Chapter 1
Demand and Supply of Maritime Transport Services: Analysis of Market Cycles

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Abstract In their contribution, authors Lemper and Tasto review the evolution of the supply and demand side of the major shipping markets since the beginning of the new millennium. The dry bulk, liquid bulk, and container shipping markets are reviewed in detail and special regard is paid to interesting market developments and limitations of forecasts during the year of the global recession 2009. For this year, the industry forecasts are matched against the effective outcome. Based on the experience of the authors, selected tips are presented on how to analyze shipping markets with the help of statistics and the concepts of inter- and intracompetition of analyzing shipping markets are touched briefly. The contribution ends with a review of the different types of shipping cycles and the lessons learned from the last boom period (2002–2008).

1.1 The Demand and Supply Side of Shipping Markets

Among economists, it is considered a common wisdom that shipping markets are the markets where the classic "pig-cycles" can be observed and analyzed par excellence since not only the supply side and the demand side are relatively well-documented, but also the market results (the freight rates or time charter rates). It is common understanding that the demand side of the markets is represented by the need for freight transport, whereas the supply side consists of the ships that deliver the commodities.

Both sides meet on the freight market, where the service "transport" is exchanged most commonly against US$. Stopford (2009) lists five elements influencing the development of either one of the sides of this market (see Fig. 1.1).

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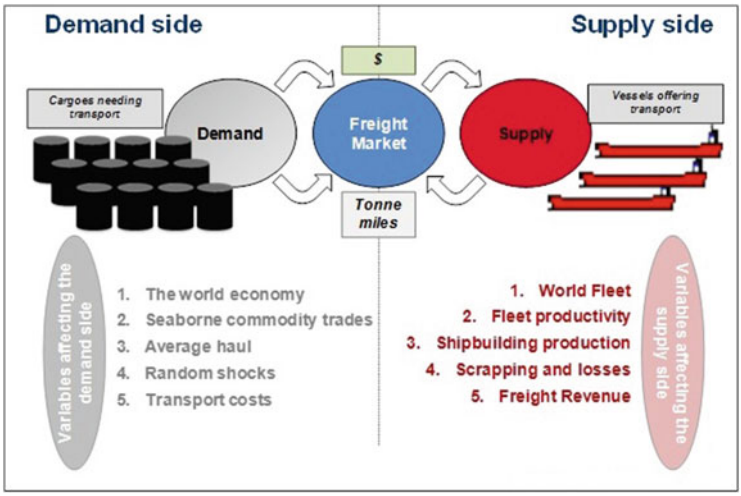

Fig. 1.1 Supply and demand side of a shipping market. *Source*: Lemper/Tasto based on Stopford (2009)

1.1.1 The Demand Side

The seaborne transport of commodities is regularly documented in statistical publications of leading brokers, NGOs or research institutes. Quite often though, these statistics are based on estimates as most publications reporting on international trade flows do not worry about the volume of goods transported as much as about their value. Therefore, the figures published on global seaborne transport volumes sometimes differ significantly from source to source and are adjusted several times. According to Stopford (2009), the development of the demand side is affected by:

(a) **The world economy**, as a higher (or lower) economic output regularly requires a higher (or lower) input of resources and also generates more (or less) merchandise available for foreign trade. Hence, both the business cycle as well as the trade development cycle (nations going through a period of transition from a traditional society to a society of mass consumption and, hence, develop different consumption/production patterns of raw materials or merchandise) have a major impact on the demand for seaborne commodity transport.

(b) **Seaborne commodity trades**, which may be subject to seasonal cycles in the short run (examples can be found in the crude oil, grain, or container trade) and which on may evolve in the long run, resulting from:

- changing industrial demands
- changing transport policies
- depletion or discovery of resources
- relocation of processing plants.

(c) **Average haul and ton miles**, being the more precise measurement of the demand side than the pure information about the volume of shipped goods as the distance over which the commodities are transported can vary widely and often demand peaks (resulting in a higher volume) have to be satisfied using more distant suppliers (generating an even larger impact on the ton miles).
(d) **Random shocks like**, wars, economic downturns, natural disasters, which can intensify the impact of seasonal or economic cycles or mess with the average haul...
(e) **Transport costs**, as the general theory of maritime trade suggests that trade takes place if a commodity can be bought more cheaply in a different country, the ever declining cost of transport (resulting from the economies of scale) in itself has helped to boost maritime trade (Stopford 2009, pp. 140–149).

1.1.2 The Supply Side

The supply side of the markets is represented by the ships that carry the cargoes. The information about the historical development of the fleet is quite accurately documented in the leading fleet registers, for example, the Clarksons Register or the databases of IHS Fairplay. The future development of the fleet can in the short term be deviated from the orderbook of the yards and assumptions on likely scrapping activity although the financial crisis of 2008/2009 has shown that cancellation, slippage, or conversion of orders can play a major role in the short run. According to Stopford (2009), the supply side is affected by:

(a) **The world merchant fleet**, contracting and expanding in cyclical movements of up to 20 years, and bringing about new ship types and designs eventually while phasing out older designs or vessel types.
(b) **The fleet productivity**, which may vary depending on the use of the vessel. The effective transport capacity each vessel can provide during a given period of time is a function of the speed of the vessel, the time the vessel is caught up in the cargo handling procedures as well as the regular or non-regular maintenance. All these elements can change over time with investment in handling technology or changing demand patterns of the ship buyers. Additionally, the time spent ballasting or pursuing cargo contracts also limits the trading capacity of the vessel. A Clarkson study of the time use of VLCCs, for example, suggests that on average, VLCCs spend no more than 135 days per year on sea voyages with a cargo in the tanks. Lastly, the utilization of the vessels in terms of physical tonnage capacity used may also vary.
(c) **The shipbuilding production**, being a cyclical industry, where a time span between the placement of the order and the actual delivery of the vessel can range up to 4 years.
(d) **Scrapping and losses**, which are the counterpart to the shipbuilding production by reducing the fleet capacity. While age is the primary factor driving the

demolition of the vessels, there are other factors like the market prospects, scrap prices, financial situation of the owners, etc. which play a role in the decision whether to scrap a vessel or not.

(e) **The freight revenue**, being probably the most important element driving the supply side. In the long run, there seems to be an evident correlation between the earnings of a fleet segment and the amount of investment that is taking place in this particular market. In the short run, the supply-side reacts to higher freight revenues by speeding up the operation and thus delivering more trading capacity (Stopford 2009, pp. 151–160).

There are quite a few approaches to categorize shipping markets and it can be done by both loading categories, ship type designs, commodities, or even the way, the markets are organized (Biebig et al. 2008, p. 138).

From the viewpoint of a maritime economist aiming to analyze a shipping market, the most interesting perspective though would be to look at the competitive environment of a certain type of vessel. This analysis has become more complicated or easier in the second half of the past century – depending on one's perspective.

Before the 1950s, the majority of seaborne trade would be transported on liner or tramp vessels of often equivalent sizes and designs and, hence, the tonnage could generally be switched between trades. The system worked well but was labor-intensive and because of the increasing labor costs, the shippers of industry raw materials sought to benefit more strongly from the economies of scale that the larger, more specialized vessels had to offer. Resulting from this as well as from the introduction of the container, the highly specialized shipping markets we are facing today have evolved. Those shipping markets offer individual vessel designs, charterers, and port equipment (Stopford 2009).

As these modern vessel types are basically no longer interchangeable like they used to be around the 1950s, analyzing the market of a certain type of vessel has become more easy because regularly only a few commodities need to be considered on the demand side (in case of very large oil or natural gas carriers as little as one commodity). Yet, as will be discussed in Sect. 1.1.3.5, some overlapping in the demand and supply of selected shipping markets appears to exist.

1.1.3 World Seaborne Trade and Merchant Fleet Development

Whilst some figures related to 2011 are still estimated and revisions of cargo handling statistics are a regular phenomenon in the runner-up year, it seems that the total amount of cargo trade has reached a volume of 9.1 bn tons and is headed for the 10 bn ton milestone in the near future.

As slightly more than 70 % of the entire seaborne trade (see Fig. 1.2) are raw materials or energy sources (see Table 1.1), it becomes clear why on average the seaborne trade has been growing in line with the output of the world economy over the last 20 years (see Fig. 1.3). Depending on the commodities, periodically special

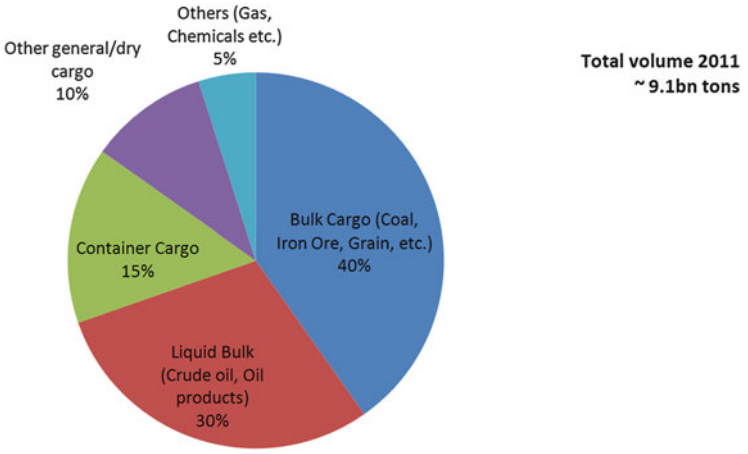

Fig. 1.2 Total seaborne trade by major loading categories. *Source*: ISL 2012 based on Clarksons Research

preconditions will lead to surprisingly high or low growth rates, as we will see in the following subchapters, which take a closer look at the major shipping markets and highlight the most important developments of the recent years.

1.1.3.1 Dry Bulk Shipping Markets

Stopford (2009) defines bulk commodities as cargoes which are carried in bulk carriers. Their common denominators are that they travel in large quantities and their physical attributes allow for easy (automated) handling. The alternative suggested definition is that they are commodities, which can be poured, tipped or pumped into the hold of a ship.

According to figures from Clarksons Research in the year 2011, roughly 3.6 bn tons have been transported on the dry bulk shipping markets. The volume comprises of the major bulks: iron ore, coal, and grain as well as bauxite/alumina and phosphate rock.[1] These commodities travel in large parcels and account for two-thirds of the entire trade volume. The remaining third of the dry bulk trade is composed of a broad mixture of agricultural products, forest products, steel products as well as non-ferrous metal ores or scrap but also cement or fertilizers. These commodities typically are required in smaller quantities by the importing industries and typically show a higher value per ton.

Until the beginning of the new millennium, the demand-growth on the dry bulk shipping markets was fairly static and mostly reliant on the steam coal trade.

[1]The latter two are sometimes found excluded from the "major bulks" and grouped with the "minor bulks" instead.

Table 1.1 Different approaches of categorizing shipping markets

Loading categories	Dry bulk		Liquid bulk			General	
Commodity group	Major bulks	Neo-bulk/ minor-bulk	Liquefied gas	Oil/oil products	Chemicals	Conventional	Container
Commodity (selection)	Iron ore, coal, grain	Bauxit, phosphate rock, fertilizer, oilseeds, steel, timber, non-iron metals and ores, sugar, salt, cement, ...	LPG (liquefied petroleum gas), LNG (liquefied natural gas)	Crude oil, petroleum, diesel, gasoline, koresene, ...	Vegetable and animal oils and fats, organ. and anorgan. chemicals, foodstuffs	Sawn wood, cars, project cargo, rail cars, steel coils, cellulose, reefer cargo, ...	Other manufactured and semi-manufactured goods, foodstuffs, consumer and investments goods, all theoretically containerisable goods
Trading area	World-wide			...	Coastal shipping		
Availability	Prompt tonnage			...	Forward contracts		
Ship type	Bulker; tanker (gas, oil, oil products, chemicals, ...); general cargo (container, multipurpose, heavy lift, ...)						

Source: Lemper/Tasto based on Biebig et al. (2008)

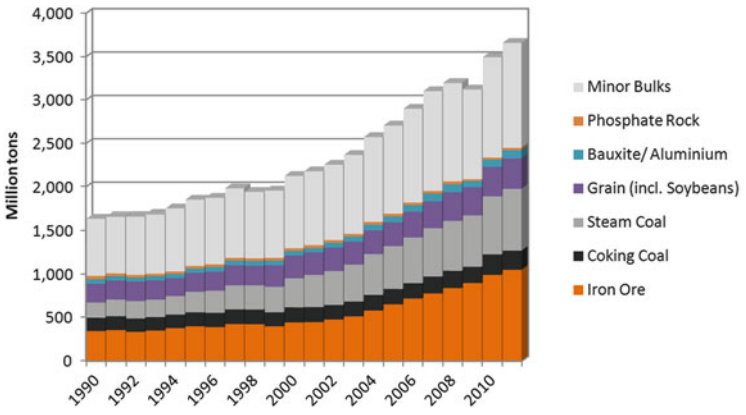

Fig. 1.3 Development of seaborne trade in dry bulk commodities 1990–2011. *Source*: ISL 2012 based on Clarksons Research 2011 = preliminary estimates

This changed radically around 2002/2003, when China, already back then the largest producer of steel, massively increased its volume of iron ore imports at a pace that was underestimated by the largest parts of industry observes.

Between 2003 and 2008, the demand impact from the Chinese imports of iron ore has been the central topic around the development of freight and time charter rates. Although investment in new vessels accelerated around 2003 already, the Chinese hunger for raw materials kept exceeding the forecasts and when vessels were queuing up in congested ports (affecting the supply side by reducing the "fleet productivity") and the Australian suppliers could not keep up with the Chinese demand growth and Brazilian suppliers stepped in happily (affecting the demand side by increasing the "average haul"), the markets have seen never before reached earnings as well as never before seen investments in new tonnage.

According to figures from IHS Fairplay, this unprecedented ordering boom has led to the dry bulk fleet surpassing the tanker fleet as the largest segment of the entire world merchant fleet, reaching a capacity of 602 M dwt early in 2012. The capacity growth of 17.1 % in 2010 and 14.8 % in 2011, respectively, has even surpassed the long term average capacity growth of the rapidly expanding container fleet, which grew by 11.5 % over the last 20 years (see Fig. 1.4).

Whilst having been notoriously undersupplied with tonnage during the years 2003–2007 and throughout most of 2008 (until the start of the global recession), the supply-demand-balance on the dry bulk shipping markets has developed in favor of the shippers in recent years, leaving shipping investors with relatively poor earrings and – resulting from the still filled orderbook early in 2012 only with medium-term hopes for a sustained recovery.

During periods of fundamentally oversupplied markets, it is not uncommon for freight rates to edge up sharply, as tonnage on the spot markets may be tight occasionally, resulting from unforeseen demand spikes (see Fig. 1.5). This has

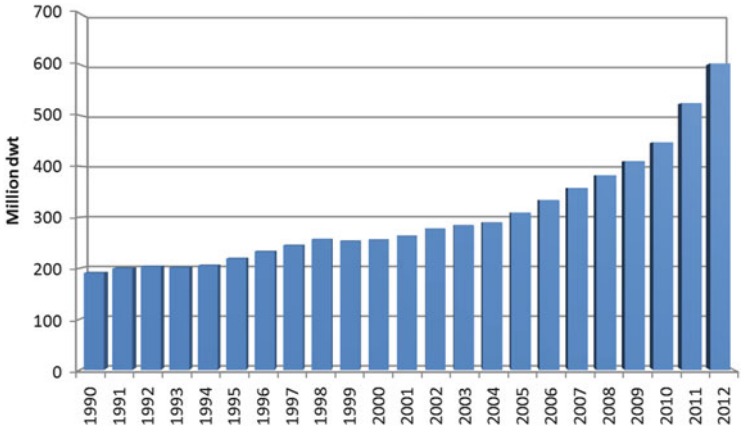

Fig. 1.4 Development of the Dry Bulk Fleet 1990–2012 (start of period). *Source*: ISL 2012 base on IHS Fairplay

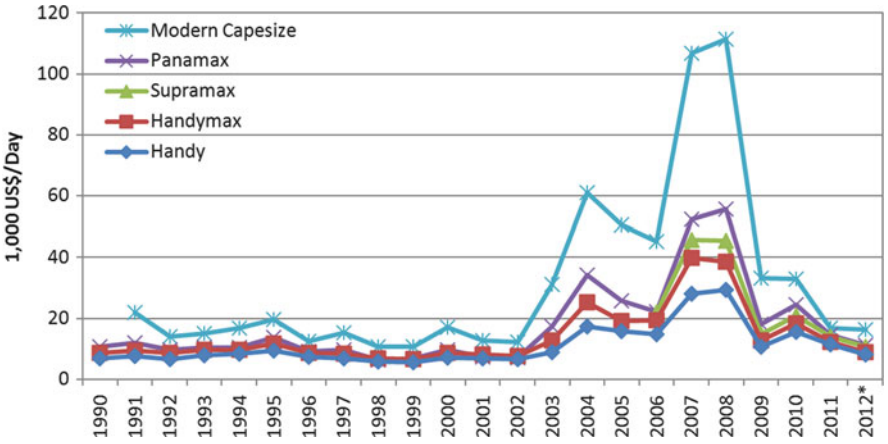

Fig. 1.5 Development of 1 year time charter rates for different bulk carriers 1990–2012 (period averages). (*Asterisk*) January until begin of March. *Source*: ISL 2012 based on Clarksons Research Shipping Review and Outlook 2012 (Clarksons Research 2012)

been observable, for example, late in 2011, when Chinese steel-mills stockpiled large amounts of iron ore, sending the Baltic Dry Index and especially capsize earnings to relatively high levels but having only a modest impact on the longer-term time charter earnings, which incorporate the future expectations of the market participants – the latter ones being quite bearish recently.

Although the longer lasting 1 year time-charter rates regularly smoothen out the volatility of the spot-market, time charter rates are quite volatile too. In the case of bulk shipping time charter-rates though, the volatility of the nineties is dwarfed by the scaling required by the 2007 and 2008 spike in earnings.

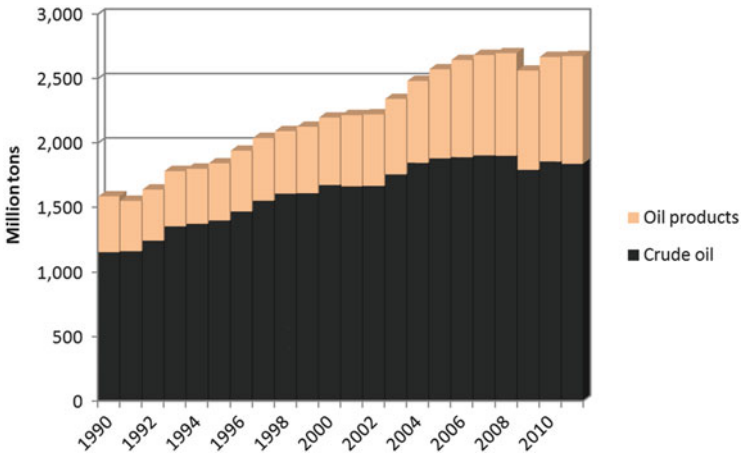

Fig. 1.6 Development of seaborne trade in oil and oil products 1990–2011. *Source*: ISL 2012 based on Clarksons Research 2011 = preliminary estimates

1.1.3.2 Liquid Bulk: "The Tanker Markets"

When brokers or market reports discuss "the tanker markets", they are typically just referring to two particular trades, one being crude oil, one being the oil products trade. Whilst it is true that chemicals and liquefied petroleum gasses or liquefied natural gas or even juices, wine, or beer may travel in vessels referred to as 'tankers', these latter vessels are operating in a different and segmented market with virtually zero overlap.[2]

After initially having been transported only as refined products, the crude oil transport soared in the 1950s, 1960s, and early in the 1970s. After the 1970s recession and oil price shock, the seaborne crude oil trade fell sharply but has recovered since then and stands—with some distance to the iron ore trade left—as the largest individual commodity being shipped in bulk. For the year 2011, Clarksons Research estimated the crude oil trade volume to be 1.84 bn tons. The estimate for the oil products trade at the same time was about 1 bn tons smaller and stood at 837 m tons (see Fig. 1.6).

Early in 2012, the capacity of "the tanker fleet" has surpassed the "half-a-billion-milestone", the relatively rapid expansion that becomes noticeable around the year 2004 is only partly attributable to the increased demand dynamics of the emerging Asian economies (see Fig. 1.7). Partly, the modern, double-hull tonnage had been

[2]*Note*: this is not entirely true as chemical tankers are well-equipped to carry oil products and will do so to fill the holds on an otherwise underutilized voyage or during repositioning to a different trading area.

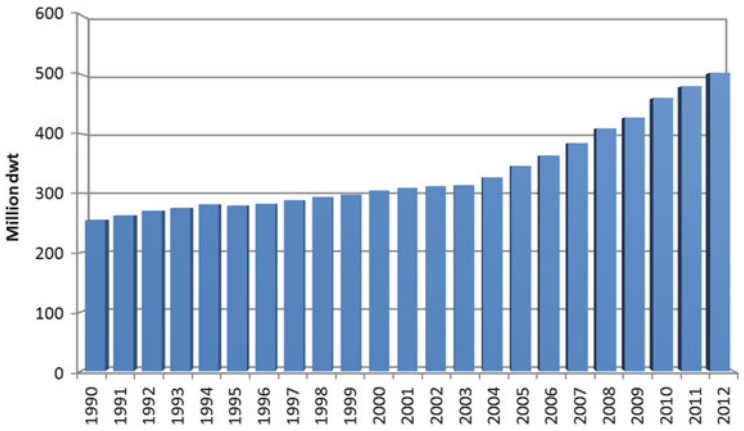

Fig. 1.7 Development of the tanker fleet (oil, oil products and chemical tankers) 1990–2012 (start of period). *Source*: ISL 2012 base on IHS Fairplay

ordered in advance of the phase out of the older single hull vessels, which was due in 2010.[3]

Looking at the development of time charter markets for large crude oil tankers in the years 2008 and 2009 leaves the reader puzzling. Based on the fundamental dynamics (an economic downturn, colliding with an ongoing fleet expansion), a more massive downturn in earnings would have been expected. Yet, especially around the end of 2008, large crude carriers earned surprisingly strong rates on the spot markets (see Fig. 1.8).

Although the fleet expansion later on was clearly driven by the positive earnings situation, earnings during the boom years were not as strong as in the dry bulk sector. Hence, the advance ordering has certainly contributed to smoothen the market peak of the tanker markets. As a result, compared to the dry bulker markets, the tanker markets are equipped with a slightly more optimistic outlook for the medium term early in 2012—albeit from low levels.

The often made reference to the shipping markets being "perfect" markets, however, is related to the perfect competitive behavior of the tanker shipping industry (Glen et al. 2006, p. 270). This degree of competitiveness cannot be found in every shipping market though.

1.1.3.3 Container Shipping Markets

The clockwork-like double digit growth of the container shipping markets was fuelled by the globalization of trade flows as well as the containerization of the

[3]For selected single-hull-tankers, using a condition assessment could prolong the life-span as far as 2015.

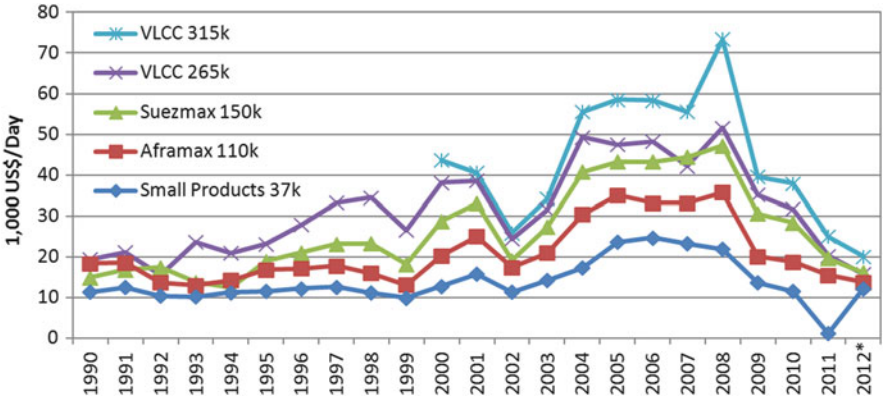

Fig. 1.8 Development of 1 year time charter rates for different tanker vessels 1990–2012 (period averages). (*Asterisk*) January until begin of March. *Source*: ISL 2012 based on Clarksons Research Shipping Review and Outlook 2012

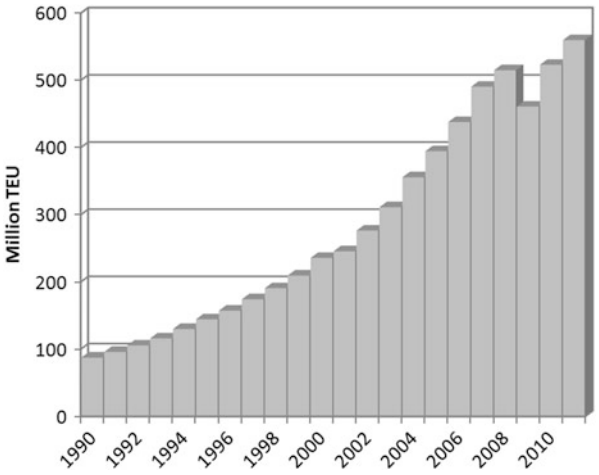

Fig. 1.9 Development of world container handling 1990–2011. *Source*: ISL 2012

already existing general cargo flows (see Fig. 1.9). Whilst most industry observers expect both these demand drivers to lose momentum eventually, they still expect the container traffic to grow super proportionally in relation to the global GDP. Whilst historically, there have been only few opportunities to "mis-invest" in an industry with a regularly reappearing demand growth, the sharp economic downturn of 2008/2009 has set back the long term growth path of the demand side by approximately 3 years.

Measuring the container trade itself is a complicated task since it is not a reported item in official statistics and the assessments of industry observers show large

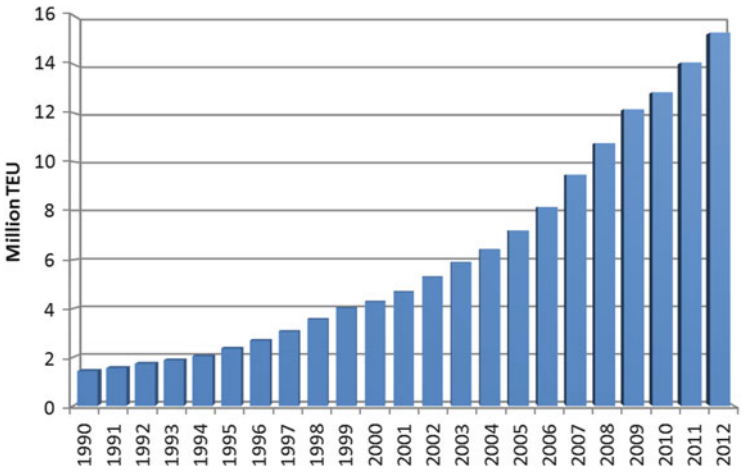

Fig. 1.10 Development of fully cellular container fleet 1990–2012 (start of period). *Source*: ISL 2012 base on IHS Fairplay

differences. Hence, the handling volumes of containers, which are more precisely traceable are usually used as an indicator for the demand side of the markets (Dörn et al. 2012, pp. 14–16).[4]

According to preliminary estimates, world container handling grew by 7 % in 2011, reaching a new all-time high of ~560 M TEU. Taking into account that at least in the industrialized economies everything that may reasonably be transported in a container is nowadays being carried in such steel boxes as well as that the soaring market penetration of Chinese manufactures around 2002–2005 are both losing steam/gradually wearing of, the age of double-digit growth rates on a worldwide level may well be over for container shipping. Yet, ISL forecasts that the billion-TEU-milestone is likely to be reached around the year 2020 which reflects an expected average annual growth rate of around 6.5 % for the coming decade.

Early in 2012, the fully cellular fleet has reached a nominal capacity of 15.6 M TEU (see Fig. 1.10), spread among 5,000 units of different size classes, with the largest regular units in service having slots for as much as 15,500 standard-boxes and a handful of even bigger vessels currently on order.[5] Unlike the more matured dry and liquid bulk fleets, the containership fleet is still evolving in its dimensions. Whilst there are numerous historic miss-assessments about the final limit of this evolution process, the market currently seems to settle for vessels of 14,000 TEU and the larger units are being eyed somewhat cautiously. With a length of little less

[4]Recent research suggests that an index tracking the monthly handling volumes of containers provides some fair amount of insight into the health and state of the world economy and thus forms a "leading indicator".

[5]The Maersk EEE-Series of vessels reportedly will be able to carry 18,000 TEU.

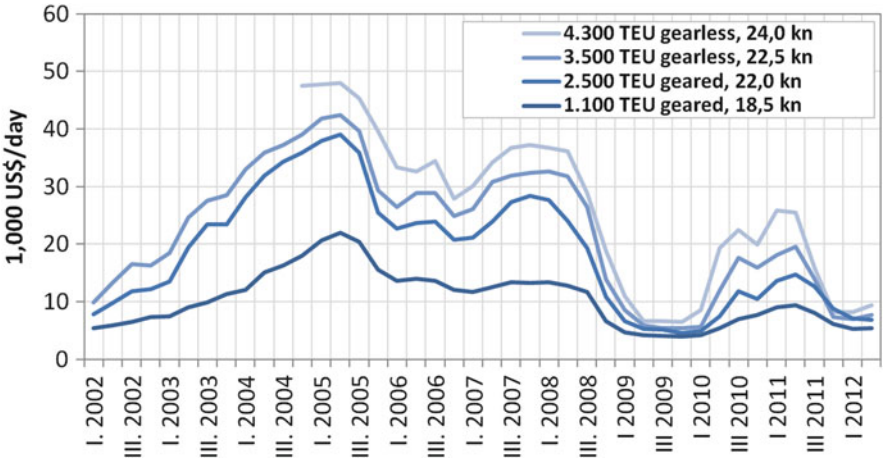

Fig. 1.11 Development of 1 year time charter rates for container ship sizes 2002–2012 (period averages). (Asterisk) II 2012 only April. *Source*: ISL 2012 based on Howe Robinson

than 400 m, a width of 23 boxes across (about 59 m), and a draught of up to 16 m, their deployment options remain strongly limited in the short run.

One result of this ongoing evolution of ship sizes, as well as the organization in liner shipping form, is that the time charter markets are as of 2012 only regularly documented for vessels from ~500 TEU to the panamax segment (~4.400 TEU). The larger vessels came into service only during the last 10–15 years and, hence, are regularly still tied up in their initial charter contracts. Periodically, one of the larger units appears on the markets as the large operators sometimes charter out their tonnage to other operators. Yet, these transactions are still not common enough to allow for the creation of monthly time series. This is likely to change in the near future though. The fleet growth in terms of numbers is currently taking place almost exclusively in the size classes above 4,000 TEU, increasing the "market volume" of the larger units and the vessels of 5,000+ TEU are starting to appear more regularly on the charter markets.

Coming from a somewhat discouraged sentiment surrounding the burst of the dot-com bubble and the terrorist attacks in 2001, the container shipping markets have been taken by surprise by the impact of China's ascension to the WTO. The strong trade growth fuelled the charter markets, peaking in 2005. Until early in 2008, the markets remained in positive territory. Although the fleet growth was catching up with the demand side, the ever increasing fuel costs and record high bunker prices of the years 2007 and 2008 made "slowsteaming" an economic viable strategy (see Fig. 1.11). Thus, part of the newly built tonnage could be absorbed in the markets without increasing the fleet effective transport capacity. Put precisely, the fleet productivity (supply side) was shrinking but freight and charter markets remained relatively stable despite over-proportionate fleet growth.

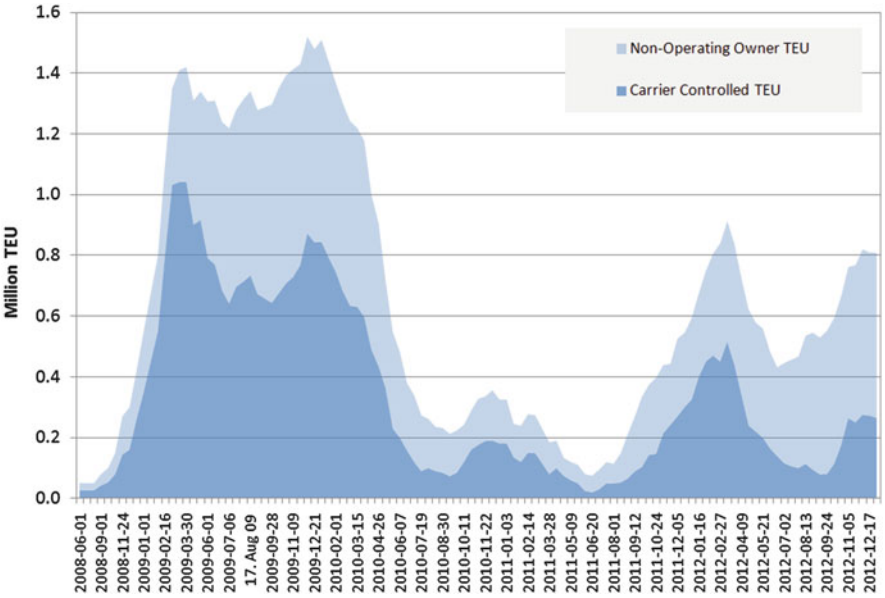

Fig. 1.12 Development of idle container vessels capacity 2008–2012. *Source*: ISL based on Alphaliner

When trade volumes fell strongly late in 2008 and early in 2009, accompanied by the trough in the inventory cycle and the regular seasonal downturn of the container shipping markets, a strong fleet growth collided with a before unseen decline of the demand side. Within a very short time, container ships with an aggregate capacity close to 1.6 M TEU have been reported as inactive and have pushed the time charter markets into a long-lasting trough. The increase in rates in 2010 came as surprising as the strong recovery of the demand side. Yet, it proved to be short-lived (see Fig. 1.12).

1.1.3.4 Other Specialized Shipping Markets

Next to the major shipping markets of dry-bulk, liquid bulk, and container shipping, various smaller market segments with individual ship designs and only limited overlap exist. The most important ones are the markets of:

- **Liquefied gas transportation**. It should be pointed out that the individual commodities and vessel designs, as well as the parcel sizes and typical ship sizes, differ strongly from each other in this sector, as do the demand and supply mechanisms of the commodities (see Fig. 1.13).
- **The chemicals trade** consists of a wide mixture of sophisticated cargoes, which mostly travel in small parcels, consequently, two-thirds of all chemical tanker

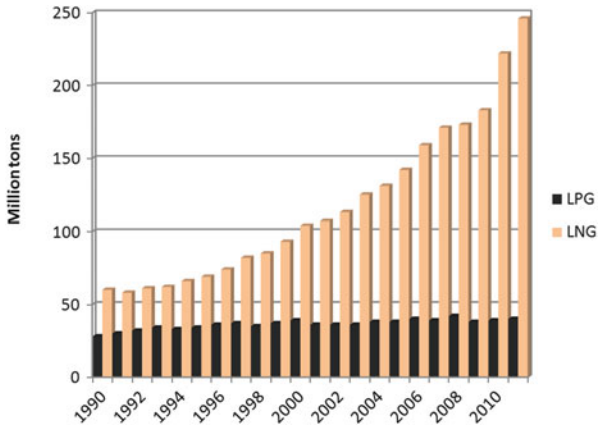

Fig. 1.13 Development of seaborne trade in liquefied gases 1990–2011. *Source*: ISL 2012 based on Clarksons Research 2011 = preliminary estimates

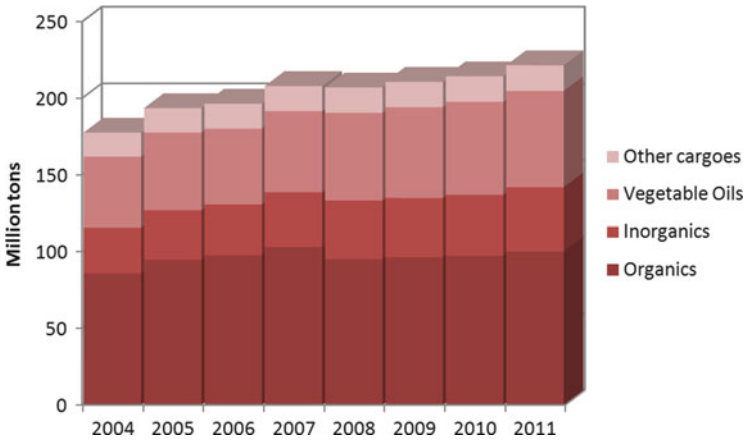

Fig. 1.14 Development of seaborne trade in chemicals 1990–2011. *Source*: ISL 2012 based on Drewry Shipping 2010/2011 = preliminary/forecast

vessels do not exceed a capacity of 20,000 dwt, whilst having several individual holds (tanks) for cargoes, ranked in grade by their hazardous potential (see Fig. 1.14).

- **The car/vehicle trade** is mainly done with specialized vessels (PCC = pure car carrier or PCTC = pure car truck carrier), which are especially designed for this purpose. They are constructed as more or less huge multi-storey car park with capacities up to 8,000 vehicles. In most cases, these vessels are sailing on relatively fixed routes and in addition in some cases there also exists a regional feeder network like, e.g. from the northwest European ports to the Baltic. This market—except for the 2009 crisis—is steadily growing and expected to continue on a moderate growth path.

- **The reefer trade**, being somewhat of a declining phenomenon, whilst for many years the persistent belief was that for a large part of the refrigerated commodities, containerization is not an option, the reefer fleet is currently declining whilst the reefer-container fleet is constantly growing. In several ports the removal of installations for handling of e.g. bananas as typical cargo for reefer vessels has already started.
- **The general/project cargo trade**. The general cargo trade has experienced a bit of a renaissance despite the unstoppable success of the container shipping markets, which have transferred the liner connections between the major trading partners. Whilst general cargo liner trades have become a niche business, the general cargo spot market has benefited strongly from the growth of project cargo shipments. This sector of the shipping markets is particularly hard to gauge or quantify. Often, residuals of the foreign trade statistic ("miscellaneous cargoes") are being transported and—as comes with the definition of "project"—this transport is being carried out on an irregular base. A (non exclusive) list of typical industries, demanding theses shipping services includes not only the mining industry, power plants, wind energy, railways, pipelines, offshore industries, the metal processing/producing industries but also chemical or high tech industries.

1.1.3.5 Spillover Effects: Intra-Competition of Shipping Markets

The modern merchant fleet is divided into clearly distinguishable vessel designs, which cater to a particular type of shipping demand. Additionally, major shipping markets are typically disaggregated by size and each vessel is involved in the transportation of certain commodities. Yet, there is possible competition from the adjacent segments within the fleet, as the tonnage is generally substitutable, particularly in the bulk shipping markets where the spot demand for a vessel size may occasionally outweigh the spot supply by so much that the freight rates justify using larger vessels (with a resulting deadfreight) or two (or even more) shipments using smaller vessels.

Consequently, positive as well as negative shocks from one sector of the fleet are passed on to the other sectors. Alizadeh and Nomikos (2002) looked into this phenomenon and found that shocks stemming from the larger vessel sizes tend to have a higher impact on the market, resulting from the larger capacity of those vessels combined with their inflexibility in terms of trading possibilities. This intra-competition of vessels goes a long way in explaining why the peaks and troughs of certain vessels sizes are mirrored by the adjacent segments. When, for example, capesize-tonnage is in such short supply that shippers start employing two panamax units, this additional unusual panamax-demand is driving the rates up for panamax bulkers as well. Correspondingly, if the spot-rates for the large capesize-vessels are low, they place a lid on the rate-levels, which the smaller panamax-bulkers could potentially reach (see Fig. 1.15).

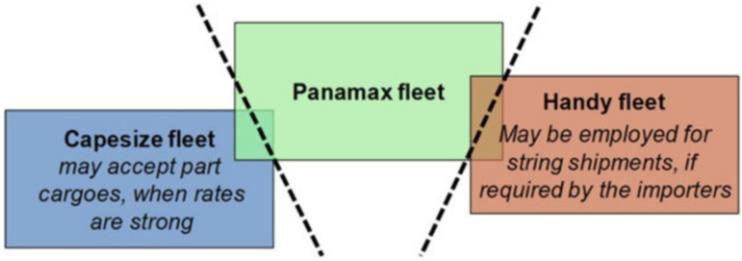

Fig. 1.15 Illustration of the intra-competition of the bulk shipping markets. *Source*: ISL based on Alizadeh and Nomikos (2002) (pp. 243ff.)

1.1.3.6 Spillover Effects: Inter-Competition of Shipping Markets

On top of the **intra**-competition there is also a certain amount of **inter**-competition from different vessel types, which may be employed in the same trades. Products tankers, for example, may be used for crude oil transport, but because the cleaning of the holds after the crude oil transport is quite expensive and likely to wear down the coating and the products fleet has higher capital and operation costs, it is seldom done (read: when the price is right). Similarly, the chemical tanker fleet will often accept product cargoes to avoid dead freights or to subsidize the repositioning to a different trading area.

An example where competition from two shipping markets seems to be given are the multi-purpose vessels. These are typically general cargo vessels with holds that are box-shaped without cell-guides. Hence, they can transport bulk cargoes, containers, or large project cargoes.

Figure 1.16 illustrates how the time charter rates for multi-purpose vessels have been affected by the all-time highs of the container shipping markets (around 2005) as well as the sky-high earning of the dry-bulk shipping markets (2007, 2008).

1.1.4 How to Interpret and Work with Shipping Statistics

Whilst shipping markets appear to be very transparent and well-equipped with sufficient data for analysis, one should bear in mind that ultimately, all statistics are created by humans and human beings are prone to errors. Hence, irrational jumps in time series should always be taken with a pinch of salt and questioned. Another item which is often discussed alongside the IAME-conferences (International Association of Maritime Economists) is the degree to which statistics may be regularly estimated by brokers in the absence of real data. Whilst it is beyond doubt that those closest to the market are most qualified to provide an educated guess to where a market could be at a given point of time, one should not fall into the trap of taking every quoted rate or price for face value, as they often reflect discounted

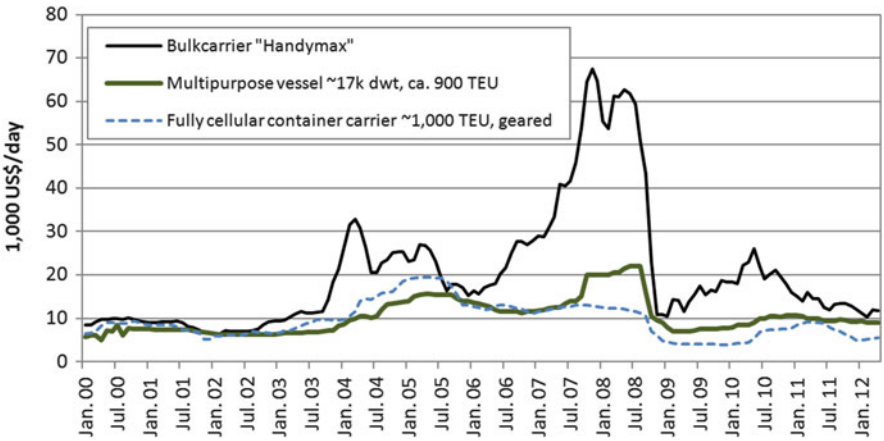

Fig. 1.16 Illustration of the inter-competition on the multi-purpose markets. *Source*: ISL 2012 based on Fearnleys and Clarksons Research

values of neighboring size classes or comparable vessel ages. Also, statistics should always be interpreted against the background of knowledge and experience. During the 2009 recession, for example, the sale and purchase market practically collapsed as the ideas of buyers and sellers differed too fundamentally to form a sound market base. During this time, some brokers rightfully stopped reporting second-hand-prices as there were only limited sales taking place to back those figures, yet others continued and even those brokers who temporarily abandoned the coverage of selected vessels nowadays report second-hand values for tonnage for the months early in 2009.

Another example showing the need for the right reading and interpretation can be found in the "statistics" on global container handling volumes. Several analysts are publishing figures on handling volumes of container ports, but figures often/usually differ.

1.1.4.1 Different Sources Reporting the Same Item Will Seldom Match

Worldwide Container Handling 2007 according to different sources:

- ISL: "490,6 Mil. TEU"
- Drewry: "496,6 Mil. TEU"
- Clarkson: "472 Mil. TEU"

Every analyst team has to make the best of what is statistically available to them and some ports, which may respond to the questionnaires of team A, may not cooperate with team B and vice versa. Hence, to some extent, the data needs to be estimated. All handling volumes of containers of ports, tracked in ISLs port-data-base, regularly add up to ∼85 % of all container trade ISL presumes to exist. The remaining volumes are expected to be "lost" in small ports, which mostly do not release statistics or which simply don't report the amount of boxes handled, but release only general information about "general cargo tons".

1.1.4.2 Different Release Dates Will Lead to Slightly Differing Numbers

Whilst providing this article, most, but by no means all ports have reported "final" handling statistics for their seaborne trade. Yet, those ports that did not report "final" statistics for 2011 at least provided preliminary estimates. Earlier in 2012, the share of preliminary estimates was even higher. Depending on the time of report, the assessment of the reported item will change. Depending on the reported subject, these changes may go back several years. For example, the assessments of the past growth rates of the world economy are often re-adjusted after as much as 2–3 years. The changes become smaller, as more time has passed, but they still are common.

1.1.4.3 Different Time Series of the Same Source Often Won't Match

This is a result of a combination of both previous elements in play. As time series for seaborne trade volumes often have to be enhanced with estimates, changes to the way these estimates are made will then lead to changes in the total volume of trade being reported. To estimate the market growth rates correctly, the new methodology then would have to be applied to the previous year as well. Whilst the current growth rate then should be reflected decently, the growth rate of the year $t - 1$ versus the year $t - 2$ would be distorted. Hence, market reporters often correct a couple of years in the historic time series to provide a more accurate total volume for "today" as well as a more accurate historic development of growth rates. However, at some point, the methodology is skipped, leading to irrational jumps in the historic time series from one market report to the next one.

1.1.4.4 Beware of Different Use of Vocabulary or Units

When talking about the ports of the Hamburg-Le Havre Range, the term "transhipment" regularly only means one thing: containers which are arriving in the port by sea-going vessels and which are leaving the port again by seagoing vessels. In other parts of Europe, "transhipment" may very well also relate to all forms of transit cargoes, which arrived in or leave the port by land. Another example would be the port of New York, which reports monthly TEU handling volumes but those related only to laden containers.

Some market reports will quote both growth rates for transported tons and ton-mile demand. While the latter is certainly the more accurate measure, it is harder to compile and may differ from the growth of the total trade.

1.1.4.5 Time Series Regarding Particular Vessel Sizes Will Evolve Around "the Market"

The bulk shipping markets are more matured in the evolution of different vessel sizes compared to the still young container shipping fleet. Yet, the individual size classes of the bulk carrier fleet keep evolving. An example are the modern "supramax" – designs, which can have a capacity of to 55,000 dwt and which have evolved from the previous "handymax" vessels. Similarly, "typical capesize" – bulkers first used to have a capacity of around 150,000 dwt, then edged up to 170,000 dwt and – in line with the latest ordering trends and deliveries – are likely to evolve further in the near future. When the focus of a market changes, reported time series will often be abandoned, or merged with the new "standard"-vessel sizes. This will often be found in the explanatory notes related to the time-series provided by market reporters and should be taken into consideration when analyzing the time-series over longer periods.

The lesson to be learned from all of the above points certainly is: "be very careful when blending different time series when analyzing data". If it cannot be avoided, the merging of the series should be properly documented to allow the reader to understand how gaps or irrational jumps in the data have been treated.

1.1.5 Forecasting Challenges and Limitations

> Although this may seem a discouraging way to introduce a discussion of forecasting techniques, at least we are getting off on the right foot by accepting that our forecasts will often be wrong. (Stopford 2009).

Forecasting charter rates is a bit of a black art because it involves the precise prediction of a market result. However, analyzing the development trends of the demand and supply side allows for some general insights into which directions the markets are likely headed. Yet, there is always the chance that the market participants behave or things turn out differently than expected. Some interesting examples for this will be discussed in the following subsections. It is generally accepted among maritime economists that the growth of the demand side of shipping markets is **mainly** driven by the development of the economic activity. As far as raw materials are considered, elements like depletion of existing resources or discovery of new resources do play a role, yet in the short run, the simple formula applies "a higher economic output requires a greater input of raw materials". The question how this relationship is exactly defined depends on a few elements. First, technological

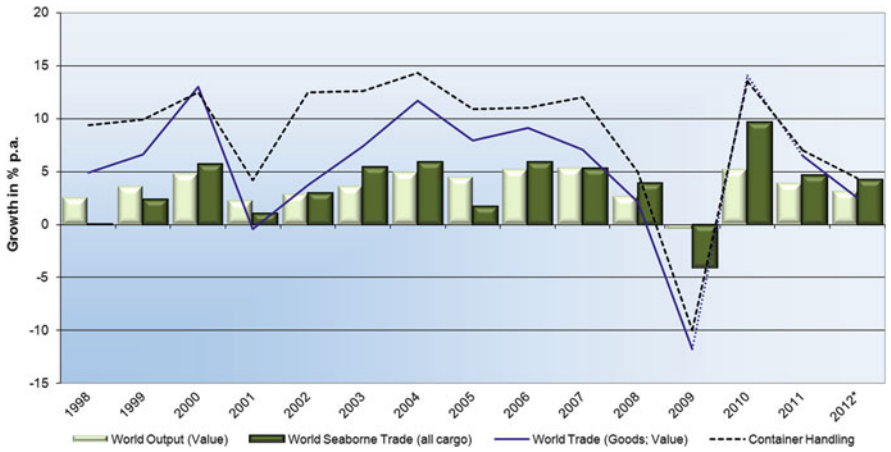

Fig. 1.17 Annual growth of world GDP, word trade, world seaborne trade and world container ports throughput (1998–2012). (*Asterisk*) Estimate/forecast. *Sources*: IMFOECD-Economic Outlook, ISL estimates 2012

innovations regularly allow for a greater economic output to be realized with fewer resources. Second, according to the trade-development-cycle (Stopford 2009, pp. 407–411), as economies mature, the economic growth shifts away from the resource intensive sectors to a higher importance of services.

This well-established relationship between the growth of shipping demand and the growth of economic activity goes a long way in explaining the great attention paid by the maritime industry to the forecasts of economic growth in both the developing and the developed economies.

The developments of the supply side on the other hand side can – in a normal market environment – be deducted relatively precisely from the age structure of a certain fleet of vessel as well as the orderbook for that particular market segment.

However, the global recession has produced some unforeseeable irregular developments on both the demand as well as the supply side (see Fig. 1.17).

1.1.5.1 The Crisis of the Container Shipping Industry in 2009: Forecasts and Outcomes

The global recession of the year 2009 has managed to turn established ratios of the container shipping demand upside down. Starting in autumn 2008, container trade volumes first grew slower and then declined rapidly as the regular seasonal downturn of container shipping demand and the trough in the inventory cycle were taking their toll. Around the turning of the year 2008/2009, the worldwide monthly container handling volumes were down by as much as 16 % compared to the volumes 12 months ago (see Fig. 1.18). Combine that with an industry that was used to and

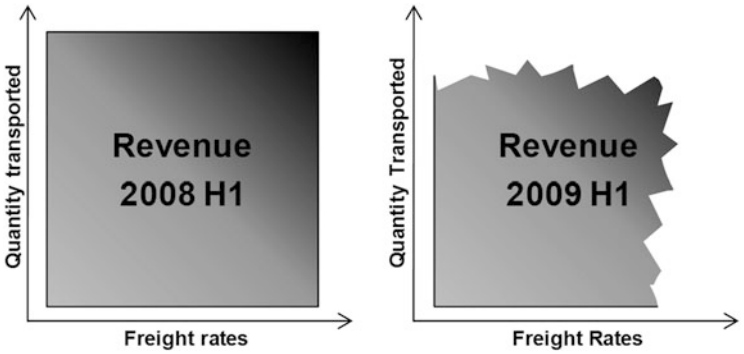

Fig. 1.18 Illustration of the impact of the global recession during 2009 H1 on the freight revenue of the liner shipping industry

expecting enduring double-digit growth rates and which has been ordering tonnage not only in anticipation of that market growth, but also in anticipation of market share gains and all of the sudden the container shipping markets have been hit by something often referred to as "the perfect storm".

In panic, the liner shipping companies tried to fill their new vessels fighting for the quickly dwindling box trade volumes with low freight rates. Consequently, their revenue came under pressure from two dimensions. The number of transported containers declined, while at the same time the revenue per box was shrinking fast to unprofitable levels. At the same time, the cost structure of a liner service operation is relatively static, as the ships are deployed on routes and have to be operated in order not to scare away the remaining customers. The cumulated losses of liner industry have been estimated to be US$20 bn in 2009.[6]

From a point of view early in 2009, the fundamental outlook for the near future of the container shipping markets was a grim one: the capacity of the units reported as "inactive" was soaring rapidly, reaching close to 1.4 M TEU early in 2009, the forecasts of both economic activity and world trade had undergone one downwards adjustment after the other and the container fleet was set to expand at a pace unseen before as a result of the ordering boom of the previous years (see Fig. 1.19).

Consequently, most industry observers predicted a strong further increase of inactive vessels, as the oversupply was a given reality and according to the forecast demand and supply fundamentals the gap between supply and demand was set to widen during the rest of 2009 as well as 2010.

Strangely enough, the total amount of inactive capacity never ever made it far beyond the 1.5 M TEU mark and actually declined relatively quickly in 2010. What had happened? The industry had somewhat overcompensated and in expectation of a very poor year 2010 postponed large parts of the newbuilding deliveries as well as

[6]See also Lloyd's List, March 3rd, 2010.

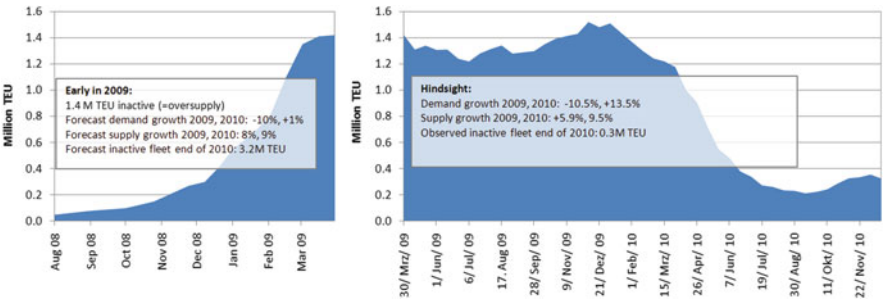

Fig. 1.19 Build-up of inactive units—forecast from a 2009 point of view and actual development. (*Left*) *Source*: Inactive fleet statistics based on Alphaliner, supply/demand forecast: ISL 2009 (base case). (*Right*) *Source*: Inactive fleet statistics based on Alphaliner, supply/demand based on IHS Fairplay/ISL

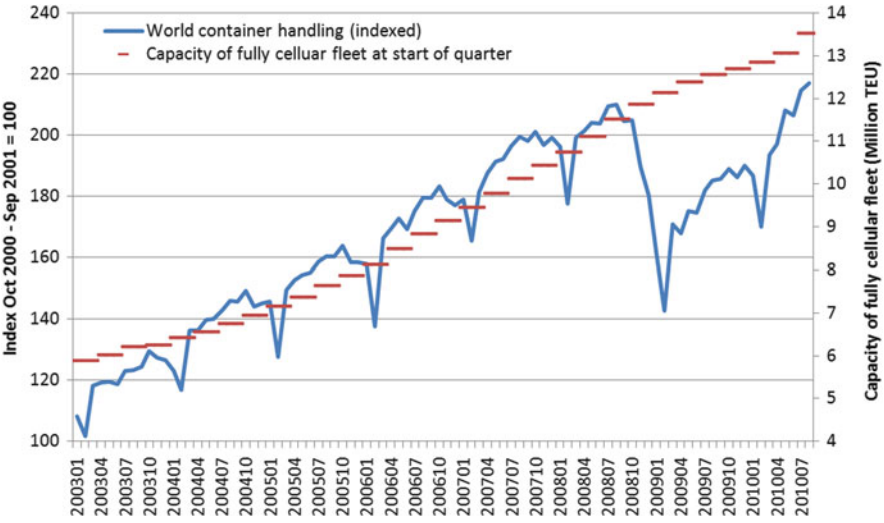

Fig. 1.20 Development of supply and demand on container shipping markets 2003–2010. *Source*: ISL 2010 based on ISL Monthly Container Port Monitor, IHS Fairplay

scrapped a high volume of older units. Additionally, the slowsteaming, which was introduced around 2005/2006 when fuel prices started to increase, was applied on a massive scale, thus reducing the effective fleet productivity. In addition, all of a sudden, when the world economy recovered vividly from the sharp downturn, so did the container trade growing by 13.5 % in 2010. Consequently, instead of further increasing the inactive tonnage remained almost stable during 2009 and already early 2010, the supply-demand gap started to close rapidly with the effect of a fast reduction of idle capacity and increasing charter rates (see Fig. 1.20).

A result, unimaginable from within the gloomy months early in 2009. Within a few weeks, tonnage actually became scarce, freight rates edged up sharply and some companies which had been fighting for survival in 2009 posted record earnings in 2010. The impact of the slowsteaming on the total market balance becomes understandable when the supply and demand side (indexed) are joined together in a diagram. In the summer of 2010, freight rates were high and the idle units mostly back in service. Yet, it was too early to get excited as the supply side was set to grow in 2011 and 2012 partly due to postponed deliveries, partly due to newly placed contracts while the demand side was bound to lose steam in 2011, as much of the growth of 2010 was attributable to the recovery and the comparison to the weak volumes of 2011.[7]

1.1.5.2 The Crisis of the Dry Bulk Shipping Industry in 2009: Forecasts and Outcomes

The earnings of the dry bulk shipping markets in 2007 and 2008 have been unparalleled yet. Whilst it became evident that a bubble was building up on the markets, the ever soaring Chinese commodity demand kept tonnage tight and ports congested (reducing the fleet productivity). Also, more distant suppliers had to step in (increasing the average haul) and driving the freight markets – and as an almost directly related result, the investments in new vessels to heights never seen before.

When late in 2008, the global economic bubble burst and the world industrial production went into a sharp decline, the general industry consensus was that this party was over for good. At the beginning of 2009, the dry bulk fleet was looking at annual capacity growth rates in excess of 15 % and demand was expected to decline by 4 % in 2009 and recover only gradually in 2010. Around that time capesize-bulk carriers who in the peak of 2008 could fetch spot-earnings of up to US$250,000/day on the Brasil–China Route, dwindled down quickly and owners (sometimes admittedly with large and comfortable cash reserves) had to settle for spot earnings as low as US$1,000/day.

The more exciting and almost “disturbing” was that early in 2010, suddenly the freight markets started to improve as is represented by the Baltic Dry Index, which is effectively a blend of the spot earnings on a number of defined routes and vessels sizes (which each have their own sub-indices).

The initial response of market observers asked to explain this increase early in 2010 was to shrug and trace the development back to a market which had been extremely tight before the economic downturn and that it would not be uncommon to experience short-lived spikes in such an environment since the doom (represented by the 72 % strong orderbook) was only set to hit the waters in the years to come.

[7]Resulting from these developments, both freight and charter rates were quite week late in 2011, after the liner shipping companies had initially in 2011 fought for market shares at the expense of freight rate revenue.

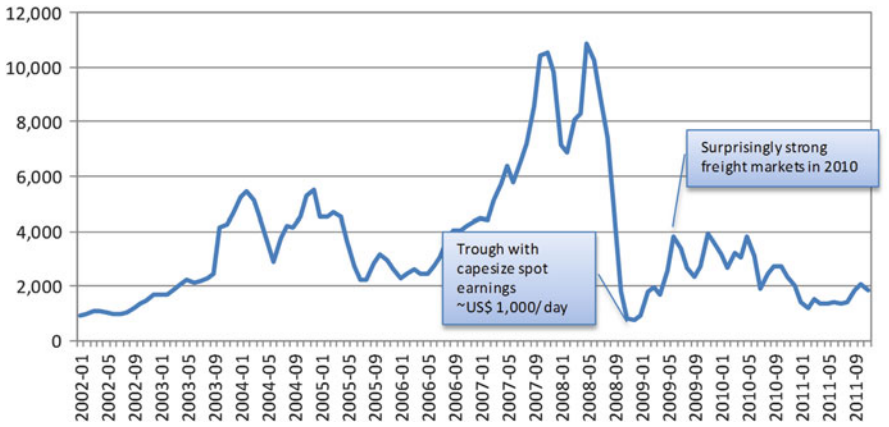

Fig. 1.21 Development of the Baltic Dry Index 2002–2011. *Source*: ISL 2012 based on Baltic Exchange

It was not before April/May until it finally became evident what was really driving the markets. According to figures from Clarkson Research, the Chinese imports of iron ore (which accounted for 52 % of all seaborne iron ore trade in 2008 already) were skyrocketing once more, increased by an unbelievable 41 % in the year of the biggest post-war-economic downturn, turning around the fortunes of the dry-bulk market on its own. With hindsight, this development became understandable:

Generally speaking, trade is a function of the prices of a commodity in the domestic country, the foreign country and the tariffs and freight (Stopford 2009, p. 16). In 2008, both the freight for shipping iron ore to China as well as the international commodity prices had reached historical heights. Yet, China reached a new all-time high of iron ore imports in that year. When in 2009, both the freight rates as well as the commodity prices fell sharply, the price of imported iron ore was almost halved from the point of view of the Chinese steel mills.

Whilst China thus saved the dry bulk markets in the short run, the fundamental problems of a too large orderbook remained and when the delivery of new bulk tonnage finally soared during 2010 and 2011, the earnings finally came under the expected pressure (see Fig. 1.21). Early in 2012, the dry bulk shipping markets are likely going through the trough of this "mega-cycle".

1.1.5.3 The Crisis of the Tanker Shipping Industry in 2009: Forecasts and Outcomes

Crisis? What crisis? Late in 2008, very large crude carriers (VLCC's) were doing quite fine on both the spot and time-charter markets. According to figures from Fearnleys research, modern VLCC tonnage could still fetch 1-year time charter contracts valued at around US$50,000/day late in 2008, which is a very acceptable

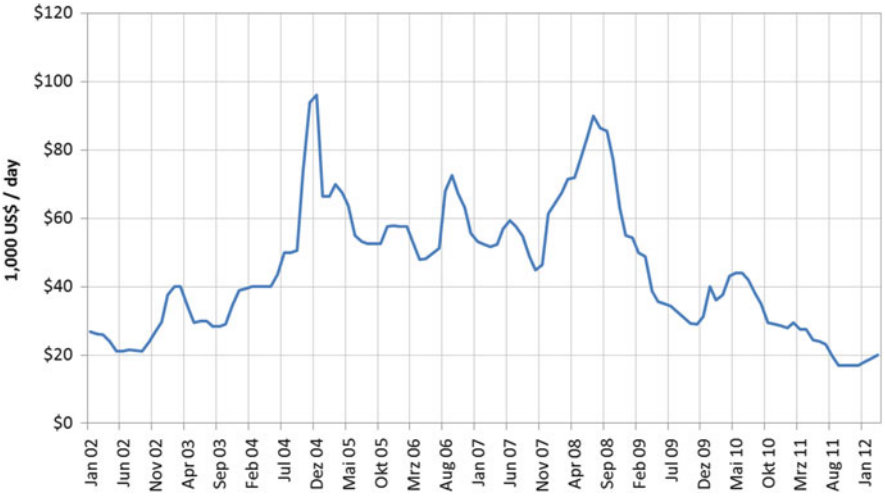

Fig. 1.22 Development of 1-year time charter rates for Very Large Crude Carriers (VLCCs) 2002–2012. *Source*: ISL 2012 based on Fearnleys

level for ship-owners (see Fig. 1.22). Yet, it is offsetting for shipping market analysts, as the fleet (the supply side) has been growing at an accelerated pace throughout the years from 2003-2008 and was set for further dynamic expansion in 2009 and 2010, whilst the crude oil demand, being centered in the industrialized economies, was expected to decline sharply in line with the economic downturn.

A couple of special developments have been taking place at the end of 2008—early in 2009 which have affected the supply and demand side of the tanker markets beyond what can be seen from the pure fleet and trading volume statistics.

First, piracy increased sharply in the Gulf of Aden around the year 2008. As a result, a lot of tanker operators chose to avoid the passage through the Suez Canal and instead opted for a routing around the Cape of Good Hope. Thus, the average haul of the commodities was artificially increased, leading to a higher demand for ton-miles.

Second, a number of the older single-hull units of the fleet were already earmarked for timely scrapping. When suddenly earnings on the dry bulk shipping markets spiked, some of the tanker owners took a different strategy and decided to convert their tankers into dry bulkers. This conversion is hardly ever economically viable and probably adds to underline the extreme nature of the dry bulk earnings of those years. Consequently, the supply side of the market was reduced.

The third and fourth element can be traced back to the falling oil prices. Before the collapse of Lehman Brothers, which became a synonym for the start of the global recession in 2008, crude oil had become increasingly expensive, passing the US$130/bbl mark around mid of 2008. When crude oil prices fell sharply in the following months,

- The largest consumers started to import additional volumes to fill up their reserves, generating an additional demand
- Speculative traders bought huge quantities of the energy resource, expecting to be benefiting from a recovery in prices. They then chartered VLCCs to store away the oil for the time being. According to Lloyds Shipping Economist, early in 2009 between 50 and 70 units of the roughly 530 strong fleet of VLCCs have been tied up in these kind of storage contracts, cutting into the fleet productivity and, hence, reducing the supply side.

Lastly, a fifth element came into play here which is disguised in the combination of the fleet statistics, the trading volume and the charter rates. Early in 2010, Clarksons Research published an analysis of the number of spot voyages, which the older single-hull tankers have been conducting per year.[8] According to this research, this figure peaked in the strong markets of 2004 at close to seven fixtures per ship, but has been declining ever since, as sufficient modern tonnage came into the markets and was more sought for by the charterers. By the year 2009, the average number of fixtures/year for the older single-hull tankers had reportedly fallen as low as 2.5. Hence, the development of the total tanker fleet in comparison to the total seaborne trade can be misleading here, as the total tanker fleet also contained a stock of less-desirable single-hull tankers, whereas the time-charter rates portrayed for example by brokers like Fearnleys generally refer to the more modern double-hull vessels. Favoring the more modern vessels is inarguably a political decision carried by the shippers of the cargoes and, hence, an element of the demand side.

Like on the container shipping and dry bulk shipping markets, it was foreseeable that these special developments could not out-run the market fundamentals forever and the tanker markets are early in 2012 also considered to be going through the trough of their own cycle.

1.2 Analysis of the Market Cycles

Shipping always has been and always will be a cyclical industry. Stopford (2009) found evidence of shipping cycles dating back more than 260 years.

1.2.1 Different Types of Shipping Cycles

Generally, the analysis of Stopford (2009, pp. 95–97) suggests three types of trade cycles:

[8] See: http://www.clarksons.net/markets/feature_display.asp?section=&news_id=29828&title=Mysterious+Tanker+Disappearing+Trick+%96+We+Reveal+All.

- **Seasonal cycles**
  These are regularly reoccurring annual upswings and downturns of shipping demand. In an otherwise balanced market, these cycles may have a noticeable impact on the freight markets Examples include:
  - The summer peak season in container shipping, which results from the stockbuilding in the western economies in summer/autumn and is reinforced by the Chinese new year holidays at the beginning of the year. As a result of the Chinese ascend to the workbench of the world, the Chinese Lunar Holiday has an impact on port handling volumes worldwide, which can also be seen in the monthly container port statistics of the Institute of Shipping Economics and Logistics (ISL)[9]
  - The higher crude oil demand of the western hemisphere resulting in stocking up movements before the winter
  - The timing of the grain harvests
  - The harvests of fresh fruits (relevant for the reefer trade)
- **Short cycles**
  These are the classic shipping cycles which have four identifiable stages:
  - A trough
  - A recovery
  - A peak
  - A collapse

  Each of these stages has some clearly identifiable characteristics (Stopford 2009, p. 98) and together they coordinate supply and demand in the shipping market. Examining these cycles on the dry cargo freight markets between the years 1741 and 2007, Stopford found 22 cycles with average peaks of roughly 4 years and average troughs of 7 years.
- **Long shipping cycles**
  which "are driven by technical, economic or regional change" (Stopford 2009, p. 98). These long lasting economic cycles have been examined by Kondratieff and Schumpeter. Whilst of economic relevance, their impact on the shipping markets is hard to quantify as is their individual state.

1.2.2 Lessons Learned from the Various Cycles

The short term shipping cycles are an unavoidable reality of the markets and are unlikely to be overcome, as the supply side can only react to changes of the demand side with a time-lag for it takes time before the new ships can be delivered in

[9] See also ISL Monthly Container Port Monitor. This regularly reoccurring demand fluctuation can be recognized in Fig. 1.20 of this chapter.

strong markets or older units are finally being removed from the markets in weak times. Generally, "Freight cycle peaks and troughs are produced by the inelastic demand curve moving along the supply curve" (Stopford 2009, p. 173). Sadly for the analysts, Stopford found out that no cycles ever resemble each other and that the variance in the length of the peaks and troughs is quite noticeable.

1.2.3 Lessons Learned in the Last Boom Period (2002–2008)

One feature of the previous mega-cycle[10] certainly was the increasing dependency on one new key-player in the shipping markets. The People's Republic of China is the most important exporter of containerized merchandise, the most important importer of dry bulk cargoes and has surpassed Japan as Asia's leading importer of crude oil. Whereas in the container shipping market, much depends on the demand of the consumer-powerhouses in northeast Europe, China has already demonstrated that its demand swings can turn around the fortunes on the dry bulk shipping markets in extremely short times. The (shortlived) spike that can be seen in the Baltic Dry Index diagram late in 2011 is an example of such a demand spike by Chinese iron ore stockbuilding. As soon, as this cyclical demand levelled off, early in 2012, the BDI hit a new all-time-low.

Another particular development in the collapse of this cycle was the increasing unreliability of forecasts in the face of the severe economic downturn. Within just 8 months time, the assessment of the increase of the global economic output was slashed from a robust 3.9 % growth, suggesting a vivid increase in seaborne trade volumes, to a global recession of −1.4 %, suggesting an only limited growth respectively a decline in the development of seaborne trade (see Fig. 1.23).

Furthermore, the vessel deliveries of the years 2009, 2010, and 2011 suggest that the orderbook has partly lost its high degree of reliability in the short run. Whilst for bulk carriers, it became clear that the yards would not be physically able to construct the massive contracted volumes on time,[11] the genuinely foreseen box-ship deliveries for the year 2009, which seemed more feasible have been postponed on a massive scale.[12]

[10]In line with the definition of the stages of a cycle, the current trough experienced on all three of the major shipping markets is considered to be the beginning of the next cycle. Ordering activity is declining, scrap volumes are high and while trade volumes are growing, the seed for a recovery is sown.

[11]New records were met in the delivery of dry bulkers continuously though and in 2011, the total volume of delivered dry bulk tonnage exceeded the tonnage volume of all merchant vessels delivered in 2007 according to databases from IHS Fairplay.

[12]According to the IHS Fairplay orderbook database as of autumn 2008, a total of 468 vessels with a capacity of slightly more than 1.8 M TEU was earmarked to go into service in 2009. In Hindsight, only 265 of those units with a capacity of close to 1.1 M TEU were actually delivered.

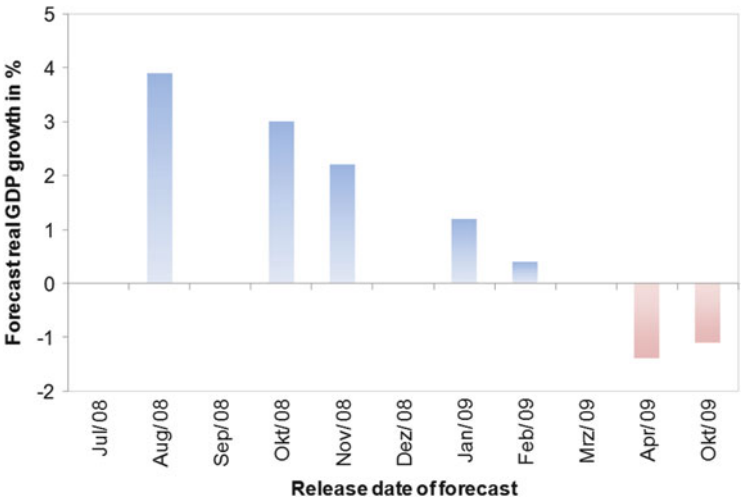

Fig. 1.23 Evolution of forecast world GDP growth for the year 2009. *Source*: ISL based on IMF World Economic Outlook (various issues)

If anything, the crisis has left the ship finance industry as well as shipping investors more risk-aware and the banks are requiring higher degrees of private equity to be willing to grant finance for new vessels.

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