Shipping Indexes Signal Global Economic Trends

International trade is the centerpiece of the global economy; the United States increasingly turns to foreign suppliers for many consumer goods it once produced domestically. Yet, many studies of international trade emphasize only the starting and finish lines of the supply chain, with little consideration of how goods arrive at their final destination. A closer look at the logistics reveals a story of competition and innovation, in which a complex and dynamic network of ships moves the vast majority of traded goods across the world's oceans. A number of indexes document two principal sectors of maritime shipping—dry bulk and container cargo—and are believed to foretell broader production and commercial developments. Understanding the methodology used in these measurements aids the understanding of international trade trends and their implication for recovery from the global financial crisis.

Dry Bulk Market

Baltic Dry Index: An Industry Standard

The Baltic Dry Index (BDI) measures shipping costs for dry bulk commodities, including coal, grain, iron ore, finished steel and other metals, minerals and similar materials. Representatives of the Baltic Exchange, the ship brokers' association responsible for publishing the index, canvass a panel of members daily and gather charter rates (in U.S. dollars) for representative cargoes and routes. In a "time charter" system, agents seeking to transport cargo typically work through brokers, who hire a ship at a per diem rate. The charter is active from the moment the ship's owner delivers a vessel for voyage until it is returned free of cargo. Charters may be thought of as a type of forward agreement: Both brokers and their clients gain the security of set income and availability at the risk of losing out on favorable future price movements. Additionally, the Baltic International Freight Futures Exchange uses the BDI as a settlement index, providing sellers and buyers a baseline for futures contracts used to hedge charter rates.

The BDI began in 1985 as the Baltic Freight Index, based on a weighted average of shipping costs on 13 trade routes: grain (five routes), coal (three routes), iron ore (one route) and general charter (four routes).[1] The Baltic Exchange reserves the right to modify these routes or their weightings, and since 1985, the number of routes included in the index has increased to match trade volumes. In October 2001, the BDI underwent major expansion to cover 26 shipping routes and four vessel sizes: Handysize, Supramax, Panamax and Capesize.[2] Their names refer to limits on their ability to transit the Panama Canal: Handysize and Supramax ships have no restrictions due to size, Panamax are at the limit for passage and Capesize are too large for the canal and must travel around the Cape of Good Hope off South Africa or Cape Horn at the tip of South America. These carriers typically transport cargo in lots exceeding 10,000 dead-weight tons (DWT); most often, a single client books an entire vessel for one cargo type. These size classes comprise 36 percent of the merchant and nonmerchant global fleet of ships.[3]

The Baltic Exchange employs a methodology that preserves the continuity of the BDI through vessel and route modifications by calculating a time-charter average (TCA), a standard metric used in the shipping industry to assess the daily average revenue performance of a given vessel. Expressed in U.S. dollars per voyage day, the TCA is computed by subtracting expenses such as port costs from voyage revenue and dividing the adjusted number by the number of voyage days. The TCA for an entire vessel class is found by taking the average of all individual TCAs. The composite

BDI is the product of an unweighted average of TCAs for all vessel classes and a "continuity multiplier," which changes when routes or vessel classes are added to or removed from the index. The BDI calculation is

BDI = (CapesizeTCA + PanamaxTCA + SupramaxTCA + HandysizeTCA)/ 4 * 0.113473601

As an index for the dry bulk shipping industry, the BDI's advantages are its rich historical data, large underlying membership and daily frequency of time charter rates. The index has gained a reputation as a bellwether of economic activity and is used to forecast industrial production and economic growth. Unlike forward rate agreements, the index lacks a speculative component; in theory, it operates according to the fundamentals of supply and demand for ship capacity in real time. An index that trends upward means shipping prices are being bid up. This should signal rising demand for shipping space and accelerating economic activity.

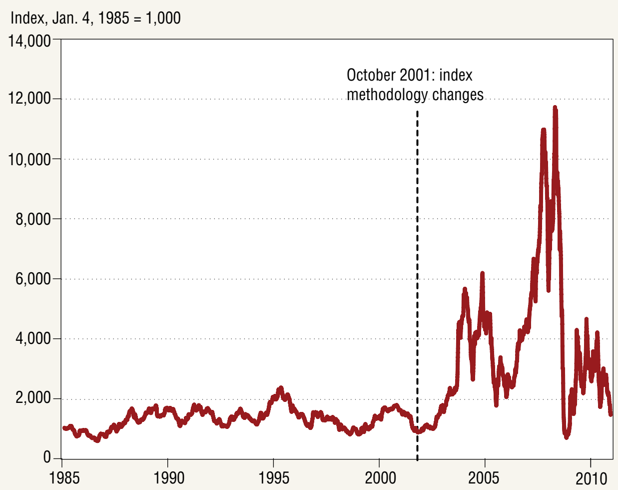
However, critics downplay the BDI's predictive power. China's rapid industrialization, they say, has shifted the index to reflect Chinese demand for commodities. They also point to commodity futures markets as providing better metrics for predicting future demand and to overcapacity that plagues both dry bulk and container fleets. In normal circumstances, the critics say, the index may hint at the direction of activity, but the financial crisis has revealed instability in the measure that makes it unsuitable as a predictive tool.

Supply Sensitivity Causes Volatility in BDI

A closer look into the methodology of the BDI reveals that index values may change even if underlying demand for capacity does not. Since the BDI approximates the prevailing rate for cargo space, the index may drop if excess space—added capacity for which no demand exists—comes online. This pattern occurs frequently in the shipbuilding cycle, as shipbuilders respond to high demand by ramping up construction of vessels, which require two to three years to complete. By then, demand may have diminished and these deliveries may not be needed. Additionally, shipyards do not adjust output quickly and will offer low vessel prices in a depressed market to unload excess inventory. This combination of delayed supply and prolonged periods of excess capacity causes shipbuilding cycles to last longer than broader business cycles. The BDI becomes especially volatile when supply and demand for shipping capacity change simultaneously, as occurred during the recent shipping bust (*Chart 1*).

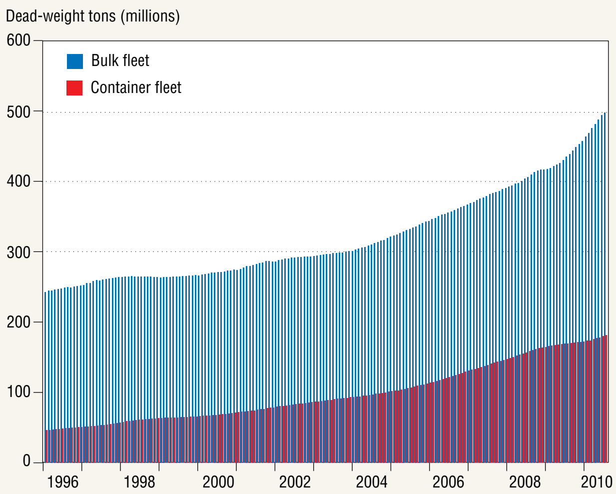
After a 2005–07 shipping boom, the BDI dropped 94 percent from May to December 2008 during the throes of the global financial crisis. In June 2010, the index averaged 2,375, a fourfold increase from the December 2008 trough, but still more than 2,000 points off the three-year average.

Chart 1
The Baltic Dry Index



SOURCES: Baltic Exchange; Bloomberg.

Chart 2
Dry Bulk and Container Ship Fleet Growth



SOURCE: Clarkson's Shipping Register 2010.

From last May 25 to July 16, the index dropped from more than 4,000 points to just above 1,700, an almost 58 percent decline. After rallying in the fall, the index fell again to close out 2010 below 1,800.

Also, dry bulk goods are used principally to produce other goods, and demand is dependent on when finished goods come to market. Rice and grain can arrive in consumer markets quickly, while iron ore manufactured into steel requires more time. Thus, even if raw goods shipments are expanding, when the supply chain will move these items into their finished stage isn't clear. Economic surprises, unanticipated pricing changes, tariffs and quotas can disrupt the supply chain and delay manufacturing, complicating the BDI's ability to predict the direction and pace of global economic activity.

The Container Ship Market

A ship carrying dry bulk cargo usually transports a single type of load, such as iron ore, coal or grain. Container ships, by comparison, typically carry a wide variety of finished goods from a multitude of sellers. Before the standardized shipping container gained popularity in the 1950s, moving such cargoes was inefficient and even dangerous.[4] An International Organization for Standardization (ISO)-approved standard container measures 20 x 8 x 8.5 (twenty-foot equivalent unit, TEU) or 40 x 8 x 8.5 (forty-foot equivalent unit, FEU) and provides ship owners with homogeneous cargo, mechanized loading and discharging systems, and streamlined transport across ship, truck and rail.[5]

As of August 2010, 4,914 container ships with a carrying capacity of 178 million DWT sailed in the world fleet, compared with 7,748 dry bulk carriers with a capacity of 500 million DWT. From 1990 to 2006, the worldwide container ship fleet grew 9.2 percent, while the dry bulk fleet expanded more slowly, 3.2 percent.[6] However, since 2009, the dry bulk fleet has grown significantly faster than the container ship fleet (*Chart 2*).

While the dry bulk market has its de facto standard measure of costs, no single standard serves such a role for container shipping. Instead, ship brokers' associations assemble indexes based on data from member fleets. Container ship indexes measure either container ship spot rates or time-charter rates. Spot rate indexes record the current cash price of transporting an ISO-approved container across a designated route for immediate payment and delivery and serve as a sector snapshot of the container ship market. For example, Drewry Shipping Consultants releases a container ship spot-rate index that tracks the cost of transporting an FEU container between Hong Kong and Los Angeles. By comparison, time-charter data for container ships are calculated the same way as for dry bulk shipping and are provided in earnings per voyage day.

The container ship market reached record lows in port traffic, spot prices and time-charter rates during the global financial crisis. A disparity between cash and charter rates grew as liner companies, coping with low import volumes, reduced capacity by returning vessels as soon as charters expired. Sellers also managed risk by signing shorter charter contracts, further depressing prices.

Container fleet capacity grew 6 percent in 2009, while demand fell 11 percent. In 2010, even with slow steaming—a tactic by liners to reduce the speed of ships in their fleet, keeping ships full of cargo longer—and scrapping, which analysts estimate effectively reduced capacity growth to 1 percent of current fleet size, supply exceeded demand by 12 percent.[7] Meanwhile, 36 percent of scheduled deliveries never materialized due to cancellation or postponement. Accordingly, orders for new container ships fell 26 percent, with 94,720 TEU contracted for in 2009, representing less than 2 percent of ships already on order. Meanwhile, liners scrapped 340,000 TEU in 2009, a record high, though most retired vessels were small. Disproportionate growth in large, Capesize class container ships offset the impact of scrapping.

In 2010, 2.1 million TEU were scheduled to enter the container fleet, including 1.4 million in the Capesize class. However, analysts at Danish Ship Finance, a Copenhagen-based financing firm, estimate that liners deferred 760,000 TEU until 2011 and undertook more extensive scrapping (an estimated 390,000 TEU) and slow steaming to compensate for the rapid capacity expansion.

Harper Petersen Index (HARPEX)

HARPEX is a container ship charter rate index released by Harper Petersen and Co., a ship broker based in London and Hamburg. Like the Baltic Exchange, Harper Petersen collects information from its members. Instead of using shipping routes as a unit of analysis, HARPEX weights average daily charter rates across eight size classes of vessels to formulate its index.

Harper Petersen calculates an average vessel rate based on the number of charter parties using a given ship and defines eight ship classes by storage capacity, speed and charter length (the duration that clients contract to use ship space). This average takes into account a base rate for each class of vessel, defined as the sum of the cost of capital invested in the ship, which depreciates over time, and operating costs. Then, an index for each vessel class is compiled based on how the average vessel rate compares with its base rate. Individual indexes are weighted by class and averaged to form the composite HARPEX index, reported weekly (*Chart 3*).

Clarkson's ClarkSea Time Charter Index

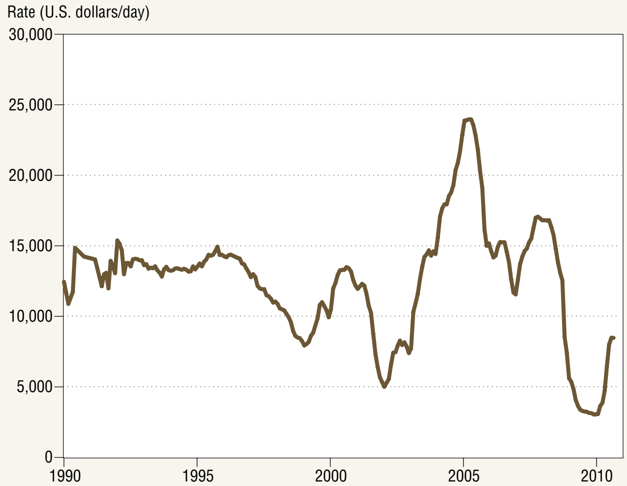
Clarkson's, a ship broker based in London, publishes weekly time-charter average earnings for all vessels in the container market, making it the most broad-based such measure of shipping rates (*Chart 4*). According to Clarkson's, its gauge, the ClarkSea Time Charter Index, is the only published weekly indicator of earnings for all principal commercial vessel types. Figures are estimated as daily time-charter equivalents of voyage freight rates and are expressed in U.S. dollars/day per voyage. Unlike the HARPEX index, which uses freight rates dependent upon its eight vessel classes, Clarkson's calculates earnings based on a single freight rate and publishes rates for only the newest vessels. These methodological differences have not proven consequential: HARPEX and Clarkson's

Chart 3
HARPEX Index, 1995–2010

SOURCE: Harper Petersen Ship Brokers.

Chart 4

Clarkson's ClarkSea Time Charter Index



SOURCE: Clarkson's Shipping Register 2010.

Chart 5

Hamburg New Contex Index, 2007–10

SOURCE: Vereinigung Hamburger Schiffsmakler und Schiffsagenten e. V.

data track each other with high correlation, a comparison of the two shows.

Hamburg Shipbrokers' Association New Contex Index

The Hamburg Shipbrokers' Association (VHSS) New Contex Index reports time-charter data from member brokers in Hamburg, Copenhagen, London and Paris (Chart 5). The index's strength is its breadth: More than 50 percent of the worldwide container fleet operates from Germany, and Hamburg brokers control 75 percent of all container charter tonnage, according to the VHSS. However, the dataset is not as comprehensive as Clarkson's since VHSS surveys only its members. The composite index is an analysis of container ship time-charter rates based on 20 to 30 Hamburg freight brokers across 10 size categories and a minimum charter period of three months. In this sense, the New Contex Index provides more granular data than Clarkson's index, which is a composite earnings benchmark. Since its creation in October 2007, the New Contex Index has tracked closely with Clarkson's, though its relatively short history limits its usefulness.

Producer Price Indexes

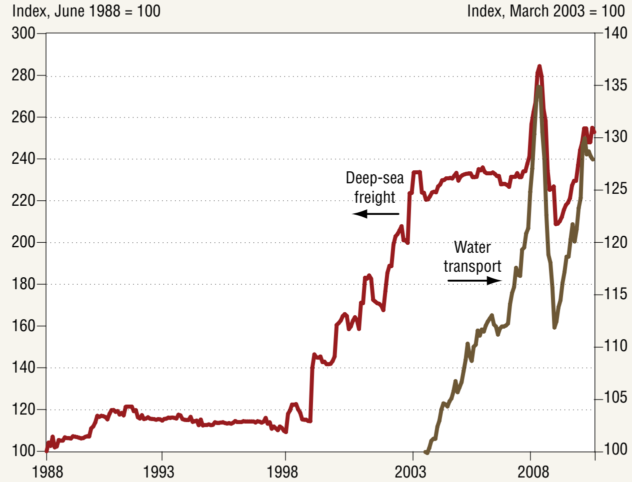
The U.S. Bureau of Labor Statistics (BLS) compiles producer price indexes and reports relative price changes for water and deep-sea freight transport (*Chart 6*). The water transport index includes inland shipping, while the deep-sea freight index focuses on open-water transport. The BLS systematically selects for polling U.S. manufacturers within an industry that seek unemployment insurance (as classified by the North American Industry Classification System). Because the probability of a firm's selection increases as its employee count rises, the survey appears weighted toward larger firms. Using disaggregation, a statistical technique in which the firms' goods are categorized according to how much they contribute to overall revenue, the BLS determines products and services to be included in its survey. Disaggregation is carried out until specific products sold to specific buyers are identified and tracked over time.

Producer price index participants report for seven years, and the survey sample for each industry grouping is much larger than any other shipping trade index. These characteristics translate into low implied index volatility. However, the reliability that the index's large sample size achieves comes with a loss of precision. The BLS collects price data from all U.S.-based firms within the deep-sea freight industry, not just charter rates for container and dry bulk shipping. Participants are guaranteed confidentiality, so observers cannot know what proportion of the price index is composed of information from tonnage providers, dock operators, ship liners or other water transport entities. Finally, the BLS's reliance on U.S. firms excludes the large industry segment based outside the country.

Table 1 shows pair-wise correlation statistics between dry bulk and container indexes and prices for bunker fuel, a key variable ship cost. The HARPEX and BDI do not move in step, with a correlation coefficient equal to 0.16 from 1995 to 2010. (A coefficient of "1" would theoretically indicate complete agreement between the indexes.) What causes the disparity? Demand for commodities and finished goods do not move contemporaneously, but should peak and trough in a cyclical fashion: Finished goods are particularly sought during economic booms, while demand for raw goods generally lags behind and lasts longer as sellers replenish inventories depleted during periods of sustained demand. A year-over-year comparison, offering a more general view of index movements, provides a closer relation between the BDI and HARPEX, with a correlation coefficient of 0.7. Worth noting is the difference in volatility present in the BDI for 1995–2001 compared with 2001–10, which suggests that an adjustment in index methodology may have played a role in how the BDI compares with other shipping indexes.

The BDI and the producer price index similarly lack correlation, with a coefficient of 0.08 before 2001 and –0.03 afterward. The producer price index draws on data only from companies seeking unemployment insurance in the United States; by comparison, only one of the BDI ship brokers' data providers is a U.S. firm (John F. Dillon and Co.). While both indexes measure aggregate prices for maritime shipping, they share little methodological common ground. Indexes for the container shipping industry, on the other hand, track each other to a high degree. HARPEX and Clarkson's have the highest correlation in the analysis, 0.76, over the entire sample range.

Chart 6
Producer Price Indexes for Deep-Sea Freight and Water Transport



SOURCES: U.S. Bureau of Labor Statistics; Haver Analytics.

Shipping Indexes and Energy Prices

Even with maritime transport's economies of scale, moving thousands of tons of cargo still requires significant maintenance and fuel expense. The cost of bunker fuel, as an input to production, affects time-charter and spot rates and likely influences dry bulk and container ship indexes. As anticipated, the correlation coefficient between

No. 6 crude oil (bunker fuel) and the BDI is higher than the correlation with any other index, 0.35 for 1986–2010. Following the index revision in 2001, the BDI began to track more closely with bunker fuel prices, 0.4.

Oil prices, however, appear to factor less into container shipping market indexes. The correlation coefficient between the HARPEX index and bunker spot prices is 0.2 for 1995–2010; between Clarkson's index and bunker oil, 0.26. One reason for the disparity: Materials classified as "dry bulk" are denser than container cargo, meaning that for a given volume and distance, dry bulk cargoes are heavier and more energy-intensive.

Conclusion

Maritime shipping markets for bulk and container cargo have rebounded since the global financial crisis, but industry indexes have not converged to signal a future path. While container shipping seems to have recovered, reflecting global trade volumes, dry bulk commodities, as measured by the BDI, have faltered and still exhibit high volatility. Dry bulk shippers continue to confront excess capacity in an uneven demand environment. Fleets expanded rapidly during the 2005–07 shipping boom in both container ship and dry bulk sectors, especially in the larger ship classes. Heightened demand spurred investment to increase vessel capacities and encouraged intense investment in shipbuilding. As a result, China solidified its presence as a top-tier shipbuilding nation, while orders for new vessels and earnings reached record highs. The global financial crisis hit shipping especially hard, as sellers kept inventories low amid a scarcity of credit. Weak final demand created significant capacity surpluses, following the boom-period fleet additions. With emergence of a new pace of trade, vessel scrapping intensified amid sluggish growth in advanced markets.

By examining the methodology used to create the sector's indexes, we understand how reliably

Table 1

Comparison of Shipping Rates

(Pair-wise correlation table of shipping indexes and fuel cost*)

January 1995–September 2001

	Baltic Dry	Clarkson's	HARPEX	Producer price index	Bunker fuel	Standard deviation
Baltic Dry	1	0.28	0.20	0.08	0.21	0.08
Clarkson's	0.28	1	0.61	0.07	0.17	0.07
HARPEX	0.20	0.61	1	0.15	0.21	0.06
Producer price index	0.08	0.07	0.15	1	0.16	0.02
Bunker fuel	0.21	0.17	0.21	0.16	1	0.10

October 2001–November 2010

	Baltic Dry	Clarkson's	HARPEX	Producer price index	Bunker fuel	Standard deviation
Baltic Dry	1	0.20	0.15	–0.03	0.40	0.21
Clarkson's	0.20	1	0.83	0.24	0.28	0.07
HARPEX	0.15	0.83	1	0.36	0.18	0.06
Producer price index	–0.03	0.24	0.36	1	0.10	0.02
Bunker fuel	0.40	0.28	0.18	0.10	1	0.10

*Due to its brief history, the Hamburg Index is not included in the correlation analysis.

SOURCE: Author's calculations.

they capture the state of global markets as well as the potential for predicting future economic activity. Shipping indexes can measure time-charter rates, spot rates or aggregate prices, and all rely on survey data gathered from or estimated by panelists, participants or members of ship brokering associations. Evaluation of these indexes suggests that dry bulk shipments tend to face mismatches in the timing of supply and demand because of the relatively long lifespan of the bulk cargo fleet, while container ships are more versatile, carry cargo from many sellers and are generally smaller. Although the BDI remains the industry standard for dry bulk shipping, the container shipping industry has multiple indexes that generally track one another closely. However, differing sample sizes as well as methods of indexing, data collection and aggregation introduce relative strengths and weaknesses for each measure (*Table 2*). Such differences may yield index values that are biased or do not reflect the totality of global shipping activity and illustrate the importance of a careful and holistic evaluation of all evidence when offering analysis or predicting future trends.

—Payton Odom

Notes

[1] Martin Stopford's *Maritime Economics* text contains a comprehensive discussion of the Baltic Dry Index and is cited throughout this article. See *Maritime Economics*, by Martin Stopford, London: Routledge, 2009.

[2] Information on the composition and calculation of the Baltic Dry Index comes from the Baltic Exchange's *Manual for Panelists: A Guide to Freight Reporting and Index Production*, www.balticexchange.com.

[3] "Review of Maritime Transport 2010," United Nations Conference on Trade and Development, New York and Geneva, 2010.

[4] See *The Box: How the Shipping Container Made the World Smaller and the World Economy Bigger*, by Marc Levinson, Princeton: Princeton University Press, 2006.

[5] See note 1, Stopford, p. 574.

[6] See note 1, Stopford, p. 370.

[7] "Shipping Market Review," Danish Ship Finance, Copenhagen, April 2010.

Table 2
Summary of Shipping Indexes

Index	Type	Method	Advantages	Disadvantages
Baltic Dry	Dry bulk	Time-charter equivalent earnings average across four size classes	Historical data, large membership listing, industry standard status	Subject to overstated volatility due to fixed supply, changes in methodology affect volatility of index, simple average calculation ignores contributions to price changes by different vessel classes
HARPEX	Container cargo	Time-charter equivalent earnings across four size classes	Measures and weights eight size classes of container ship, includes vessel prices for previous four years	Near-perfect correlation with Clarkson's but with smaller sample size
Clarkson's	Container cargo	Weighted average of all container ship earnings	Most comprehensive and longest spanning of container series	Earnings based on a single freight rate and only most-modern vessels are used—potential for bias on the upside
Hamburg	Container cargo	Time-charter equivalent weighted across 10 size classes	Only company-independent analysis of time-charter rates	Limited history and sample size
Producer price index	All water transport and deep-sea freighting	Price data from a sample of firms' products and services over time	Large sample size, low index volatility, only capture of aggregate price level that is not an average across different size classes	Only captures data from U.S. shipping companies, weighted toward larger firms, does not distinguish between charter rates and other services involved in water transport, does not distinguish between liners and bulk shippers nor between cargo types