10. Taxes: Buyers and sellers are responsible for their own costs of registration etc.
11. Condition on delivery: The ship must be delivered in the condition in which it was inspected; it must be in class, and the Class Society must have been notified of anything which could affect its Class status.
12. Name/Markings: On delivery the buyer must change the name of the vessel and all funnel markings (i.e. so that it is clear that it is not still trading under the previous owner).
13. Buyer's default: If the buyer defaults and the deposit has not been paid, the seller can claim his costs from the buyer. If the deposit has been paid, but the purchase money is not paid, the seller can retain the deposit and claim compensation for losses, with interest, if the sum exceeds the deposit.
14. Seller's default: If the seller fails to provide a Notice of Readiness for Delivery for the vessel, or if the ship is not physically ready on the cancellation date stated in clause 5, the buyer has the option to cancel the contract and receive interest and compensation for expenses.
15. Representatives: Once the agreement has been signed the buyer can, at his expense, put two representatives on the vessel as observers. The place of boarding is stated.
16. Arbitration: Sets out the legal jurisdiction and the terms under which arbitration will be carried out.

5. *Closing*. Finally, the ship is delivered to its new owners who simultaneously transfer the balance of funds to the seller's bank. At the closing meeting representatives of the buyer and seller on board ship are in telephone contact with a meeting ashore of representatives of sellers, buyers, current and prospective mortgagees and the ship's existing registry.

How ship prices are determined

The sale and purchase market thrives on price volatility. 'Asset play' profits earned from well-timed buying and selling activity are an important source of income for shipping investors. Bankers are just as interested in ship values because a mortgage on the hull is the primary collateral for their loans.

There has always been plenty of volatility to attract investors and worry bankers. Early in the twentieth century Fairplay monitored the price of a 'new, ready 7,500 ton cargo steamer'. The price of this vessel increased from £48,000 in 1898 to £60,750 in December 1900, and then fell by one-third to £39,250 in December 1903.[7] The same vessel was worth £232,000 in 1919, £52,000 in 1925 and £48,750 in 1930. Over the last thirty years we find much the same sort of pattern. For example the price of a Panamax bulk carrier, shown in Figure 5.8, fell to $6 million in December 1977. Three years later in December 1980 the price had increased by 60% to $22 million, but by 1982 it was back down to $7 million, and did not reach $22 million again until late 1989, after which it was steady until the end of the 1990s, when it fell to $13.9 million in February 1999. From there prices surged, reaching $28 million at the end of 2003; $34.5 million in October 2004 and $92 million in December 2007. Interestingly the price of the cargo steamer at the 1919 peak was 5.9 times its 1903 trough price of £39,250, but the 2007 peak of $92 million for the bulk carrier was 15 times the 1977 trough. So these extreme fluctuations are very large.

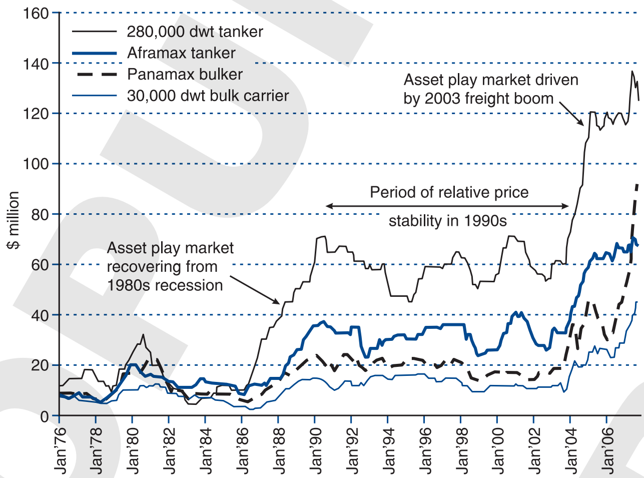


Figure 5.8
Price cycles for tankers and bulk carriers (five-year-old ships)
Source: Clarkson Research Services Ltd

If we express the price of a Panamax bulk carrier as a percentage deviation from a linear regression trend fitted over the period 1976–2007, the volatility becomes even clearer. In 1980 the price peaked at 90% above the trend, then in 1986 it fell to 60% below trend, eventually rising to 125% above trend in 2007 (Figure 5.9). There are no rules about how low or how high prices can go during these cycles. Like any commodity, the price is determined by a negotiation between a buyer and a seller. Where prices settle depends on who wants to sell and who is willing to buy. Obviously selling a ship at the bottom of a market cycle is disastrous for its owner and a great bargain for the buyer. No shipping company follows this suicidal course of action by choice. 'Distress' sales during market troughs are generally forced on companies by cashflow pressures such as bunker bills or a banker who has foreclosed and taken possession of the fleet. For example, when the price fell 32% below trend in February 1999, only one ship was sold. Very high prices generally occur when there are plenty of buyers and firm market sentiment, so nobody wants to sell. It follows that the extreme price fluctuations shown in Figure 5.9 are very much a characteristic of the extreme cashflow fluctuations in the shipping industry. However the intervals between the more extreme fluctuations are sometimes long when measured in terms of the working life of managers and investors working in these markets, making it difficult for them to keep a balanced perspective.

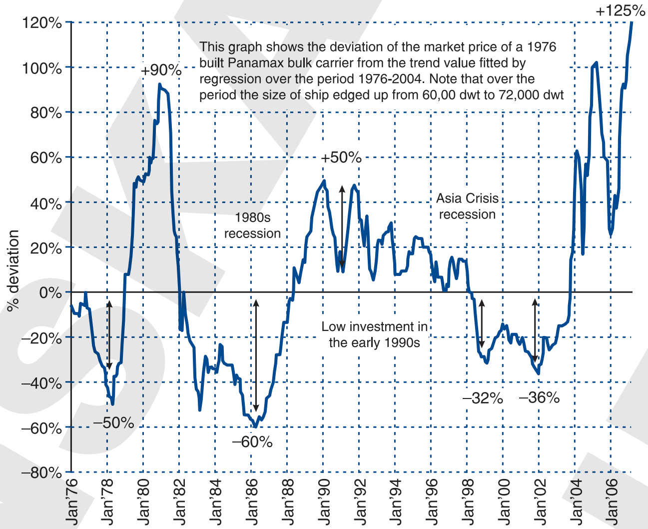


Figure 5.9
Bulk carrier price volatility, 1976–2007 (65,000 dwt bulk carrier)
Source: Clarkson Research Services Ltd

Not surprisingly, movements in the price of different ship types tend to be closely synchronized. For example, the analysis in Box 5.3 shows that between 1976 and 2003, 79% of the price movements of a 65,000 dwt bulker and a 30,000 dwt bulker were correlated. In other words, the movement in the price of the 30,000 dwt ship explains 79% of the price movement of the Panamax bulk carrier. That is reasonable, since the two vessel types are close substitutes. The relationship is slightly weaker for the

BOX 5.3 SECOND-HAND PRICE CORRELATION IN TANKERS AND BULK CARRIERS

Correlation of price movements 1976–2004	*Coefficient (R2)*
65,000 dwt and 30,000 dwt Bulk Carriers	0.79
30,000 dwt and 280,000 dwt Tanker	0.58
65,000 dwt Bulk Carrier and 280,000 dwt Tanker	0.62
30,000 dwt Bulk Carrier and 30,000 dwt Products Tanker	0.63

30,000 dwt and 280,000 dwt tankers, with 58% of the price movements correlated. Even tanker and bulk carrier prices show a correlation coefficient of 62% for the small vessels and 63% for large vessels[8]. Considering the long time period covered and the different character of the markets, the relationship is remarkably close. It raises an interesting question. If the prices of different types of ships are so highly correlated, does it really matter what ship type asset players buy? For really major swings in prices it probably does not matter because cashflow pressures work their way from one sector to another. However, there is plenty of room for independent price movement during the more moderate cycles. For example, between 1991 and 1995 bulk carrier prices held steady, while the price of large tankers fell. This is where the choice of market really does make a difference.

Price dynamics of merchant ships

In the circumstances outlined above it is natural that second-hand prices play a major part in the commercial decisions of shipowners – very large sums of money are involved. What determines the value of a ship at a particular point in time? There are four factors which are influential: freight rates, age, inflation and shipowners' expectations for the future.

Freight rates are the primary influence on ship prices. Peaks and troughs in the freight market are transmitted through into the sale and purchase market, as can be seen in Figure 5.10 which traces price movements from 1976 to 2006 for a five-year-old bulk carrier, comparing the market price with the one-year time charter rate. The relationship is very close, especially as the market moves from trough to peak. When the freight rate fell from $8,500 per day in 1981 to $3600 per day in 1985 the price fell from $12 million to $3 million. Conversely, when the freight recovered to $8,500 per day the price increased to $15 million and when it went to $41,000 per day in 2007 the price jumped to $57 million. This correlation provides some guidance on valuing ships using the gross earnings method. Analysis of the past relationship between price and freight rates suggests that when freight rates are high the Sale and Purchase market values a five-year-old ship at about four to six times its current annual earnings, based on the one-year time-charter rate.

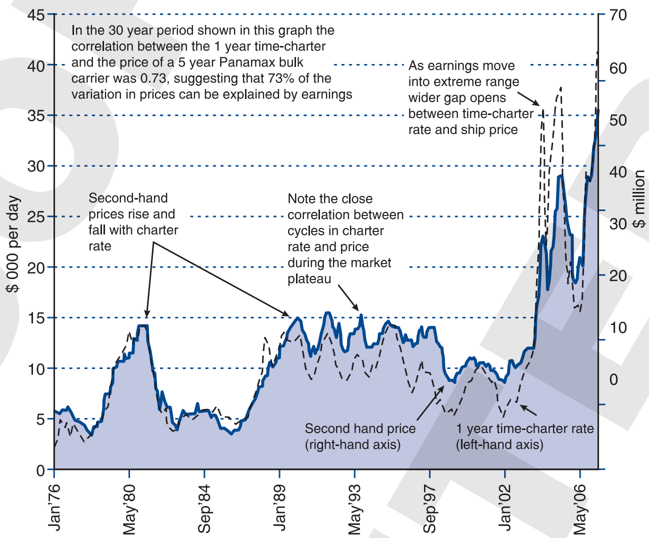


Figure 5.10
Correlation of second-hand price and freight rate (five-year-old 65,000 dwt bulk carrier)
Source: Clarkson Research Services Ltd

For example, if it is earning $4 million per annum it will value the ship at $24 million. But this depends on the stage in the cycle. Broadly speaking, when the market falls the earnings multiple tends to increase, and when it rises the multiple falls, but there can be no firm rules because it all depends on sentiment and liquidity.

The second influence on a ship's value is *age*. A ten-year-old ship is worth less than a five-year-old ship. The normal accountancy practice is to depreciate merchant ships down to scrap over 15 or 20 years. Brokers who value ships take much the same view, generally using the 'rule of thumb' that a ship loses 5–6% of its value each year. As an example of how this works in practice, Figure 5.11 shows the price of a 1974 built products tanker over the 20 years to 1994. The slope of the depreciation curve reflects the loss of performance due to age, higher maintenance costs, a degree of technical obsolescence and expectations about the economic life of the vessel. For a specific ship the economic life may be reduced by the carriage of corrosive cargoes, poor design, or inadequate maintenance. When the market value eventually falls below the scrap value the ship is likely to be sold for scrapping. The average age of tankers and bulk carriers scrapped in 2006 was 26 years, but in protected trades, such as the US domestic trades, the average scrapping age is up to 35 years. Ships operating in fresh water environments such as the Great Lakes last much longer.

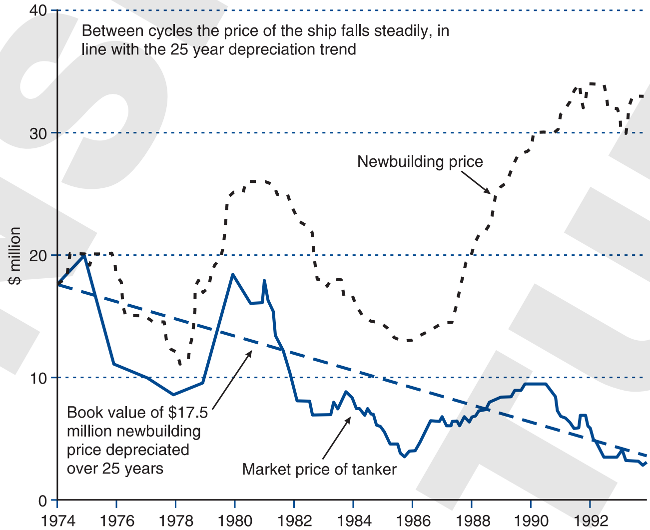


Figure 5.11
Price lifecycle and depreciated trend (30,000 dwt products tanker built 1974)

In the longer term, *inflation* affects ship prices. To illustrate the point we can look at its effect on the market price of the second-hand Aframax tanker shown by the thick line in Figure 5.12. The price fluctuates wildly, starting at $20 million in 1979, falling to $8 million in 1985, shooting up to $34 million in 1990, wandering around $30–35 million until 2003, then suddenly doubling to $78 million in 2007. To identify the part inflation played in this volatility we first must decide what inflation index to use. One possibility is the US consumer price index, since the ship price is in dollars, but a more appropriate measure would be the shipbuilding price, since this determines the replacement cost of the ship. For example, if an investor sells a ship for twice what it cost, but has to pay twice as much for a new replacement, he has not really made a profit so by deflating the asset price by the newbuilding cost we get a clearer idea of whether the ship's economic value is going up or down. The deflated price of the five-year-old Aframax, using a newbuilding price index, is shown by the fine line in Figure 5.12. This inflation adjusted price has a much clearer trend,

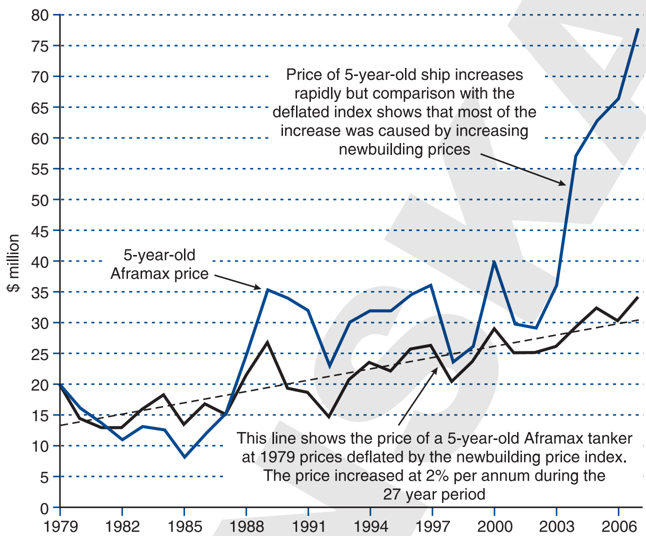


Figure 5.12
Price of five-year-old Aframax tanker adjusted for newbuilding price inflation
Source: Clarkson Research Services Ltd

increasing by 2% per annum over the 27-year period, which suggests for example that most of the big price movements such as those in 2003 and 2006 were driven by newbuilding price changes. In conclusion, although second–hand price statistics may suggest that asset values are increasing, when the effects of replacement cost inflation are taken into account that may not be the case. Inflation and freight cycles both have an effect which can, and should, be considered separately.

The fourth and in some ways most important influence on second-hand prices is *expectations*. This accelerates the speed of change at market turning points. For example, buyers or sellers may first hold back to see what will happen, then suddenly rush to trade once they believe the market is 'on the move'. The market can swing from deep depression to intensive activity in the space of only a few weeks, as the following newspaper report demonstrates:

> A very large crude carrier damaged in a Persian Gulf missile attack and destined to be broken up has become the subject of one of the year's most remarkable sales deals. Market sources believe that the buyer has paid $7 million for the tanker which, until the recent surge in demand for large tonnage, appeared to have no future. The rescue of the *Volere* is indicative of the continuing shortage of large tankers which has prompted many vessels to break lay-up. A month ago the 423,700 dwt *Empress* was brought from Taiwanese interests after being towed half around the world for intended demolition.[9]

The *Volere* was resold two months later for $9.5 million and second-hand tonnage was in very short supply as owners held back on sales to see how prices would develop. In short, although there is a clear correlation between second-hand prices and freight rates, the movement of prices is often not a leisurely process. Peaks and troughs tend to be emphasized by the behaviour of buyers and sellers.

Valuing merchant ships

Valuing ships is one of the routine tasks undertaken by sale and purchase brokers. There are several reasons why valuations are required. Banks lending against a mortgage need to value the collateral and will probably continue to monitor the ship's value over the term of the loan. Prospectuses for public offerings of equity generally include a valuation of the company's fleet, as do the annual accounts of public companies. Finally, leases often require a view on the residual value of the ship at the end of the loan period, a much more complex and difficult task than simply appraising the current value. This is covered in Section 6.8 which deals with valuing ships and shipping companies, including the calculation of residual values and scrap values.

5.6 THE NEWBUILDING MARKET

How the newbuilding market differs from sale and purchase

Although the shipbuilding market is closely related to the sale and purchase market, its character is quite different. Both markets deal in ships, but the newbuilding market trades in ships which do not exist. They must be built. This has several consequences. First, the specification of the ship must be determined. Whenever possible, the shipyards will press the buyer to take a yard standard design. This speeds up the negotiation, reduces the pressure on their design and estimating resources and is generally cheaper to build than a bespoke design. Totally new designs are tricky because the costs have to be estimated early in the negotiation and that involves a significant risk. Buyers can make modifications to the yard design, but will generally be charged extra for these. For the same reason, the shipyards prefer series orders. Second, the contractual process for such a major undertaking is more complex. Third, the ship will not be available for 2–3 years from the contract date, by which time conditions may have changed, so expectations are important.

Buyers and sellers in the newbuilding market

The *purchaser* entering the newbuilding market may have several different motives. He may need a vessel of a certain size and specification, and nothing suitable is available on the second-hand market. This often happens when market conditions are firm and the supply of good-quality ships is restricted. Second-hand prices may even be higher than new prices, as discussed in the previous section. Another possibility is that the ships are needed for an industrial project. Steel mills, power stations, LNG schemes and other major industrial projects are generally developed with specific transportation requirements met by newbuildings. Some large shipping companies have a policy of regular replacement of vessels, but this is less common than it was when British shipping companies would replace their fleets at 10 or 15 years of age. Finally, speculators may be attracted by incentives offered by shipbuilders short of work – low prices and favourable credit are examples – or by the availability of profitable time charters, if they can only find a ship.

The shipyards form a large and diverse group. There are about 300 major shipyards and many smaller ones.[10] Their size and technical capability ranges from the small yards with a workforce of less than 200 employees building tugs and fishing boats, to major South Korean yards employing over 10,000 workers building container ships and gas tankers. Although some shipyards specialize in one particular type of ship, most are extremely flexible and will bid for a wide range of business. In adverse markets major shipyards have been known to bid for anything from floating production platforms to research vessels.

The newbuilding negotiation

The negotiation is complex. Often owners appoint a broker to handle the newbuilding, but may deal direct, especially if they have an existing relationship with the shipyard and the expert resources to handle the negotiation, which can be time-consuming. The buyer may approach the shipbuilding market from several different directions depending on their circumstances and the state of the market. One common procedure is to invite tenders from a selection of suitable yards. The tender documentation is often very extensive, setting out a precise specification for the ship. Once tenders have been received the most competitive yards are selected and, following a detailed discussion of the design, specification and terms, a final selection is made. This whole process may take anything from six months to a year. In a sellers' market the tender procedure may not be possible. Buyers compete fiercely for the few available berths and shipyards set their own terms and conditions. Often shipyards take advantage of a firm market to insist upon the sale of a standard design.

The contract negotiation can be divided into four areas on which negotiations focus, the price, the specification of the vessel, the terms and conditions of the contract, and the newbuilding finance offered by the shipbuilder. In a weak market buyers will seek to extract the maximum benefit from their negotiating position in each area. Conversely in a strong market the shipbuilder will negotiate for the maximum price possible on a standard vessel, with favourable stage payments.

Price is the most important. Usually ships are contracted for a fixed price, payable in a series of 'stage payments' which spread payment over the construction of the vessel. The shipbuilder's aim is to be paid as he builds the ship, so that he does not need working capital, and will generally aim for stage payments along the lines shown in Box 5.4.

The pattern varies enormously with the market, but nowadays there are seldom more than five or six payments. In a seller's market the builder may demand 50% on contract signing, whilst low interest rates and a weak market in 2002 resulted in contracts with 10% payable at contract, keel lay and launch and the remaining 70 percent on delivery. The specification of the vessel is also important, because modifications to the design may add 10–15% to the

BOX 5.4 TYPICAL PATTERN OF SHIPYARD STAGE PAYMENTS

Stage in production	*Payment due*
Signing of contract	10 per cent
Steel cutting	22.5 per cent
Keel laying	22.5 per cent
Launching	22.5 per cent
Delivery	22.5 per cent

Source: H. Clarkson newbuilding department cost. There are many negotiable elements in the contract, as discussed below. Finally, the provision of finance by the shipbuilders is a long-established way of securing business, especially by shipyards who are uncompetitive on price, or during recessions when customers find it difficult to raise finance. The financing of new ships is discussed in Section 8.4.

The shipbuilding contract

Once the preliminary negotiations are complete, a 'letter of intent' is often drawn up as a basis for developing the details of the design and the construction contract. At this stage the letter of intent is not generally legally binding, though this can become a delicate issue, especially if the builder is devoting significant resources to working up a design to the buyer's specification. For example the cost of developing a detailed design for a ferry or a large containership can exceed $1 million.

Because the construction of a merchant ship can stretch over several years, things may not develop as expected, leading to design changes or disputes between the buyer and the builder. The shipbuilding contract must ensure that each of these disputes can be dealt with in a fair and orderly way which does not disrupt production or commercial relations. Inevitably the contract is more detailed than the brief sales form used for second-hand transactions, typically running to 70–80 pages, containing a preamble and various articles, each of which deals with a specific area where disputes have been found to arise. The general form of shipbuilding contracts is now well established, and Box 5.5 provides a broad summary of the issues dealt with, including procedures for resolving anticipated problems, whilst minimizing expensive legal disputes.

Shipbuilding prices

Shipbuilding prices, like second-hand prices, are determined by supply and demand. However, in this case the sellers are not other shipowners, but shipyards. On the demand side, the key factors are freight rates, the price of modern second-hand ships, financial liquidity of buyers, the availability of credit and, most importantly, expectations. From the shipyard supply viewpoint the key issues are production costs, the number of berths available and the size of the orderbook. A yard with three years' work may be reluctant to offer a longer delivery because of the inflation risks, while another yard with only the ships under construction on order will be desperately keen to find new business. This balance is what drives shipyard prices. During booms when the yards have built up long orderbooks and many owners are competing for the few berths available, prices rise sharply. In a recession the opposite happens. Shipyards are short of work and there are fewer buyers, so the yards have to drop their prices to tempt in buyers.

As a result shipbuilding prices are just as volatile as second-hand prices and with good reason are closely correlated with them, as can be seen in Figure 5.13. This graph compares the new and secondhand price of an Aframax tanker over 18 years. This chart

BOX 5.5 EXAMPLE OF A TYPICAL SHIPBUILDING CONTRACT. SEVERAL DIFFERENT STANDARD CONTRACTS ARE AVAILABLE, BUT MOST HAVE 'ARTICLES' DEALING WITH THE ISSUES LISTED BELOW

Article 1: Description and Class. A detailed description of the ship, its yard number, registration and classification and the use of subcontractors (e.g. if part of the vessel is subcontracted).

Article 2: Contract price and terms of payment. Specifies the contract price, currency, the instalments and the method of payment for modifications, and premiums.

Article 3: Adjustment of the contract price. Sets out the liquidated damages and compensation which will be paid if the speed, deadweight, cargo capacity and fuel consumption measured on the sea trials do not exactly comply with the terms of the contract.

Article 4: Approval of plans, drawings and inspection during construction. This important section covers the procedures for approving plans and the rights of the buyer's supervisor to inspect the vessel during construction and attend tests and trials. The builder must send the buyer three copies of the plans and technical information for approval. One annotated copy must be returned to the builder within 21 days. During construction, defects noted by the supervisor must be notified in writing and a procedure is laid down for resolving disputes.

Article 5: Modifications. Lays down the rules for any modifications to the design requested by the buyer after the contract date, or to meet changing regulatory requirements. It gives the builder the right to charge for any changes and modify the building programme if necessary. The builder is also permitted to make minor specification and material changes if they do not affect performance.

Article 6: Trials and acceptance. Deals with sea trials, including the weather, the conditions under which tests will be carried out and the right of the builder to repeat trials or postpone them if necessary. The builder must notify the buyer that trials are complete within 5 days, following which the buyer must accept or reject the vessel, giving specific reasons. Dispute procedures are set out in Article 12.

Article 7: Delivery of the vessel. States where and when the vessel will be delivered and lists the documents to be given by the builder to the buyer.

Article 8: Delays and extension of time for late delivery. Defines *force majeure* (causes of delay) which may be acceptable reasons for late delivery and lays down procedures for notifying the buyer if the delivery date is postponed. The buyer has right to cancel if delivery, excluding permissible delays, slips by more than 210 days. Sets out the liquidated damages and premiums for late/early delivery. Permissible delays include strikes, extreme weather conditions and shortage of materials.

BOX 5.5—cont'd

Article 9: Guarantee. Sets out the terms and period over which the vessel is guaranteed against defects due to bad workmanship or defective materials.

Article 10: Cancellation by the buyer. Within 3–4 months of signing the contract the builder must provide the buyer with a Letter of Refundment Guarantee from an acceptable bank. If the buyer cancels in writing for reasons acceptable under the contract and the builder accepts, all stage payments must be returned with 8% interest. Otherwise arbitration procedures are followed (Article 12).

Article 11: Buyer's default and builder's default. Defines the conditions under which the buyer or builder are deemed to be in default. Stipulates the interest rate at which late payments by the buyer will be charged and the terms under which the builder can rescind the contract and sell the vessel. Defines the rights of the buyer to be repaid with interest if the builder goes into liquidation or stops work on the vessel.

Article 12: Arbitration. Nominates the legal regime, and sets the conditions for appointing a classification society or technical expert to resolve any disputes over the construction of the vessel and the arbitration regime for any contract disputes.

Article 13: Successor and Assignees. Sets out the terms under which the buyer can sell the ship to a third party or assign the contract for financing purposes.

Article 14: Property. Defines who owns the plans, the working drawings and the vessel itself during construction. Alternative formats may be offered. The first specifies that the vessel belongs to the contractor until delivery; the second makes it the property of the purchaser, but gives the contractor a lien for any unpaid portion of the price; the third lays out a procedure for marking parts which become the purchaser's property held as security against instalments paid.

Article 15: Insurance. The builder is responsible for insuring the vessel and all associated components.

Article 16: Contract expenses. Allocates payment of taxes, duties, stamps and fees between the contractor and the purchaser.

Article 17: Patents. Makes the shipbuilder liable for any infringements of patent on his own work, but not on the work of suppliers.

Articles 18–20. Deal with various technicalities, including the terms on which the contract becomes binding, legal domicile of the purchaser and contractor, the purchaser's right to assign the contract to a third party, and addresses for correspondence.

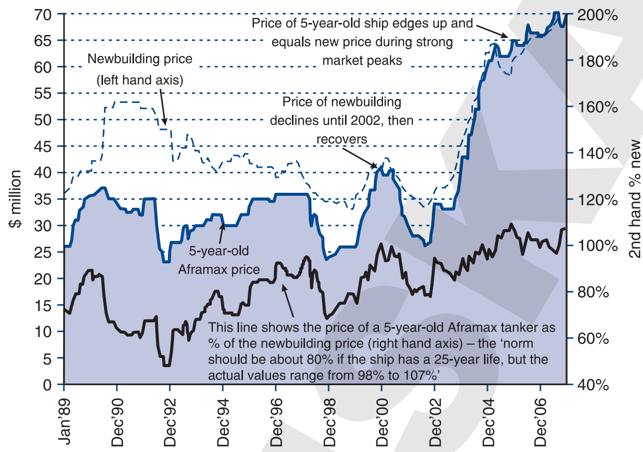


Figure 5.13
Correlation of new and five-year-old Aframax tanker prices
Source: Clarkson Research

illustrates the distinction between the way the market treats the second-hand ship which is available immediately and the new ship which will not be available for 2–3 years, depending on the orderbook. Assuming a 25-year life, on average a five-year old ship should cost about 80% of the price of a new ship. But Figure 5.13 shows that in the early 1990s the price ratio fell to 60% because the market was depressed and investors did not want a prompt ship. They preferred a newbuilding that would not be delivered for a couple of years, by which time the market should have improved. However, by 2006 the second-hand price was higher than the newbuilding price because freight rates were very high and there was intense competition for prompt ships that could be chartered at a high rate.

5.7 THE DEMOLITION (RECYCLING) MARKET

The fourth market is demolition. This is a less glamorous but essential part of the business, now often referred to as the recycling industry. The mechanics are simple enough. The procedure is broadly similar to the second-hand market, but the customers are the scrap yards which dismantle ships (see Chapter 13) rather than shipowners. An owner has a ship which he cannot sell for continued trading, so he offers it on the demolition market. Usually the sale is handled by a broker, and large broking companies have a 'demolition desk' specializing in this market. These brokers keep records of recent sales and, because they are 'in the market', they know who is buying at any point in time. When he receives instructions from the owner the broker circulates details of the ship, including its lightweight, location and availability to interested parties.

The ultimate buyers are the demolition yards, most of which are located in the Far East (e.g. India, Pakistan, Bangladesh and China). However the buying is usually done by intermediaries, buying the ships for cash and selling them on to the demolition yards. Prices are determined by negotiation and depend on the availability of ships for scrap and the demand for scrap metal. In Asia much of the scrap is used in local markets where it provides a convenient supply of raw materials for mini-mills, or cold rolled for use in construction. Thus, demand depends on the state of the local steel market, though availability of scrapping facilities is sometimes a consideration.

Thus prices can be very volatile, fluctuating from a trough of $100/lwt in the 1980s to more than $400/lwt in 2007. The price also varies from ship to ship, depending on its suitability for scrapping.

As offers are received, the price firms up and eventually a deal is made. Although a standard contract such as the Norwegian Sales Form is sometimes used, so few of the clauses are relevant to a demolition sale that brokers tend to use their own simplified contract. On completion the purchaser takes delivery of the ship and, if he is an intermediary, makes the arrangements for delivering the ship to the demolition yard.

5.8 SUMMARY

In this chapter we have looked at the four shipping markets, the freight market (including the freight derivatives market), the sale and purchase market, the newbuilding market and the demolition market. Since markets are practical places, economists who want to understand how they work must study what actually happens. Starting from the definition of a market place, we examined how the four shipping markets go about the business of managing the supply of ships.

The *freight market* consists of shipowners, charterers and brokers. There are four types of contractual arrangement: the voyage charter, the contract of affreightment, the time charter, and the bare boat charter. The owners trading in the voyage market contract to carry cargo for an agreed price per tonne while the charter market involves hiring out the ships on a daily basis (time charter). The charter is legally agreed in a charter-party which sets out the terms of the deal. Freight rate statistics show the movement of prices over time, recorded in dollars per tonne, Worldscale, or time-charter earnings. Finally the freight derivatives market allows charterers and shipowners to hedge their freight risk or speculate by making forward freight agreements (FFAs) which are financial contracts settled against the value of a base index on the date specified in the agreement.

Second-hand ships are traded in the *sale and purchase market*. The buyers and sellers are shipowners. Broadly speaking the administrative procedures are similar to real estate, using a standard contract such as the Norwegian Sales Form. Ship prices are very volatile, and this makes trading ships an important source of revenue for shipowners, though these transactions do not affect the cashflow of the industry as a whole. The second-hand value of merchant ships depends on the freight rates, age, inflation and expectations.

The *newbuilding market* is quite different. The participants are shipowners and shipbuilders. Because the ship has to be built the contract negotiations are more complex than the sale and purchase market, extending beyond price to such factors as specification, delivery date, stage payments and finance. Prices are just as volatile as second-hand prices and sometimes follow the same pattern.

Finally we looked at the *demolition market*. Old or obsolete ships are sold for scrap, often with speculators acting as intermediaries between the shipowners and the demolition merchants.

These four markets work together, linked by cashflow. The players are jostled in the direction the market wants them to go by a combination of cashflow and market sentiment, but the market does not have complete control. Ultimately what happens tomorrow depends on what people do today. In this respect shipping is just like the country market. By the time the farmer arrives at market with his pig and finds that all the other farmers have bred pigs, it is too late. Prices will fall, and the farmer, who has feed bills to pay, must accept the price on offer. But this situation was created a year earlier when prices were high and everyone started breeding pigs. The smart farmers saw what other farmers were doing and switched to chickens. This has nothing to do with the demand for pigs or chickens. It is a supply-side management and we will discuss how individual firms deal with it in Chapter 8. But for now we conclude that, like the farmer, the successful shipping company must know when to steer clear of pigs!