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## The Dynamics of the Dry Bulk Sub-Markets

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*International shipping plays a vital role in global trade. As history has shown, shipping is a cyclical and volatile industry and its evolution is strongly correlated with other industries. In this sense, the analysis of different shipping markets may provide useful and reliable information regarding the worldwide economic activity. The indices produced by Baltic Exchange offer a comprehensive outlook of different shipping markets. Moreover, the analysis of their dynamics from a time period to another improves price transparency and market understanding.*

**Keywords:** *market; shipping; exchange*

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### Introduction

Baltic Exchange produces a wide variety of shipping indices covering different vessel sizes and different cargo types. These indices provide useful and reliable information that may be considered fair and accurate representations of prevailing market conditions. The indices have been introduced successively in order to track a better progress in each sub-

market. Therefore, they are widely recognized as being unflinching indicators of market conditions in the shipping industry, improving price transparency in a market that has always been very secretive.

These indices are baskets of spot freight rates designed to reflect the daily movement in rates across dry-bulk spot voyage and time-charter rates. No specific cargo or tonnage requirements are represented, but each route is given an individual weighting to reflect its importance in the world-wide freight market (Kavussanos and Visvikis, 2006).

The Baltic Capesize Index (BCI) considers cargo movements of Capesize vessels and consists of five voyage routes and four trip-charter routes. The voyage routes are quoted in terms of US\$/mt of cargo transported and the trip-charter routes are measured in terms of US\$/day for each day of hire. The voyage routes reflect freight rates for iron ore and coal cargoes. Regarding the trip-charter routes, they cover the four major trading routes on which Capesizes operate: Atlantic Trade, Pacific Trade, trips from the Continent to the Far East and trips back from the Far East to the Continent.

The Baltic Panamax Index (BPI) considers cargo movements of Panamax vessels of 74 000 mt dwt and consists of four trip-charter routes whose geographical structure is broadly similar to that of the Capesize routes.

The Baltic Supramax Index (BSI) reflects freight rates for a 52 000 mt dwt Supramax-type vessel and consists of six trip-charter routes whose composition is broadly similar to that of the BCI and BPI.

The Baltic Handysize Index (BHSI) reflects freight rates for a 28 000 mt dwt Baltic Handysize vessel and consists of six trip-charter routes that equally cover cargo movement in the Atlantic basin and in the Pacific basin.

The Baltic Dry Index (BDI) is a composite index of the Capesize, Panamax, Supramax and Handysize Timecharter Averages and came into operation on 1 November 1999, replacing the Baltic Freight Index – the first shipping index published by the Baltic Exchange. This index is considered to be a general market indicator for the dry bulk shipping.

Over the years, the contributing indices and the methods of BDI calculation have been modified. Currently, for the computation of BDI the following formula is used:

$$\left( \frac{\text{CapesizeTCavg} + \text{PanamaxTCavg} + \text{SupramaxTCavg} + \text{HandysizeTCavg}}{4} \right) * 0.113473601$$

where TCavg = Time charter average.

The BDI can be viewed as the equilibrium price of shipping raw materials, determined by the supply of cargo ships and the demand for transporting raw materials by ship.<sup>1</sup> The Baltic Dry Index is sensitive to changes in the demand for raw materials and oil price changes. Movements in the BDI are reflected in changes of global demand for manufactured goods. Moreover, this demand influences the price of crude oil, which in turn influences the cost of maritime shipping.

The Baltic Indices are calculated every market day by the Baltic Exchange from data supplied by a panel of independent shipbrokers. The freight rate which is reported in the market is the simple average of all the panel-lists' assessments received by the Baltic Exchange on that day. The average freight rates are then multiplied by a constant number to convert individual freight rates into an index number. The multiplier is a unique constant number for each route and reflects the importance of each component route for the calculation of the overall index. The composition of the Baltic routes has to reflect current trends and developments in the freight market and its updates are decided regularly by the Baltic Exchange and its appropriate committees, which consult with the industry, market users and derivative brokers to ensure that market information remains representative of market trends. In selecting the component routes, the Baltic Exchange is guided by the following three principles: market coverage, liquidity and transparency.<sup>2</sup>

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<sup>1</sup> Rodrigue, Jean-Paul; Corntois, Claude and Slack, Brian. *The Geography of Transport Systems*. New York: Routledge, 2006.

<sup>2</sup> Amir H. Alizadeh and Nikos K. Nomikos – *Shipping Derivatives and Risk Management*, Palgrave Macmillan, 2009

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## Literature Review

The academic literature provides various research papers on the dry bulk market and its representative indices. According to Veenstra and Dalen (2008) many of the industry indices are unreliable as indicators of market developments in shipping. Therefore, they suggest different approaches to index calculation and compare their results against the existing indices in the industry. The authors notice that if there is a large amount of data, weighted unit value indices are quite robust to weighting, matching and quality correction. Also, they perform a hedonic analysis which shows that there are no structural quality aspects that influence price indices. Furthermore, they estimate price indices which take into account the duration of contracts.

Due to the fact that the Baltic Dry Index is computed as an equally weighted average of the sub-market indices, BDI weights more on larger-size market. Thus, as a reference indicator, BDI may produce larger-size bias. Ko (2010) attempts to fulfill the need of searching for another indicator for the status of global dry bulk freight market by applying a dynamic factor model. By analyzing a dynamic factor model of the change rate of BDI constitutes indices, the author succeeded to measure the synchronicity and idiosyncrasy of the sub-markets in a unified framework.

Alizadeh and Talley (2011) investigate vessel and voyage determinants of individual dry bulk shipping freight rates, vessel and voyage determinants of the individual delivery times of chartered ships and the relationship between dry bulk shipping freight rates and laycan periods of individual charter contracts, by applying a system of simultaneous-equations on a large sample of individual dry bulk chartered contracts from January 2003 to July 2009. Their research highlights the fact that the Baltic Dry Index and its volatility represent one of the determinants of the laycan period.

Duru and Yoshida (2011) consider that previous and current index measures can generate fluctuations in long run and probably

simultaneous results. Thus, they attempt to construct a composite freight index based on averaging percentage changes year-by-year, by using monthly fixtures data of eight years including cargo, port and ship particulars. Also, the authors assess previous econometric models of dry cargo freight rate and seaborne trade. According to their research, life expectancy represents a significant indicator for both seaborne trade and dry cargo freight rates.

Stefanakos et al. (2011) examine the behavior of the dry bulk indices in order to prepare reliable market research. They use extensive regression analysis between indices related to Capesizes, Panamaxs, Supramaxes and Handysizes bulk carriers. According to their research, most of the results give a very good coefficient of correlation. In addition, the authors study the univariate probability structure of the indices which provide a better understanding of probabilities of occurrence of the value of the various indices for each examined time period.

The Baltic Dry Index is especially relevant for the trade of the least developed countries. The least developed countries consist of 48 countries located across Africa, Asia, Latin America and the Caribbean, with exports mainly made up of primary goods, many of which relying on bulk carriers for international transportation. Lin and Sim (2012) try to construct a new measure of trade cost, based on the Baltic Dry Index as an instrument for trade. The authors notice that the BDI generates a statistically significant and quantitatively large response in the trade of the least developed countries.

## **Data and Methodology**

In this study, different dry-bulk market indices produced by Baltic Exchange were analyzed because their dynamics reflect the evolution of each dry-bulk sub-market. By examining these indices, we can have a complete outlook of the dry-bulk market and we can observe their behavior in different time periods. Thus, the differences identified from a

time period to another may help us to look for the proper economic reasons. This kind of analysis may provide a better understanding of the shipping market and may increase market transparency.

For the empirical study, the daily data series of various Baltic Exchange indices were used, covering the following time periods: 01.1985 – 09.2013 Baltic Dry Index, 09.2000 – 09.2013 Baltic Capesize Index, Baltic Panamax Index and Baltic Supramax Index (in the case of BSI, for the time period 04.09.2000-30.06.2006 the BHMI values increased by 10% were used due to the change of the standard vessel), 05.2006 – 09.2013 Baltic Handysize Index. Data were collected from Baltic Exchange database and the analysis was performed with EViews 7.

#### 4. EMPIRICAL ANALYSIS

Table 1 and Figure 1 provide information regarding the evolution of the Baltic Dry Index in two different time periods. The first time period is characterized by a low volatility of the index which is reflected in a relative low standard deviation, skewness and kurtosis. The index has recorded values between a minimum of 554 points and a maximum of 2352 points, with a mean value of 1282 points. As the barometer of the dry bulk-market, the evolution of the BDI during 01.1985 – 12.1999 reflects a stable time period with low volatility, a recovery period after the early 1980s' economic recession. The level of shipping transactions was low due to the fact that consumers' confidence in shipping was affected. During those years, the shipping industry was not considered to be a profitable economic activity.

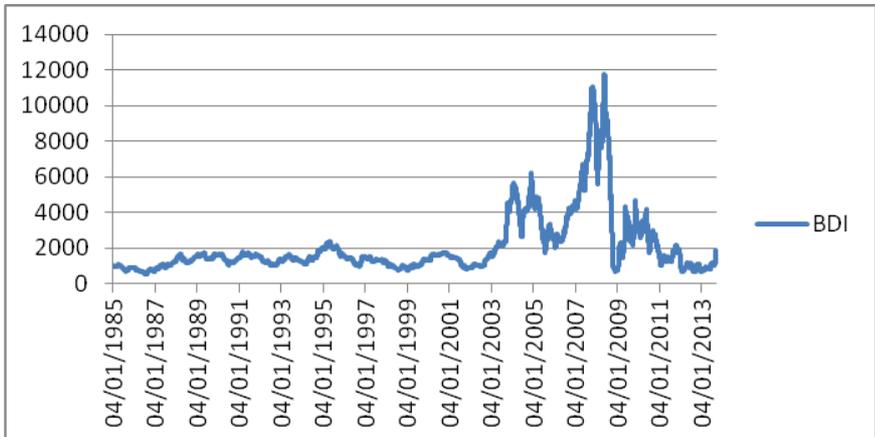
According to Table 1, compared to the first time period, the second time period is characterized by a higher volatility of the index which is reflected in a high standard deviation, skewness and kurtosis. The index has recorded values between a minimum of 647 points and a maximum of 11 793 points, with a mean value of 2889 points. In this case, the evolution of the BDI during 01.2000 – 09.2013 reflects an unstable time period with high volatility, determined by fluctuations of crude oil prices and of industrial productions. The strong industrial development in the economies of China, India and Southeast Asia, since the turn of the

twenty first century, has resulted in a significant increase of the annual growth rate of the demand for dry bulk commodities, leading freight rates to all time highs. During 2008, the financial crisis affected the shipping industry due to the fact that many industrial producers reduced or stopped their production. Overall, the index is extremely volatile in the last decade compared to the first 18 years of existence, as a consequence of the worldwide economic booms and recessions. Furthermore, volatility and cyclicity are inherent in the shipping industry.

**Table 1:** Descriptive statistics for BDI

Time period	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
01.1985 – 12.1999	1282,414	1287	2352	554	342,6156	0,344713	3,048197
01.2000 – 09.2013	2889,254	2133,5	11 793	647	2252,87	1,664262	5,627867

Source: own estimations



Source: own estimations

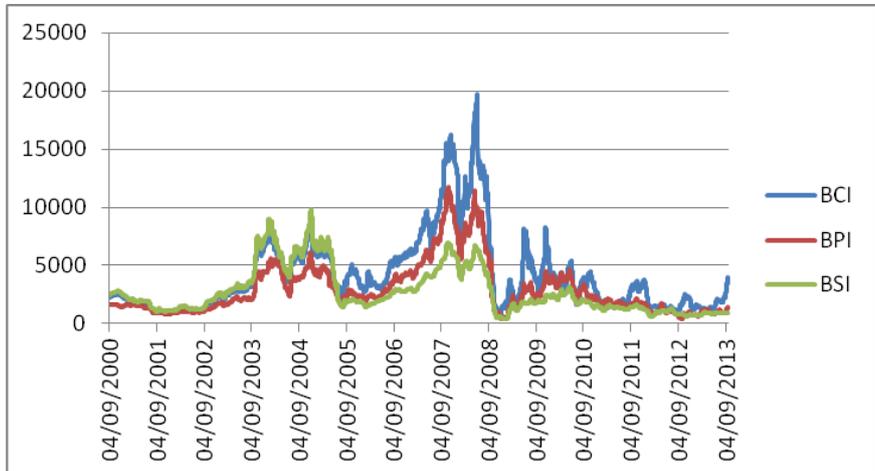
**Figure 1:** BDI during 01.1985-09.2013

Table 2 and Figure 2 provide information regarding the evolution of the Baltic Capesize Index, Baltic Panamax Index and Baltic Supramax Index during 09.2000 – 09.2013. Comparing these indices in terms of descriptive statistics, the Baltic Capesize Index seems to be the most volatile, followed by the Baltic Panamax Index and the Baltic Supramax Index.

**Table 2:** Descriptive statistics for BCI, BPI and BSI during 09.2000 – 09.2013

Index	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
<b>BCI</b>	4153,996	3108	19 687	830	3341,978	1,776570	6,310945
<b>BPI</b>	2914,721	2175	11 713	418	2235,543	1,589730	5,351021
<b>BSI</b>	2124,952	1686,3	6956	389	1386,4	1,326431	4,257245

Source: own estimations



Source: own estimations

**Figure 2:** BCI, BPI and BSI during 09.2000 – 09.2013

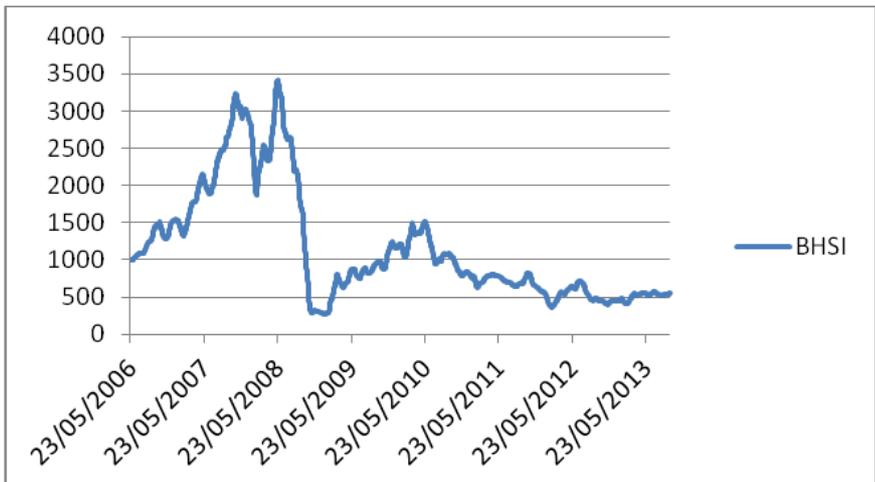
As far as concerns the Baltic Handysize Index, Table 3 and Figure 3 reflect its evolution during 05.2006 – 09.2013. It can be noticed that the

BHSI reached the highest volatility during 2006 and middle of 2008, recording a maximum value of 3407 points and a minimum of 268 points.

**Table 3:** Descriptive statistics for BHSI during 05.2006 – 09.2013

Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
1162,784	836	3407	268	773,9297	1,171325	3,326926

Source: own estimations



Source: own estimations

**Figure 3:** BHSI during 05.2006 – 09.2013

The Baltic Dry Index (BDI) is a composite index of the Capesize, Panamax, Supramax and Handysize Timecharter Averages. According to the Pearson Coefficient Correlation Matrix (Table 4), which was computed for the 09.2000 – 09.2013 time period, the BDI has the highest correlation with the BPI, followed by BCI and the lowest correlation with BSI. Also, it can be noticed that the correlation between BCI and BPI is stronger than the one established between BCI and BSI.

**Table 4:** Pearson Coefficient Correlation Matrix (09.2000 – 09.2013)

<b>Index</b>	<b>BDI</b>	<b>BCI</b>	<b>BPI</b>	<b>BSI</b>
<b>BDI</b>	1	0.98917	0.9915	0.77424
<b>BCI</b>	0.98917	1	0.96859	0.73652
<b>BPI</b>	0.9915	0.96859	1	0.76672
<b>BSI</b>	0.77424	0.73652	0.76672	1

Source: own estimations

## Conclusions

The indices produced by Baltic Exchange provide useful and reliable information, improving price transparency in a market that has always been very secretive. In this study, different dry-bulk market indices produced by Baltic Exchange were analyzed because their dynamics reflect the evolution of each dry-bulk sub-market. By examining these indices, we can have a complete outlook of the dry-bulk market and we can observe their behavior in different time periods. Thus, the differences identified from a time period to another may help us to look for the proper economic reasons.

As the leading index of the dry bulk-market, the evolution of the BDI during 01.1985 – 12.1999 reflects a stable time period with low volatility, a recovery period after the early 1980s' economic recession, when consumer's confidence in shipping was strongly affected. The strong industrial development in the economies of China, India and Southeast Asia, since the turn of the twenty first century, has resulted in a significant increase of the annual growth rate of the demand for dry bulk commodities, leading BDI to its all time high. Even though volatility and cyclicity are inherent in the shipping industry, BDI is extremely volatile in the last decade compared to the first 18 years of existence, as a consequence of the worldwide economic booms and recessions.

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