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Interrelations between dry bulk forward freight agreements and the dry bulk spot market

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INTERRELATIONS BETWEEN DRY BULK FORWARD FREIGHT AGREEMENTS AND THE DRY BULK SPOT MARKET

By

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DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

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ABSTRACT

Title of the Dissertation: **Interrelations between dry bulk forward freight agreements and the dry bulk spot market.**

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Dry bulk forward freight agreements (FFAs) are trading dry bulk indices, and thus have an impact on the dry bulk spot market.

The fast growing trade of FFAs should have a larger impact on the spot market, yet no study has estimated how the spot market will be affected by the growing FFA trade.

To evaluate the effect of the increase of FFA deals, the current interrelations should be first well defined. Consequently, the purpose of this dissertation is to analyse the interrelations between dry bulk forward freight agreements (FFAs) and the dry bulk spot market.

A brief review of the literature assists to concentrate on the four major aspects of the interrelations between FFAs and the spot market. The four major aspects of the interrelations are then investigated with numerous tools and approaches imported from economics, management or marketing.

Also, the concept and practices of FFAs are examined along with a study of the FFA market: its developments, its participants and its state of pure and perfect competition.

The study concludes with the major findings of the analysis which confirm the existence of multiple and complex interrelations between dry bulk forward freight agreements and the dry bulk spot market. Hence, the impact of a growing FFA can be extrapolated.

Key words: BDI, dry bulk FFA, forecast, supply and demand of FFAs, price distortion, BDI representativeness.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ARIMA	Autoregressive Integrated Moving Average
BCI	Baltic Capesize Index
BDI	Baltic Dry Index
BFA	Baltic Forward Assessments
BFI	Baltic Freight Index
BHSI	Baltic Handysize Index
BIFFEX	Baltic International Freight Futures Exchange
BPI	Baltic Panamax Index
BSI	Baltic Supramax Index
CFD	Contract For Difference
CIF	CIF is a screen-trading facility launched Clarkson Securities Limited, Ifchor S.A. and Freight Investor Services (FIS).
CMA	Centered Moving Average
FFA	Forward Freight Agreement
FFABA	Forward Freight Agreement Brokers Association
FIFC	Freight Indices and Futures Committee
FTSE	Financial Times Stock Exchange
ISDA	International Swaps and Derivatives Association
LCH	London Clearing House

LPG	Liquefied Petroleum Gas
NOS	Norwegian Futures and Options Clearing House
NYMEX	New York Mercantile Exchange
OTC	Over-The-Counter
S&P	Standard & Poors
SGX	Singapore Exchange
S-VECM	Simplified Vector Equilibrium Correction Model

Chapter 1 - Introduction

The shipping industry is capital intensive. Its largest source of finance is debt through bank loans. Some shipowning companies have diversified the origin of funds by going public. Some of them have been really successful to attract a large amount of funds through stock exchanges because investors were attracted by the booming revenue of some shipping sectors such as dry bulk cargo.

In finance, it is recognised that high yield often goes along with high risk. The shipping industry is not an exception. Risk management principles have been adapted to shipping and make it possible to identify three primary areas of risks (Gray, 1990, p. 23): market risk, financial risk and bunker risk. The first is by far the most damaging for the shipping industry.

A modern financial tool called the forward freight agreement (FFA) has been created to manage freight risk. Shipping companies have increased their use of FFAs in order to achieve a sustainable growth by managing freight risk and attract more funds.

If one was asked to give the fastest growing shipping market in the world between 2002 and 2005, few would be able to mention screen traded FFA (Imarex, 2007c). Even though, FFAs are still expected to grow, they are still perceived at the margin of the shipping industry. Since FFA is related to its underlying spot market, it is important to understand clearly the impact of FFA on the spot market. However, the consequences of a growing FFA market on the spot market are nowadays uncertain.

FFAs represent an important opportunity offered to operators in shipping to manage their freight risks. However, FFAs are a threat since a growing FFA market will have an unclear impact on the spot market. An investigation of this impact will permit spot market participants to anticipate it and therefore will reduce part of the uncertainty in the spot market.

FFAs can trade both dry and wet bulk freight; however, their characteristics are completely different. Therefore, this dissertation will focus only on the largest FFA market with presumably the largest impact on its spot market i.e. dry bulk FFA[1]. To assess the impact of the growing trade of FFAs on its underlying market, it is necessary first to understand the current interrelations between the spot and FFA market. That is the reason why this dissertation will undertake the analysis of the interrelations between the dry bulk FFAs and the dry bulk spot market.

This paper has not been written applying a pre-established methodology but one has been created for the purpose of this dissertation as shown in Figure 1.

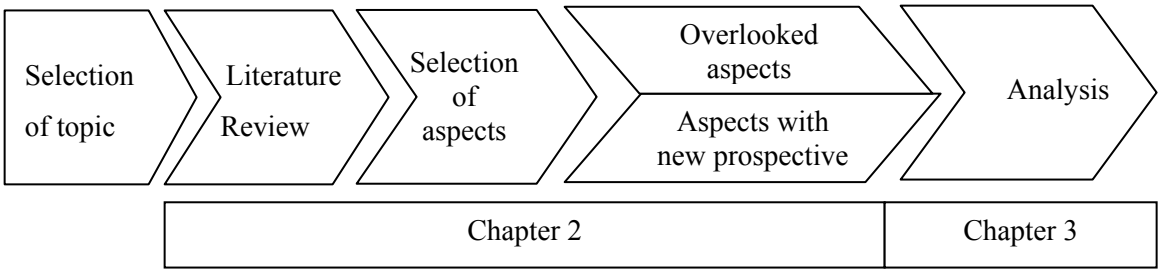

Figure 1: Methodology flow

Source: Author.

[1] As per Imarex (2007b), dry bulk derivatives amounted 60% in 2006.

The literature review will be carried out to emphasize on the progression of the research on the interrelations between the two markets. The objective is to avoid redundancy and to contribute to the research on FFAs. So, four major aspects of the interrelations of FFAs on the spot market have been identified and selected for further analysis because of their potential negative impact on the spot market or to provide a better understanding with an alternate prospective on some "hot" issue of the research.

The four aspects which have been selected are:

1. The impact on the Baltic indices of the growing influence of FFA traders.
2. The empirical limitation of the forecasting capabilities.
3. FFA pricing thanks to supply and demand of FFAs.
4. Possible price distortion of the spot prices by FFA traders.

Then, the four selected aspects will be analysed as per Figure 2.

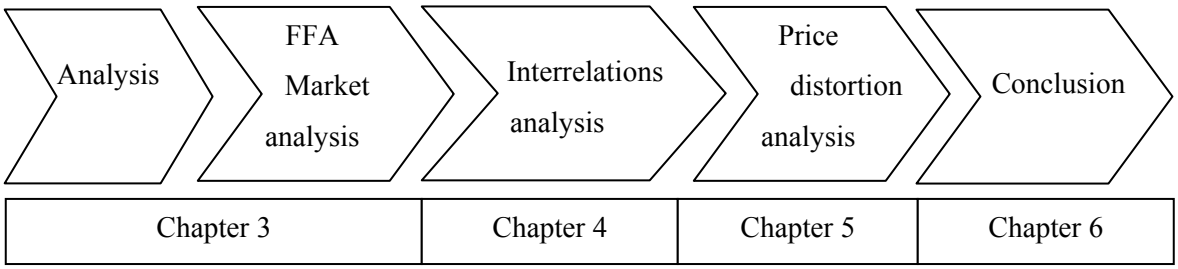

Figure 2: Analysis flow

Source: Author.

To complete the analysis of the selected four aspects, this dissertation will be organised as follow: Chapter 2 will review the literature and selects the four major aspects of the interrelations between the dry bulk FFAs and the dry bulk spot market. Chapter 3 will analyse FFA markets. Chapter 4 will start the investigation of three out of the four selected aspects of the interrelations between dry bulk FFAs and the dry bulk spot

market. Chapter 5 will study the potential price distortion using seasonality analysis. Chapter 6 will conclude by summarising the findings of this research and consider some further possible research.

Chapter 2 - Review of the literature on freight derivatives and key elements of the methodology

This dissertation will focus on the interrelations between dry bulk FFAs and the dry bulk spot market. Some research has already touched some aspects. Besides, it is hard to be exhaustive in the work realised during the two last decades by many researchers. It is necessary to review the literature on freight derivatives (part 2.1). The objective is to avoid redundancy and to contribute to the research on FFAs. Then, some key elements of the methodology will be presented (part 2.2).

2.1 Literature review

Although all research is interrelated, for the sake of simplicity, the literature review will be organised in four parts representing four elements of the research.

2.1.1 Impact of indices changes on freight derivatives

Cullinane et al. reported that the exclusion of all Handysize trades from the BFI in November 1993 has not altered its behaviour and created "only a very small deviation" (Cullinane et al., 1999, pp. 15-39).

However, models used in Cullinane (1992, pp. 91-114) and Cullinane et al. (1999, pp. 15-39) are "not capable in capturing both the short-run dynamics and the long-run relationships between the variables" (Batchelor et al., 2007, p. 102). Therefore, Kavussanos and Nomikos (2003, p. 225) have discovered that "forecasts become more accurate as a result of the introduction of time-charter routes; however, their accuracy deteriorates following the exclusion of handysize routes from the index".

On the one hand, it has been proven that changes of the indices have consequences on the FFA trade. On the other hand, no research has focused on the constraints generated by FFA trade on the Baltic dry bulk indices. Section 4.1 will analyse the latest segmentation of the indices to study if it complies with the representativeness objective or fulfils some needs of the index users i.e. FFA traders.

2.1.2 Forecasting of the spot market using FFAs

First of all, research on forecasting has developed many interrelated aspects such as the price discovery function, unbiasedness hypothesis or the lead-lag effect between derivatives and spot prices.

The freight derivatives market is relatively thin and recent. Researchers have focused progressively on commodity, financial, equity and then freight derivatives. The previous investigations still nowadays influence freight derivatives research.

2.1.2.1 Forecasting of the spot prices using derivatives

According to Kavussanos and Visvikis (2004, pp. 2017-2018) and Kavussanos, Visvikis and Batchelor (2004, pp. 274-275), "the theory governing the relationship between spot and derivatives prices of continuously storable commodities was developed by Working (1970) amongst others".

In 1988, MacKinlay and Ramaswamy (1988) published an article on the arbitrage strategies and pointed out the importance of cost-of-carry[2]. Thus, the fundamental

[2] Cost-of-carry is the sum of costs related with the purchase of "the asset at the spot price and storing it for subsequent sale at the forward price" (MacKinlay and Ramaswamy, 1988) in other words, costs related to the purchase and storage of one asset upto it resale i.e. interests, inventory costs, opportunity costs…

difference between the storable or non-storable nature of an underlying commodity in the relation between its spot and its derivatives prices has been highlighted. The "interdependence between spot and FFA prices may not be as strong [for freight derivatives] as it is for storable commodities [such as agricultural commodities]" (Kavussanos et al., 2004, pp. 274-275).

Then, authors researching on freight derivatives focused on the works on financial derivatives. Kavussanos and Nomikos (2003, p. 206) adapted their methodology from the findings of Stoll and Whaley (1990) reporting that futures of S&P-500 and Major Market Index contracts lead the underlying spot market. Comparable methods were applied and results were found by Wahab and Lashgari (1990) for FTSE-100 and S&P-500, by Hung and Zhang (1995) for interest rate futures and by Tse (1995) for Nikkei Stock index.

Further to the above research focusing on the pricing relation between derivatives and its underlying market, published articles started to consider the freight derivatives.

2.1.2.2 Forecasting of the BFI using BIFFEX

Cullinane (1992) and Cullinane et al. (1999) have succeeded in forecasting the spot freight rates (BFI) with the BIFFEX using simplier unvariate ARIMA models. Also, Chang and Chang (1996, p. 113) have "concluded that BIFFEX prices can predict movements of the dry bulk shipping market (BFI) up to six months at the maximum prior to the real happenings in the physical market with an accuracy ranging from 90% in the case of one-month lag to 23% in the case of six-months lag." Kavussanos and Nomikos confirmed that "spot and futures prices stand in a long-run relationship"

(Kavussanos & Nomikos, 2003, p. 226) but "futures prices tend to discover new information more rapidly than spot prices[3]" (Kavussanos & Nomikos, 2003, p. 205).

2.1.2.3 Forecasting of some routes of BDI using FFA

Moving to FFAs, Alizadeh and Nomikos (2003) argued that "FFAs do not seem to be very accurate in revealing the direction of future freight rates". FFAs can predict the direction of the spot market only between 46% and 74% and its forecasting accuracy declines as maturity increases (Alizadeh & Nomikos, 2003).

However, new findings contradict the previous. FFAs (routes P1, P1A, P2 and P2A) can forecast the spot prices up to two months and be extended up to three months for P2 and P2A (Kavussanos, Visvikis & Menachof, 2004, p. 241). It has confirmed the findings of Kavussanos and Nomikos (1999, pp. 353-376) for one-month and two-month BIFFEX, of Haigh (2000, pp. 545-571) for three-month BIFFEX, of Kavussanos and Visvikis (2006, pp. 245-246) but nuanced the allegations of Kavussanos et al. (2001) that "FFA prices are unbiased predictors of the realised spot prices for all investigated routes".

Later on Kavussanos and Visvikis (2004, p. 2033) estimated that FFA was ahead of the spot market with "approximately 25-30 days in route P1, and 15-20 days for the rest of the routes (P1A, P2 and P2A)" with a "correlation coefficients between FFA and spot rates in each of the routes: 0.965, 0.972, 0.986, and 0.985 (Kavussanos & Visvikis, 2004, p. 2021)".

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[3] "Fleming et al. (1996) introduce what they call the trading cost hypothesis, which predicts that the market with the lowest overall trading costs will react most quickly to new information and thus, exhibit price leadership. They suggest that the lead–lag relationship should change when it becomes more costly or less costly for traders to exploit the information in the spot market (Kavussanos and Visvikis, 2004, p. 2035)"

Then, scholars compared the forecasting performance of each models. The bivariate VECM model is argued in the literature to be the most appropriate model up to 20 days ahead (Batchelor et al., 2003; Kavussanos and Visvikis, 2006, pp. 243-244; Batchelor et al., 2007, p. 102). For extended forecast, simple univariate ARIMA models are the most suitable models (Batchelor et al., 2007, p. 102).

The latest research of Batchelor et al. (2007, p. 113) mentioned that "models (ARIMA; VAR; VECM and s-VECM) suggest that forward rates adjust more strongly than spot rates to close the gap between spot and forward rates" and "do help predict spot rates" (Batchelor et al., 2007, p. 113).

2.1.2.4 Possible extension of research

Previously mentioned studies, successful in the realisation of a forecast, have been concentrated on the four most traded routes of the BPI. Their methodology could be extended to other routes. In spite of the fact that published FFA quoted prices belong to the FFABA and the association is not willing to provide the data to any non member, data could have been compiled manually from the specialised press. However, the publication of the data is stopped when markets become illiquid, which will lead to lack of consistency of the analysed data.

Even though authors always mentioned some limitations of their own model of forecast, no extensive study exists why the forecasting capabilities are limited. Therefore, part 4.2 of this dissertation will investigate why the forecasting capabilities of the forward freight agreements are empirically limited.

2.1.3 Pricing of FFAs

Several elements of the pricing of freight derivatives have been developed like FFA price modelling (Kavussanos, 2002, pp. 661–692) (Kavussanos et al, 2004, pp. 241–266), (Kavussanos & Visvikis, 2004, pp. 2015–2049) or options pricing (Koekebakker et al, 2007). No price models will be built in this dissertation for the pricing of FFAs. However, supply and demand of FFAs will be related to the perceived freight risk from the spot market (part 4.3) offering another prospective on the research on FFA pricing.

2.1.4 Impact of FFA trade on the spot market

According to Kavussanos and Visvikis' study (2004, p. 2046), "FFA market volatility spills information to spot market volatility in route P1. In route P1A the results indicate no volatility spillovers in either market. In routes P2 and P2A, (…) the FFA market plays a leading role in incorporating new information".

In addition, research using a methodology developed by Glosten et al. (1993, pp. 1779–1801) on the impact of FFA on traded routes P1, P1A, P2 and P2A concluded that it has "improved the quality and speed of information flowing in routes P1, P1A and P2 [but not for P2A]" (Kavussanos et al., 2004, pp. 273–296), "in accordance with the results in most futures markets" (Kavussanos et al., 2004, pp. 273–296) such as studies in the electricity derivatives markets by Eydeland and Geman (1998), by Geman and Vasicek (2001), and by Besembinder and Lemmon (2002).

Kavussanos et al. "conjecture that by attracting more, and possibly better informed, participants into the market, FFA trading has assisted the incorporation of information into spot prices to be quicker (Kavussanos et al, 2004, p. 275)".

No research has quantified the impact of the settlement price calculation method of FFA on the spot price. A seasonality analysis would permit to assess if any price distortions are "visible" in the spot market.

2.2 Key elements of the methodology

As mentioned in the introduction, the four major aspects of the interrelations of FFAs on the spot market have been identified because of their potential negative impact on the spot market or to provide a better understanding with an alternate prospective on some "hot" issues of the research. The alternate prospective will be achieved thanks to the four below mentioned elements.

Firstly, the analysis is applicable to all sub-routes and indices except for one more specific research in 0 where the focus is not on the major FFA traded routes (P1, P1A, P2, and P2A) as the majority of the research but on the BCI and its routes.

Secondly, as a multidisciplinary dissertation, some analytic tools have been imported from other disciplines such as economics, management and marketing.

Thirdly, as far as possible, the most precise and complete data has been used. For instance, daily prices have been preferred instead of weekly or monthly, from the inception of the index instead of shorter periods. In addition, when achievable, data in the literature quoting other sources have been avoided to focus on first hand information. That is the reason why index data is from the Baltic Exchange and information from screen traded FFA are from the exchanges.

Fourthly, it attempts to balance sources and prospective from academic researchers and practitioners.

Chapter 3 - Analysis of Freight Forward Agreements markets

In order to analyse the relations between FFAs and the spot market, it is necessary to properly understand the FFAs. So, this chapter will be organised to reply to the questions compiled in Table 1:

Table 1: Organisation of the chapter related to key questions on FFAs

Question	Section title	Part
What are FFAs?	Concept and practices of FFAs.	3.1
What is the size of the FFA market?	Developments of a growing market but still illiquid.	3.2
Who is trading FFAs?	Concentric progression of market participants.	3.3
Are FFAs efficient? Is the FFA market in a state of pure and perfect competition?	Assessment of FFA market efficiency thanks to an analysis of the competition.	3.4

Source: Author.

3.1 Concept and practices of FFA

This section will answer "What are FFAs?" Firstly, several definitions and the basic principle will be contemplated. Secondly, the two-steps mechanics of FFAs will be explained. Thirdly, the duality of the FFA market will be dealt with. Fourth, the index of the FFA prices will be presented.

3.1.1 Definition and basic principle

As per the Baltic Exchange, "FFAs are "over-the-counter" (OTC) products made on principal-to-principal basis which provide a means of hedging exposure to freight market risk through the trading of specified time charter and voyage rates for forward positions" (Baltic Exchange, 2007, www.balticexchange.com). This definition is rather complex but reveals that its means is hedging.

According to Investopedia (2007), hedging is "making an investment to reduce the risk of adverse price movements in an asset. Normally, a hedge consists of taking an offsetting position in a related security, such as a futures contract". In other words, the basic principle of hedging is to cover a risk on the physical market by taking "exactly" the opposite position on the paper market. By doing so, the losses on one market will be offset by the gain on the other, thus the income will be stabilised at the agreed price.

ABN AMRO, one of the leading bank hedging of the FFA market on behalf of shipping companies, proposes a simpler definition: "FFA is a contract to buy or sell the price of freight for a specific cargo route over a defined future period". This explanation includes the main terms of a FFA covers (Baltic Exchange, 2007, www.balticexchange.com):

1. The agreed route.
2. The date of settlement.
3. The contract quantity (lots).
4. The contract rate at which differences will be settled (the agreed price).

ABN AMRO's definition included as well screen traded freight derivatives. In reality, the FFA market is a dual market in which cohabitates the OTC FFAs and screen traded (further details will be provided in part 3.1.3).

For Clarkson Securities Ltd which consider themselves as the creator of FFA,

> FFAs are contracts between two clients; one party (the Buyer) is committed to a view that an agreed route (based on an agreed quantity) will be valued higher than an agreed rate on an agreed date. The other party (the Seller) contracts to differ. In nearly all cases, it will be a component part of one of the Baltic indices on the agreed date which determines the rate at which the FFA is settled (Clarkson Securities, 2007, www.clarksonsecurities.com).

This definition introduces the idea of speculation. Hedging and speculation cohabitate in the intention of uses of FFAs and will be studied in following section 4.3. Further, it is highlighted that mostly Baltic indices are used as "commodity". Other indices used for FFA such as Platts will be disregarded in this dissertation.

Lastly, the definition from two maritime economists researching on FFAs appears the most complete:

> FFAs are principal-to-principal contracts for difference (CFDs), between a seller and a buyer to settle a freight rate, for a specified quantity of cargo or type of vessel, for usually one, or a combination of major trade routes of dry-bulk or wet-bulk sectors of the shipping industry (Kavussanos & Visvikis, 2006b, p. 234).

Currently, FFAs are focused on bulk carrier and tanker freight. However, the Baltic Exchange provides data on LPG and will possibly establish an index for containerships (Jupe, 2006, p. 20) which can be suitable for hedging purposes. The Hamburg Shipbrokers Association assisting the Baltic Exchange for the conception of container

index said that containership derivatives would be marketed "by the end of the year" ("Boxship Brokers", 2007). This dissertation will only focus on the dry bulk sector.

3.1.2 Mechanics of FFAs: a two steps mechanism

FFAs function in two steps which are clearly identified in time: Firstly, the agreement when terms and conditions are defined and secondly the settlement when cash is exchanged.

3.1.2.1 From a principal to principal agreement…

As mentioned in the previous definition FFAs are OTC arrangements which means that "deals are fixed directly between two counterparties [Principal-to-principal] utilising the services of broking intermediaries" (Jupe, 2006, p. 20).

"Brokers, acting as intermediary only, are not responsible for the performance of the contract" (Baltic Exchange, 2007, www.balticexchange.com) but should reach an agreement on the main terms (agreed route, date of settlement, contract quantity (lots) and agreed price) and conditions of the FFABA standard contract.

3.1.2.2 …to settlement price calculation at maturity.

As mentioned by Clarkson, "All settlements are made in cash and require no physical delivery" (2004, p. 3). Since maritime transportation is a non storable "commodity", it cannot be delivered. "Cash settlement against the value of a freight index provided the solution" (Kavussanos & Visvikis, 2006, p. 147).

For time-charter (T/C) paper contract, settlement is against the monthly average of the T/C index (indices). For route paper contract, settlement is against the average of the last seven index days of the month of the agreed route (Brau, 2006, p. 12). As per the

FFABA 2006 standard terms, "settlement is between counterparties in cash within five days following the settlement date" (Baltic Exchange, 2007).

Figure 3 summarises the two step mechanism and illustrates two scenarii when the average price at maturity is higher than the contracted price (1st scenario) and when the average price at maturity is lower than the contracted price (2nd scenario). On the right part of Figure 3 the calculation of the settlement price is presented for the two scenarii.

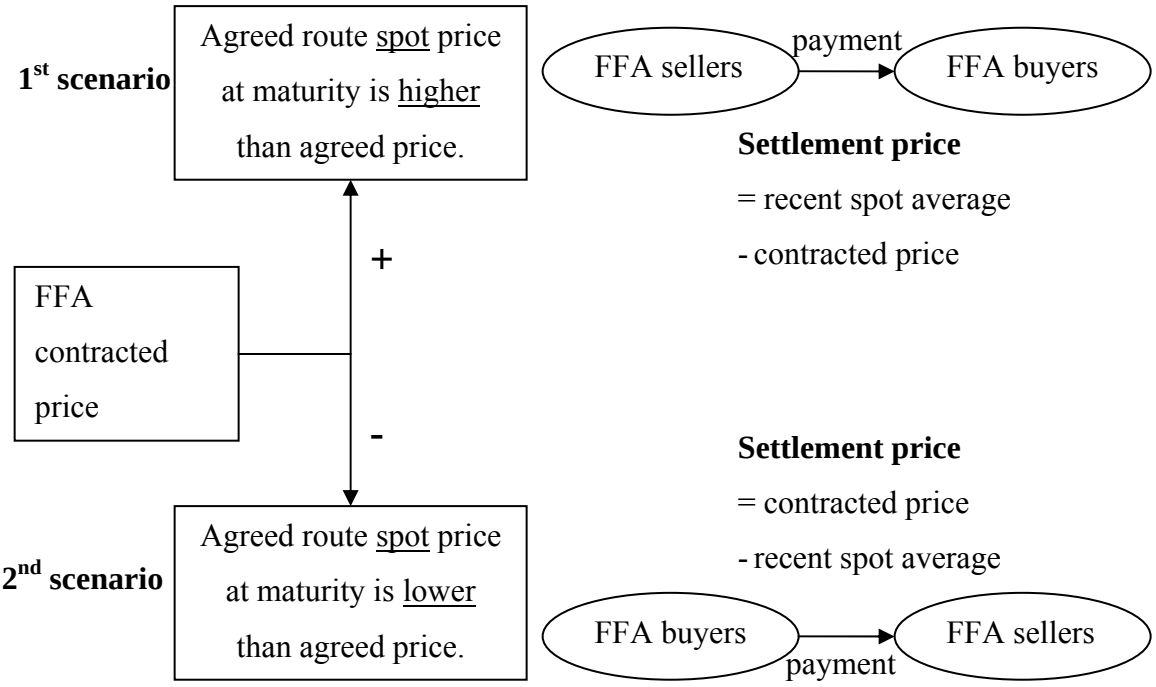

Figure 3: Settlement price calculation according to spot market level at maturity

Source: Author

If hedge has been carefully selected (referred in the literature to the concept of "perfect hedge"), the gain (loss) on the paper market will offset the loss (gain) on the physical market and therefore stabilise the freight at the contracted price.

3.1.3 A dual market: OTC and screen

As defined in part (3.1.1), FFAs are traded OTC. The dry bulk market has traditionally been served as an over-the-counter market directly between market participants, and still retains many of these characteristics (Imarex, 2007b).

However, freight derivatives are as well traded on screen through specialised stock exchanges (Imarex in Oslo, NYMEX in New York and SGX in Singapore). Also, three major FFA brokers Clarksons Securities, Ifchor SA, and Freight Investors Services have created in a venture the CIF FFA Trading Screen in London. Such freight derivatives traded are comparable with FFAs.

To understand the difference between the OTC and screen traded, the four main terms of the FFA agreements will be analysed for both FFA and screen traded freight derivatives.

3.1.3.1 Agreed routes

For OTC agreements, all indices reported by the Baltic Exchange can be used as commodity i.e. dry bulk indices BDI, BCI, BPI, BSI and BHSI as well as all voyage and time-charter routes compiled in the indices (see appendix 1). Non standard terms such as an average of several routes can be agreed as well.

For FFA screen traded, it is the discretion of each exchange to decide which routes to be traded.

3.1.3.2 Date of settlement

For the OTC agreements, dates of settlement should be agreed by the principals through a broker. Dates of settlement are commonly the last day of the month, quarter or calendar year. Also, non standard terms can be incorporated in the contract for a special maturity date irrespective of the previously presented rule or a “settlement price to be

calculated for last 15 days of contract's life" (Kavussanos & Visvikis, 2006a, p. 195). They start with the current month and extend up to several calendar years. As per the manual for forward panellists (Baltic Exchange, 2007b, p.9), reported dates of settlement (which are the most common) are maximum eight months, maximum four quarters and maximum three years. The maximum limit is due to the fact that the number of the reported period is changing over time and that a rollover system has been implemented by the forward panellists (Baltic Exchange, 2007b, p. 9). In May 2007, a major FFA broker reported an OTC agreement on BPI until the end of 2012 ("SSY Claims", 2007) i.e. for a period of 5 years.

For FFA screen traded, it is the discretion of each exchange to decide which dates of settlement can be traded.

3.1.3.3 Contract quantity (lots)

For the OTC agreements, the quantity of contracts is negotiated between the principals through a broker.

For FFA screen traded, the FFA buyer registers the quantity of FFA lots on the exchange; each time the quantity of demand and supply match, the trade is confirmed. No negotiation between principals occurs and traders do not know their counterpart. That is the reason why all the trades are cleared through the official clearing house of the stock exchange. According to Imarex (2007b), dry bulk FFAs to a large extent used to be traded with full cargo as in the "physical market". However, a developing technique consists in trading small lots in order to attract counterparts (Imarex, 2007b). The average number of lots per trade was 148 in 2004 and dropped to 68 in 2007 (Imarex, www.imarex.com). (refer to appendix 2).

3.1.3.4 Agreed price

For the OTC agreements, the price is negotiated between the principals through a broker that provides an indication of the level of the market, frequently called the market-maker.

For FFA screen traded, FFA prices are communicated on stock exchange screens representing the fluctuations of demand and supply of FFA in this specific exchange.

3.1.3.5 FFABA standard contract

For the OTC agreement, the concept of freedom of contract is applied. Principals commonly use FFABA standard contract and incorporate possible negotiated amendments. The FFABA standard contract was revised in 2006. For further clarifications, the International Swaps and Derivatives Association (ISDA) definitions were incorporated in the contract (ABN AMRO, 2006, p. 3). The 2006 FFABA standard contract "incorporates ISDA Master Agreement by reference" and improves the original contract (Perrot, 2006, p. 2). Furthermore, contracts are "private and confidential" (Jupe, 2006, p. 22).

3.1.4 The Baltic Exchange FFA index: the Baltic Forward Assessment

The Baltic Exchange has continuously facilitated the FFA mechanism to develop the use of FFAs. For instance, in November 2002, "monthly settlement prices are launched to assist in the settlement of FFA contracts" (Baltic Exchange, 2007a, p. 19). Baltic Exchange has attempted to attract new FFA traders by increasing FFA price transparency. As mentioned in the history of the Baltic Exchange, the introduction of the daily BFA has been progressive (see appendix 3).

According to the Baltic Exchange Chief Executive, BFA "is the only independent curve available than accurately tell you the prices at which freight derivatives are trading" (Penn, 2006).

The BFA reporting has really increase FFA trade transparency since the alternative ways to estimate the prices of FFAs were to contact the brokers (for OTC) or to access the FFAs exchanges website whose data was either partial or biased. Last month, "Imarex has joined the FFABA panel and has begun supply its data for the forward curve published every evening used for the mark to market settlement" ("NOS adopts", 2007) i.e. BFA reported routes, time charter and time charter baskets.

3.2 Developments of a growing market but still illiquid

It is undeniable that the FFA market is growing. However, it is also facing a problem of liquidity.

3.2.1 A growing market: Dry bulk FFAs

The FFA market is still growing. Market size can be estimated either in signed contracts (OTC), lots traded or market value. It is hard to establish the FFA market size since it is traded in three different exchanges, one screen platform and through brokers. The Baltic Exchange started to publish the record of FFA volume from the third quarter of 2006. This data is compiled from 15 leading FFA brokers including two founders of the CIF platform, Imarex-NOS and LCH-Clearnet. It is currently the most accurate publicly accessible data on FFA volume. Nonetheless, data from FFA brokers Ifchor and SGX screen is missing.

3.2.1.1 Dry bulk FFA signed contracts

To start with, Figure 4 shows the constant increase in number of signed contracts from the inception of FFA in 1992 to 2005.

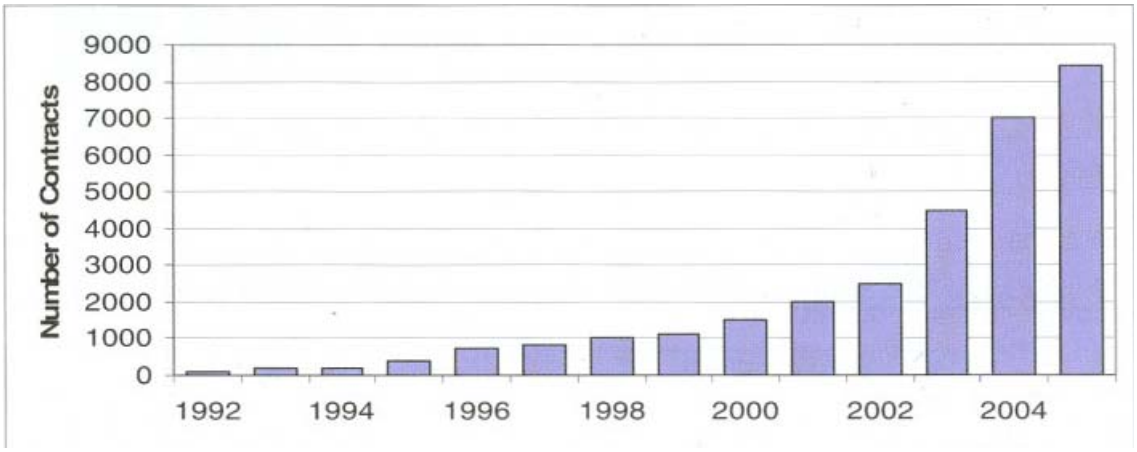

Figure 4: Yearly number of signed dry bulk FFA contracts (Jan. 92 -Sept. 2005)

Source: Clarkson Securities Ltd (Kavussanos and Visvikis, 2006a, p. 189)

3.2.1.2 Dry bulk FFA lots traded

Table 2 compiles the data published by the Baltic Exchange. The number of lots of dry bulk FFA (either in T/C day or in thousands tonnes) traded during the last 12 months (from Q3.06 to Q2.07) is 1,584,510. For 2006, it has been estimated from the Baltic Exchange press releases (Baltic Exchange, 2007c, 2007d, 2007e, 2007f) that the total dry bulk volume reached 1,320,566 lots.

Table 2: Dry bulk FFA volume in lots (1 T/C or 1,000 tonnes)

Year, Quarter		Lots	OTC		Cleared	
2006	Q3	511,105	452,188	88%	58,917	12%
2006	Q4	313,945	281,745	90%	32,200	10%
2007	Q1	326,650	282,015	86%	44,635	14%
2007	Q2	432,810	326,680	75%	106,130	25%
Total		**1,584,510**	**1,342,628**	**85%**	**241,882**	**15%**
Ave. Q		396,128	335,657	**85%**	60,471	**15%**

Source: Author, data compiled from Baltic Exchange, 2007.

Figure 5 illustrates the constant increase of dry bulk FFA volume from 1992 in FFA equivalent tonnage.

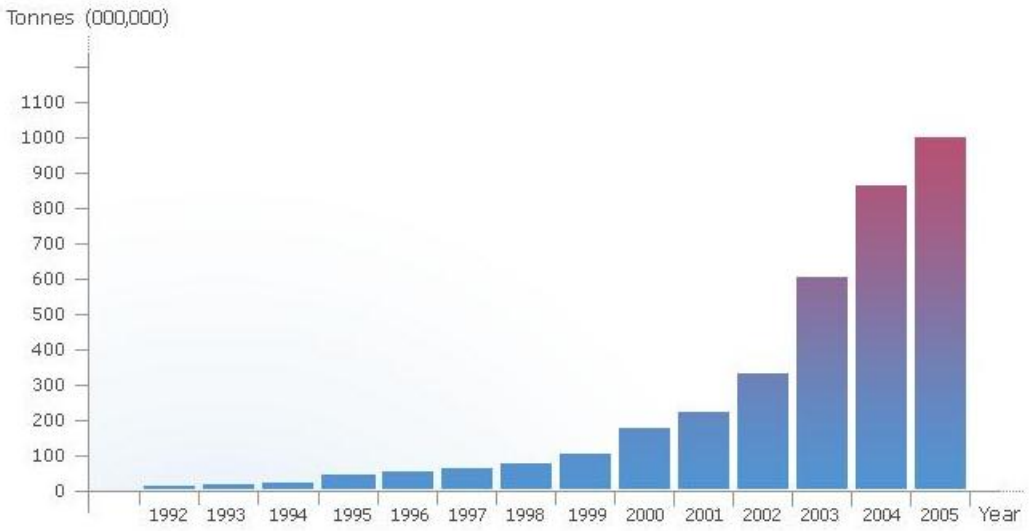

Figure 5: Total dry bulk FFA volume from 1992 to 2005

Source: Clarkson Securities Ltd, 2007.

After conversion into FFA equivalent tonnage, Freight Investor Services estimated that the FFA market reached, in 2005, 100% of the 5 major bulk trades (Kavussanos & Visvikis, 2006a, p. 190) i.e. 38% of the total dry trade (Clarkson Research, 2007a, p. 2). In 2007, the Chief Executive of Imarex NOS reported that FFA trade represents 50% of the underlying dry bulk seaborne transportation (Mortensen, 2007).

Figure 6 is an estimation of the FFA equivalent tonnage per vessel segment based on the figures posted on Clarkson Securities' website. It illustrates that depending on the vessel segment the FFA market differs. For Capesize, the FFA market represented in 2006 about 70% of its underlying market. In 2006, FFA trade of Panamax indices corresponds to 115% of its underlying market. For Supramax, the FFA market represented in 2006 only 43% of its underlying market.

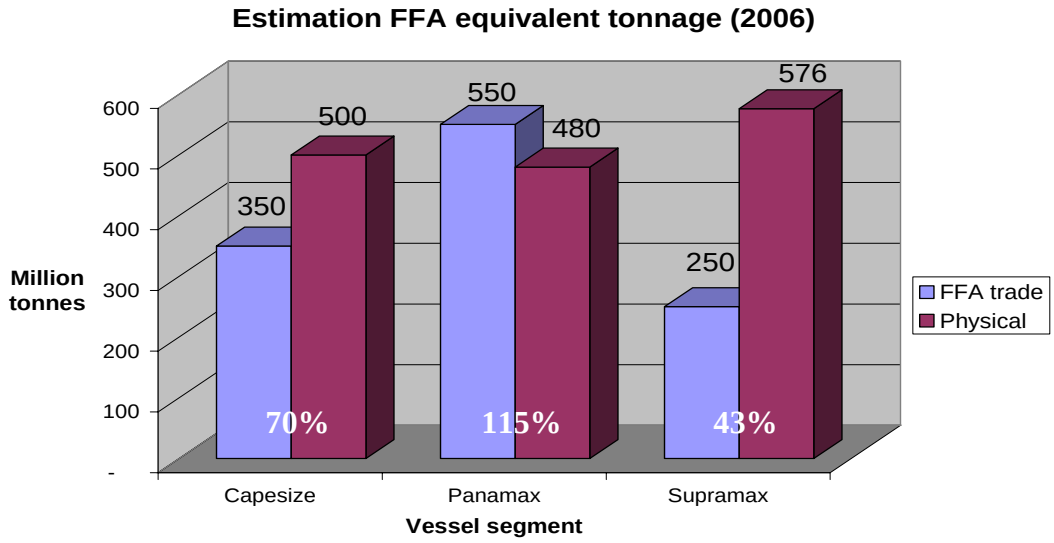

Figure 6: Estimation of the FFA equivalent tonnage (2006)

Source: Author, data compiled from Clarkson Securities, 2007.

Also, according to Swiss Mar, FFA C4, a dry bulk route, was, in 2005, approximately three times larger that the capesize route C4 (Kavussanos & Visvikis, 2006a, p. 191). As well "in the OTC market, panamax FFA business is regularly around 1.3 times that of the underlying physical market" ("Derivatives prosper", 2007).

3.2.1.3 Dry Bulk FFA traded value

Since the number of signed contracts and the FFA equivalent tonnage have increased, the FFA traded value has also improved. Figure 7 illustrates the raising value. It should be noted that the augmentation of FFA traded value is also influenced by the increase of the spot market.

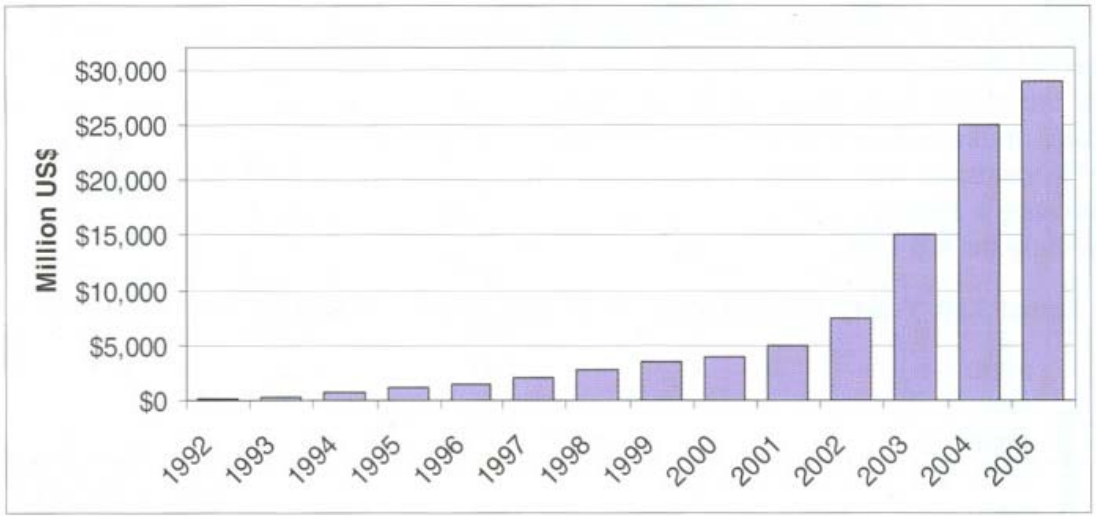

Figure 7: Yearly value of dry bulk FFA contracts (Jan. 92 - Sept. 2005)

Source: Clarkson Securities Ltd (Kavussanos and Visvikis, 2006a, p. 190)

FFA market represented USD29 billions in 2005 (Clarksons Securities, 2007a) and USD20 billions in 2006 (Baltic Exchange, 2007d) i.e. a drop of 31%. The traded value of FFAs has been affected by the decrease of the underlying market.

FFA market is expected to grow up to several time the underlying market (as for Atlantic clean tanker route TC2, "Supply gap", 2007) taking into consideration that the derivative market for other commodities are ten times bigger that the underlying market.

According to Mortensen (2007), the FFA trade will continue to grow boosted by the high volatility of the market (refer to part 4.3) which is even more increased by the interests of speculators and banks on shipping in general (Macquarie, 2006b, p.5).

To conclude, 1,320,566 lots have been traded in 2006 with a nominal value of USD20 billions and representing about 36% of the underlying market. Even though the FFA market has been growing, its liquidity is still limited leading to some problems.

3.2.2 A growing market still facing lack of liquidity

Since the FFA market is illiquid, it makes it difficult to find a counterparty to support all positions or forecasts. The FFA market is growing so still globally illiquid.

"Liquidity determines the number of counterparties available to offset positions in the market" (Jagani & Thabel, 2005, p.20). Some professionals argue that the problem of liquidity is linked to the problem of transparency: "currently [there is] no official record of FFA business, therefore making hard for participants to know if there is enough liquidity in the market to offset positions" (Jagani & Thabel, 2005, p.20). Two major ways that have been considered to improve liquidity are register FFA trade (The publication started in third quarter 2006 (Baltic, 2006c, p. 36)) and trade smaller lots of contracts (Jagani & Thabel, 2005, p.20).

Also, trading smaller lots presents other advantages such as (Jagani & Thabel, 2005, p.20):

1. spread credit risk (smaller contracts should be signed with a different counterparty),
2. improve hedge (settlement price against seven days (route) or one month (time charter),
3. attract speculators,
4. increase flexibility.

Other elements are causing the lack of liquidity such as the lack of demand due to the relatively low hedging performance (see 2.1), the hedging substitution (part 4.3.1.1) and the frictions of the FFA market (5.1).

3.3 FFA market participants: the actor of supply and demand

Two major segmentations of market participants are relevant: the segmentation by background and the segmentation by region.

3.3.1 Segmentation of market participants by background

In 2005, trading houses were negotiated 40% of FFA value and financial houses traded 10% (Jagani & Thabel, 2005, p.20). These data confirmed the estimation for 2005 of Freight Investor Services and Clarksons Securities Ltd. (Kavussanos & Visvikis, 2006a, p. 192) that FFA value was traded by:

- Shipowners: 20%
- Charterers and operators (fleet managers and freight traders): 30%
- Trading Companies: 40%
- Financial House and banks: 10%

The issue of the type of contract composing the dry bulk indices will be dealt with in part 4.1.4. The fact that 30% of the value of FFA trade was made by charterers and operators results from the strategy implemented by the Baltic Exchange to compose dry bulk indices at 85% with time charter fixtures.

Figure 8 has been adapted from a presentation made by Yao during the 6th FFA annual Forum held in Copenhagen in 2006 and illustrates the several concentric tiers of FFA counterparties who enter consecutively in FFA markets.

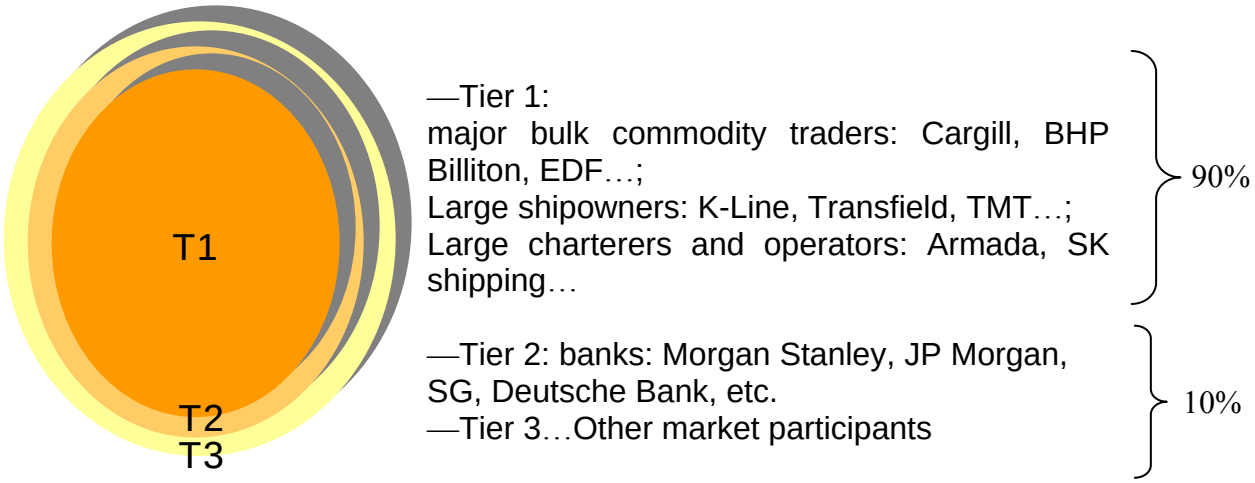

Figure 8: Concentric tiers of FFA counterparties

Source: Author, adapted from Yao (2006, p. 7) and Brau (2006, p. 8)

While tier 1 market participants are interested in hedging and as well as speculating, tiers 2 and 3 FFA traders have really little to hedge since the majority of those FFAs participants are not involved in shipping and are not directly facing the freight risk.

The FFAs participants are eager to attract new participants (like speculators from tiers 2 and 3) since it increase FFA market liquidity.

3.3.2 Segmentation of market participants by region

Regional segmentation of FFA trade has been estimated by some major FFA brokers. Nonetheless, they are sometimes contradicting and should only be considered as rough indicators.

In 2005, OTC FFA statistics were presented by Kavussanos and Visvikis (2006a, p. 192) based on an estimation from Freight Investor Services and Clarksons Securities representing together 50% of OTC FFA. As per their estimation, FFA trade volume was originated at 50% from Europe, 20% from USA and 30% from Asia.

However, Freight Investor Services and Macqueen (2006, p.23), estimated one year later that in 2006, 70% of the total FFA trade (OTC + screen) was initiated from Europe, 25% from Asia[4] and 5% from USA. Further, it is accepted that Asia is the fastest growing market (Macqueen, 2006, p.23; "Derivatives prosper", 2007): Asian FFA volume grew from almost nil in 2002 to an estimation of 40% of Asian underlying Seaborne trade in 2006 (Yao, 2006, p.2). The main hindrance for a stronger Asian development is not the lack of liquidity in Asian FFA routes but the lack of knowledge. Also, the European FFA market is shifting South with a growing participation of Greek shipowners. "The market has seen participant numbers in Greece rise from five to around 35-40 in the past few years" ("FFA market", 2007).

To conclude, the liquidity can be achieved if more market participants enter and trade all routes. The Baltic Exchange dry bulk indices are in some aspects partially representing the market (see part 4.1 for further analysis). Some further research could investigate if the fact that major shipowning countries like Greece or China owning older tonnage are still under represented in the FFA market can be explained by the segmentation of the indices.

3.4 Assessment of FFA market efficiency thanks to competition analysis

The objectives of this section are to analyse if the FFA market is efficient and if it is in a state of pure and perfect competition. Firstly, the existing research will be contemplated and then four assumptions of the state of pure and perfect competition will be analysed.

[4] The commercial director of Pacific Carriers, Mr. Keith Denholm, said "Asia accounted for about 30% of all trades" ("Baltic Finalises", 2007). Also, it has been reminded that Taiwan Maritime Transport is very active on the Asian FFA market.

3.4.1 Contribution of the research on FFA hedging performance

Initially, the hedging performance of the freight derivatives (BIFFEX) was really low because the underlying market BFI was a composite of routes. As pointed out by Kavussanos and Visvikis (2006a, p. 240), "Number of attempts to resolve [the hedging effectiveness] issue were made by the industry (Kavussanos & Nomikos, 2000, p. 245), and involved changing the structure of the underlying index to make it more homogeneous". The researchers advise the Baltic Exchange decrease the spread between the market and the indices and to provide hedgers with the possibility to trade the route and not only the index. "The [Baltic] indices should as much as possible represent the market to increase hedging efficiency" (Kavussanos & Visvikis, 2006b, p. 152). Researchers' voices have been heard and leaded to the inception of the BDI in 1999.

This change with the introduction of the FFAs has been a real improvement of the hedging performance of freight derivatives, "FFA contracts provide better hedging opportunities than the BIFFEX contract" (Kavussanos & Visvikis, 2006a, p. 248). However, the hedging performance of freight derivatives is comparatively low with other derivatives as reported by Bera et al. (1997, pp. 97-106) and in Koutmos and Pericli (1999, pp. 335-363).

After perusal of several methods, it appears that "Simple OLS first-difference regression is the preferred method for estimating hedge ratios in voyage routes P1 and P2" (Kavussanos & Visvikis, 2004, p. 933).

To summarise the findings of research on hedging performance, first the hedging performance of FFAs is better than BIFFEX, second it is comparatively low with other derivatives and third it "varies from one freight market to the other" (Kavussanos & Visvikis, 2004, p. 933).

This dissertation will go one step forward than the hedging performance analysis. The focus will not be on the symptom (Is the market efficient or not?) but on the causes themselves (Can the market be efficient?). Therefore, potential hindrances to the FFA efficiency will be investigated.

Since the objective of the FFA market is hedging freight risks, an efficient FFA market should be able to fulfil a maximum of hedge demander at the most competitive price. In macroeconomics, the equilibrium price is the price at which the quantity demanded equals the quantity supplied (Lipsey, Courant & Ragan, 1999, p. 81). The laws of supply and demand[5] require that all market participants are price-takers (Dobson & Palfreman, 1999, p. 99) i.e. that the market is purely and perfectly competitive. The state of pure and perfect competition requires four assumptions:

1. Homogeneous product.
2. Absence of entry and exit barriers.
3. Perfect knowledge of market participants.
4. Atomicity of the market

Hence, the four assumptions of the pure and perfect competition will be investigated for the FFA market.

3.4.2 Homogeneous product

The FFAs market is in reality a dual market (reference to part 3.1.3). On the one hand, OTC FFAs representing 85% of the FFA market are differentiated products since the contract can be amended and tailor-made as per counterparties' demand. On the other hand, the screen traded FFAs corresponding to 15% of the FFA market are standard

[5] For more information on supply and demand of FFA, refer to 4.3

products which can be considered as homogeneous. Besides the differentiation of OTC FFA, FFAs are dealing with different sub-sectors of sea transportation of dry bulk.

The global FFA market (OTC + screen) can be divided in three segments related to size:

- 70% of FFA market value is trading Panamax indices
- 20% of FFA market value is trading Capesize indices
- 10% of FFA market value is trading Supramax indices

Handisizes have just recently become available for traders and is differentiating even more the offer to FFA traders. For OTC FFA, Capesize vessels attract 40% of FFA market value, Panamax 37% and Handymax 23% (Kavussanos & Visvikis 2006a, p. 192).

3.4.3 Absence of entry and exit barriers

A pure and perfect competitive market should have no entrance or exit barriers so that all market agents can freely enter or leave the market.

3.4.3.1 High barriers at entrance of the market

The FFA market remains an exclusive club. There are mostly two hindrances: lack of knowledge and the financial liability related to FFA trade.

Firstly, the lack of knowledge of FFAs resulted in some actors being reluctant to use them. It is often said that about six months is required to enter into the market to really understand the principle of FFA, have the relevant contacts (OTC FFA through brokers) or fulfil all the exchange requirements (screen FFA) (The Baltic, 2006a, p. 30). During a survey on derivatives organised in 2005 (Jagani & Thabel, 2005, p. 20), it has been shown that 37% of the respondents (shipping companies all potential users of derivatives) are not familiar with FFAs. In reality, shipping companies with large turnover (> USD 100m) are familiar at 92% but 100% of small shipping companies (< USD 9m) are mot

familiar with FFAs. “The results [of the survey] suggest a correlation with size and level of familiarity of the freight derivative market” (Jagani & Thabel, 2005, p. 20).

Secondly, in theory, small companies can be naturally put aside of FFAs since their lack of reputation could indirectly affect their cash flow as shown in Figure 9 and will increase the price of FFAs. In addition, the initial margining of clearing house, amounting from USD 100,000 (NOS) to USD 203,184 (LCH), are often repulsing small market participants who do not have sufficient cash flow. Therefore, it can be said that FFAs traders are large shipping companies or corporations.

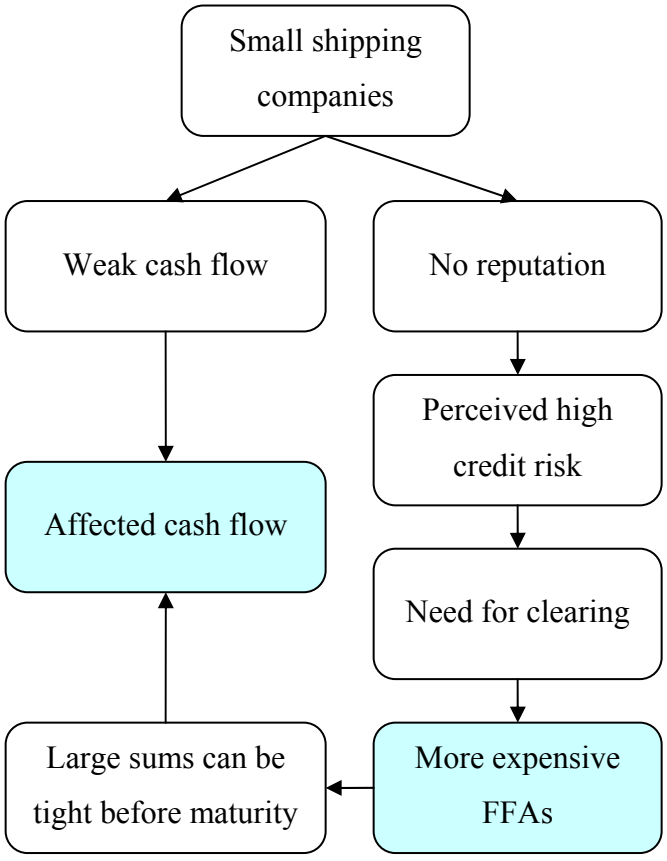

Figure 9: Consequences of FFA trading for small shipping companies

Source: Author.

As mentioned by Noble Chartering manager, Raghu Raghunath, "many shipowners don't have USD10 million to open credit lines – if they had USD 10 million they would buy another ship instead" (Baltic, 2006, p. 35). Reference is made to part 4.2.4 on the atomicity of the market.

3.4.3.2 Medium barriers at exit of the market

In theory, it is quite easy to exit the market. It is just needed to sell or buy back your screen traded FFA and then to net[6] all your positions. For OTC FFA, since the products are tailored-made it is almost impossible to resell the contract. Therefore, the FFA trader is locked with his liability up to the maturity of the contracts. Since the majority of the traded contracts have a maturity within two months, no real problem of exit barrier exists. However, Lloyds List ("SSY claims", 2007) has reported an OTC agreement on BPI until the end of 2012. Therefore, assuming that some amendments have been made to the FFABA standard form, the counter-parties would be locked into the market for 5 years.

3.4.4 Perfect knowledge of market participants: flow of information affecting the market.

Most of scholars recognise that the markets (FFA and spot) are affected by some input of information creating some fluctuations of the price.

Since the transaction costs were lower for FFAs, it has been assumed that aware market agents preferred trading FFA to the spot market as for the BIFFEX (Kavussanos & Nomikos, 2003, p. 226). Therefore, it was alleged that FFA had a price discovery

[6] Net: Settlement mutual obligations at the net value of a contract as opposed to its gross dollar value.

function. Thanks to Kavussanos and Visvikis' study published in 2004, it has been demonstrated that

> FFA prices tend to reflect new information more rapidly than spot prices in all [major panamax] routes. This pattern is though to reflect the fundamentals of the underlying asset since, due to limitations of short selling and higher transactions costs of the underlying spot rate, investors who have collected and analysed new information would prefer to trade in the FFA rather than in the spot market (Kavussanos & Visvikis, 2004, p. 2046).

However, the same scholars find "bidirectional causality in price movements in all routes, but less clear evidence on the direction of volatility spillovers between spot and forward prices across different routes" (Kavussanos & Visvikis, 2004, pp. 2045).

It is obvious that the spot market at maturity will contain more information than the FFA since all the information analysed from the agreement to the maturity will be incorporated since FFA rates are between 15-30 days ahead of spot rates (Kavussanos & Visvikis, 2004, p. 2033). Naturally, FFAs with short maturity such as one month or two months have a better forecasting performance.

Also, the FFA market was facing a problem of transparency affecting the access of information to all market participants. This problem has been solved when the Baltic Exchange started its publication (refer to part 3.2.1).

To conclude, market participants should have a good knowledge of the market but the main issue consist in the lag of the FFA between the agreement and the maturity.

3.4.5 Atomicity of the market

The current market is not atomic because some buyers and sellers are large corporations able to affect the FFA market. The Pareto's rule of imbalance is respected, for instance, at the Imarex exchange "around 20% of participants have accounted for around 80% of the transactions" (Boe, 2005, p. 89). Furthermore, it necessary to keep in mind that the major FFA traders are financially powerful and can influence the market.

Companies willing to hedge are mostly large shipping companies amongst others because of the entrance barriers (see part 3.4.3.1). FFA development to smaller companies is still limited due to some hindrances that FFAs are still suffering from.

In conclusion, the FFA products are not really homogeneous. Further to the high number of routes available, the homogeneity is lost because of the duality of the market since only 15% are standard products. The barriers at the exit of the market are medium depending on the maturity date and the specificity of the agreement. But the barriers at entrance are huge so that only large corporations can enter the market. The absence of atomicity of the market is a consequence of the entrance barriers. There are few market participants and the largest 20% concentrates 80% of the market value (Boe, 2005, p. 89). The FFA market is therefore in a state of oligopoly and oligopsony. There is good access to information but uncertainty related to the 2-steps mechanism, the lag between the agreement and the maturity. Therefore, the FFA market is not in a state of pure and perfect competition and consequently can not be efficient.

Chapter 4 - Interrelations between freight forward agreements and the spot market

The interrelations between FFAs and the spot market are complex. Firstly, the main representation of the dry bulk spot market is also the data provider for the settlement price calculation of the FFAs. So, the Baltic Exchange dry bulk indices conflict to represent the market and to comply with index users' needs (part 4.1). Secondly, researchers have studied the possibility to forecast the spot price using the FFA price. However, the outcome is quite poor. Part 4.2 will investigate why the forecasting capabilities of the forward freight agreements are limited on the empirical aspect. Since the FFAs could not exist without the spot market and its risk, the supply and demand of FFAs will be compared with the perceived freight risk from the spot market (part 4.3).

4.1. Baltic dry bulk indices: spot market representativeness vs FFA users' interests

"Indices [should] reflect the daily movement in rates across dry-bulk spot voyage and time-charter rates" (Kavussanos & Visvikis, 2006, p. 235). To achieve this objective, the Baltic Exchange has created the Freight Indices and Futures Committee (FIFC). The FIFC should be guided by the following principles: maintain geographical balance (Pacific/Atlantic, fronthaul/backhaul), avoid illiquidity (no routes with seasonality), privilege business standard terms, respect a commercial balance (T/C and voyage) and limit the number of routes (Baltic Exchange, 2007c, p. 6).

However, as a data provider to fix the settlement price of FFAs, the index should be elaborated to fulfil FFA participants' demand. In case of contradiction between the

demand of FFAs traders and the obligation of representiveness of the underlying market, it is uncertain which side the Baltic Exchange will privilege.

That is the reason why this section is analyzing the current Baltic dry indices' segmentation to analyse its representativeness focused on five criteria:

- Segmentation by number of vessels or carrying capacity
- Segmentation by age of the vessels
- Segmentation by ocean basin
- Segmentation by type of contracts
- Segmentation by routes
- Index multipliers

4.1.1. Segmentation by vessel size

Since the 2nd of January 2007, the BDI is equally composed of BCI, BPI, BSI, and BHSI. However, as per the data compiled by Clarkson Research Services (2007, pp. 14-19), the segmentation of the market by vessels' size either using fleet capacity or the number of vessels differ from the Baltic Exchange's segmentation. These differences are represented in Figure 10:

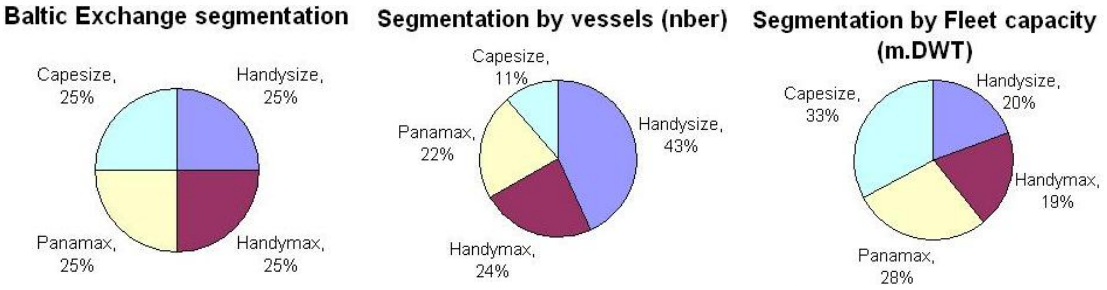

Figure 10: Segmentation by vessel size

Source: Author, data compiled from Baltic Exchange and Clarkson Research Services Limited, 2007.

Note: Handymax should be read Supramax.

On the one hand, the Baltic Exchange is over representing the number of larger vessels. On the other hand, the Baltic Exchange is under representing the carrying capacity of larger vessels. Therefore, it seems that an "intermediate" way has been taken to represent both carrying capacity and number of vessels.

Furthermore, if taking into consideration the size of the vessel described in the Baltic time-charter descriptions, the size selected is always the most common type of vessel with each segment and represents from 29% to 60% of each vessel category.

Table 3 calculates the representation of the vessel size sub-segment selected by the Baltic Exchange time-charter descriptions.

Table 3: Representation of the vessel size described in Baltic Exchange

Vessel size segmentation	Baltic vessels Description (DWT)	Representation (vessels)			Representation (m.DWT)		
		Vsl Nb.	Total	%	m.DWT	Total	%
Handysize	28,000	797	2,771	29%	22.0	74.1	30%
Handymax	52,454	558	1,522	37%	29.7	72.8	41%
Panamax	74,000	842	1,421	59%	62.6	103.6	**60%**
Capesize	172,000	406	727	56%	70.7	123.6	57%

Source: Author, data compiled from Baltic Exchange and Clarkson Research Services Limited, 2007.

Note: The sub-segment of the Panamaxes selected by the Baltic Exchange (74,000 DWT) represents 60% of the total Panamaxes carrying capacity.

To conclude, the BDI equal segmentation between BCI, BPI, BSI and BHSI can be justified to be representative of an "intermediate" way between fleet carrying capacity

and number of vessels. In addition, even though the sub-segment chosen in the vessel's description is always the most common; it represents sometimes only 29% of the number of vessels. This lack of representativeness will affect the demand of FFA for hedging purposes since shipowners of vessels within sub-segments not represented in the BDI will either adjust their hedging strategy or reject FFAs as an efficient hedging tool.

Research, beyond the scope of this dissertation, can be extended to compare the fleet of the shipowners trading FFAs and the vessel description in the Baltic indices to find a possible correlation.

4.1.2. Segmentation by age of the vessels

In the vessel' descriptions of the Baltic Exchange, the maximum allowable age is also defined. As illustrated in Table 4, it appears that the selected age is less representative of the underlying market. For instance, only 32% of the fleet of handysize is younger than 15 years and 63% is older than 20 years (Clarkson, 2007a, p. 18).

Table 4 summarises the calculations regarding the proportion of vessels and their carrying capacity falling within the age limit proposed by the Baltic Exchange.

Table 4: Representation of vessel age described in Baltic Exchange in the underlying market

Vessel	Maximum Age	Carrying Capacity	Number vessel
Handysize	15 years	33.0%	32.0%
Handymax	10 years	53.0%	50.0%
Panamax	7 years	41.0%	38.5%
Capesize	10 years	48.0%	46.0%

Source: Author, data compiled from Baltic Exchange and Clarkson Research Services Limited, 2007.

However, older tonnage can still be incorporated and tuned by panelists to fit route description. “In noting any market activity that is transacted by ships that are older than a specified maximum, panelists are expected to use their discretion in adjusting theses rates to the route definitions” as well “panellists are expected to make an allowance for any extra insurance premium [related to the age of the vessel] payable by an owner” (Baltic Exchange, 2007c, p. 9).

Those two last possibilities offered to panellists should increase the correlation between old tonnage and the indices tonnage. However, many shipowners of old tonnage will be reluctant to contract FFAs since their freight risk is not directly represented by the underlying indices (refer to Figure 16: Decision tree to select FFA for hedging strategy).

4.1.3. Segmentation by ocean basin

As representative of the market, each index is composed of routes in the Pacific or Atlantic basin and should be “maintaining a balance between fronthaul and backhaul routes.” (Baltic Exchange, 2007, p. 6)

Table 5 shows the results of an estimation of the geographical weight for each index. This estimation of the geographical weight is not taking into consideration the origin or the destination of the cargo that has been researched several times but focus on the distances stemmed, since maritime transport services are estimated by ton-miles. Since for each segment (Capesize, Panamax, Supramax and Handysize) the carrying capacity is similar (25% as per the Baltic Exchange segmentation), the only considered variable is the distance in nautical miles. The slight difference of carrying capacity within BCI (see appendix 1) has been disregarded for the sake of simplicity and because the difference will be only marginal.

For routes originated from one ocean basin and heading in the other, the distance stemmed in each basin has been calculated so the routes are apportioned proportionally. When routes used a range of ports, the furthest has always been chosen. See appendix 4 for details of calculation.

Table 5: Geographical segmentation of indices (by ton-miles and sea basins)

	BCI	BPI	BSI	BHSI	BDI
Atlantic	43%	47%	38%	50%	45%
Pacific	57%	53%	62%	50%	55%

Source: Author, data compiled from Baltic Exchange.

Table 5 shows that the ton-miles of the indices are globally privileging the Pacific basin. Comparing this finding with the dry bulk market geography would have been of interests for general knowledge but is beyond the scope of this dissertation. In addition, shipowners with a freight risk in the Pacific should be in theory more active in the FFA market. Thus, Asian traders are not very active FFA market participants but this fact is not due to the lack of available Pacific routes.

4.1.4. Segmentation by type of contracts

The BDI is built with 15% voyage charter and 85% time charter. Looking closer, only the BCI is elaborated with voyage assessments which represent its 60%.

This result is precious because the voyage charter-party is normally only signed between two counterparties and all subsequent charter-parties are time-charter-parties. As illustrated by Figure 11, it is common that several charterers are intermediaries between the cargo owners and the shipowners.

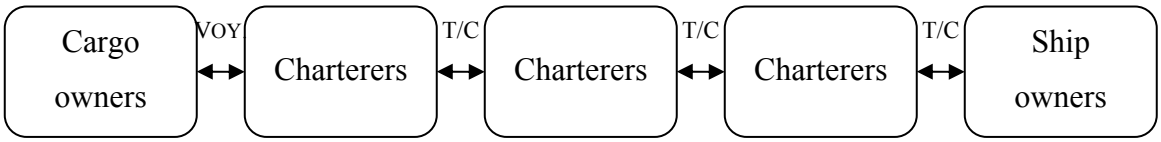

Figure 11: Example of legal relation between agents within maritime transportation chain
Source: Author

As a consequence, more time-charter parties are signed than voyage charter parties. Therefore, the highest risk for maritime transport agents is represented by hire (time charter) rather than freight (voyage charter). So, the Baltic Exchange by incorporating time charter rate within its indices increase the number of potential FFA traders. Already 30% of the value of FFA trade emanates from charterers and operators that are in the middle of the maritime transportation chain.

Hence, it is questionable whether reporting time-charter rate is representative of the dry bulk market. In addition, it is not clear which time-charter should be reported by the panelist. Further research could investigate these specific issues that are beyond the scope of this dissertation.

4.1.5. Segmentation by routes

Route selections should represent the market and as well fit the requirements of indices users. In the Baltic Manual to panellist (2007, p.4), it is reminded that indices are "used widely in the underlying physical freight market; as settlement mechanisms for FFAs; and in a range of market research and dispute settlement roles."

For example, during the FFABA 2006 annual conference, held in Copenhagen, FFAs users were openly requiring from the Baltic Exchange to divide round voyages into two sub-routes. In January 2007, Route S4 (Transatlantic time charter from Europe to Europe via US Gulf) was subdivided in S4A and S4B. However, the route S4 was a

round voyage since it represents the reality of the market. Vessels are ballasting from Europe to the US Gulf, load cargo at one US Gulf port and then discharge in a European port. It is an example of that the interests of the FFABA has been preferred to the representativeness of the indices.

As stipulated in the last update of the manual to panellists of the Baltic Exchange (2007, p.4), "route assessments and the production of its indices [are] the responsibility of the Freight Indices and Futures Committee (FIFC) (…) to ensure it has the views [among others] of the Forward Freight Agreement Brokers' Association (FFABA)". That is the reason why for each change of routes the FFABA has to be consulted. Moreover, previously and by convention "the FIFC comprises the chairman of the FFABA" (Baltic Exchange, 2001, p. 7).

Later in the manual, the importance of the impact of FFA and FFABA on indices is acknowledged: "With the development of the FFA trade ('swaps'), even closer attention has been paid to the returns for each individual route" (Baltic Exchange, 2007b, p. 6).

4.1.6. Index multiplier

In order to reach the initial index level of 1,000 and to merge voyage charter and time charter, the Baltic Exchange is using route multipliers.

Also, when the BFI became BDI in November 1999 a multiplier of 0.998007990 was applied directly on the index. Since the introduction of the BHSI into the calculation of the BDI, which dates back to the 2nd January 2007, would have pulled down the BDI level; a multiplier of 1.192621362 applies as well on the BDI.

An important contradiction appears in the BHSI inception between the willingness to represent the market and the obligation not to drastically affect the index. In a larger

perspective, the challenge consists in meeting both the objective of representativeness and the interests of index users. On the one hand, the introduction of the BHSI into the BDI should fulfill the Baltic Exchange's objective for its indices "designed to reflect the daily movement in rates across dry-bulk spot voyage and time-charter rates" (Kavussanos & Visvikis, 2006a, p. 235). Therefore, it can be assumed that BHSI has been included into the calculation of the BDI in order to increase BDI representativeness of the daily movements of the market. On the other hand, the Baltic Exchange was not willing to drop the BDI level by the inception of a cheaper index which will tremendously affect the users of the indices.

On the 4th August 2007, the BDI reached the historical level of 7,000 points. With no BHSI introduction, BDI should have been at 7,060 points (only 0.85% difference) proving that the route multiplier has been carefully chosen. But with no index multiplier, it should be around 5,900 which should have changed the perception of the market.

Furthermore, the application of a significant multiplier on the BDI itself not only leads to an increase of 19.26% the level of the BDI, but also changes the volatility of the indices.

In conclusion, even though the Baltic Exchange is continuously adapting the BDI structure, some gaps between the indices and the underlying market can be found illustrating the impact on the BDI of the growing influence of FFA traders. The partiality of the indices (restricted vessel age span, subdivision of routes, size of the vessel…) may serve the interests of current FFABA members. However, it will not only decrease the representativeness of the indices but as well diminish a large amount of maritime companies' interests in FFA trading. Last but not least, the increase of consideration of the FFABA by the Baltic Exchange signifies that the Baltic indices became a "marketing product" for FFAs.

Further research beyond the scope of this dissertation should be conducted to study if a relation can be found between the fleet characteristics of major shipowners trading FFAs (size, age…) and the indices segmentation.

4.2. Limited forecast capabilities

The limited forecast capabilities of the FFAs will be investigated by studying two empirical aspects of the FFA trade. Firstly, it will be demonstrated that the forecasting performance can be achieved only temporarily. Secondly, the FFA price is an average of biased perceptions and as such should not be considered as market forecasting tools.

4.2.1. Temporary forecasting performance

According to major scholars (Kavussanos & Visvikis, 2006a, p. 243; Batchelor et al., 2003), one of the main interests to build forecasting models is "as a non storable service, forward rates of sea transportation are not tied up to spot market but are free to be determined by a speculative activity".

However, high forecasting performance can not be maintained since it will reduce the profit for speculators and stop the need for hedging. The liquidity of the FFA trade will therefore be reduced and so the quality of the forecast. Figure 12 shows the flow of events from a temporary high forecasting performance leading to a poor forecast.

As a starting point, the assumption has been taken that the forecasting performance of FFAs was high. The problem is that as soon as the forecasting performance is identified by market participants, the demand of FFAs leading to a lack of liquidity which is a condition *sine qua non* of forecasting performance.

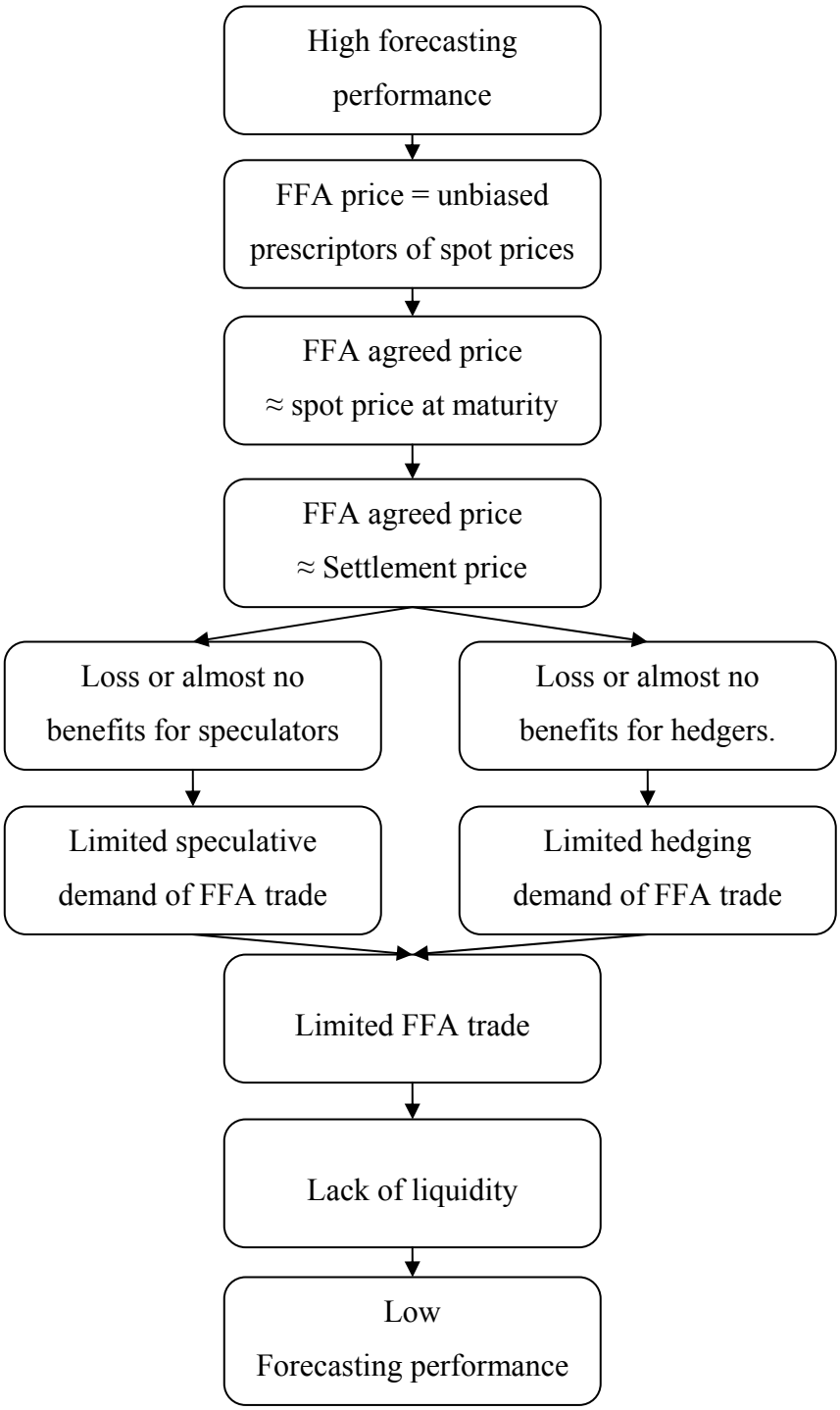

Figure 12: Temporary forecasting performance chain of events

Source: Author

Event though, the maritime industry is eager to reduce the perception of freight risks by establishing some accurate forecast of the spot market, the reduction of perception of freight risks itself will reduce the demand of FFAs.

4.2.2. FFA price is an average of biased perceptions.

According to Kavussanos and Visvikis (2006a, p. 245), the price of an FFA is equal to $F_{t,T} = E_t(S_T)$ i.e. the forward price is equal to the expectations by the market of the freight rate that will prevail at the maturity. It is pointed out that "this is not an exact pricing relationship and **its validity depends,** among other things, **on how precisely expectations are formed in the market** (Kavussanos & Visvikis, 2006a, p. 245)".

However, FFA traders' expectations are not precise and are related to principals' objectives. Three kinds of counterparties' objectives exist: hedgers to hedgers, hedgers to speculators and speculators to speculators.

4.2.2.1 Absence of forecast for hedgers to hedgers

Pure hedgers do not have to realise a forecast but just take the opposite position in the paper market than the risk exposition in the physical market. The hedge will come thanks to the offset of the losses on one market by the gain on the other. However, it is said that few hedgers purely hedge. According to Clarkson (2004), all hedgers realise a forecast and adjust their hedging strategy accordingly.

4.2.2.2 Forecast deviation for hedgers to speculators

The hedgers as mentioned in the previous section will take the opposite position than its physical risk but the speculators will realise a forecast. Therefore, the forecast will be biased according to the speculators' position in the FFA agreement either seller or buyer. This situation (hedgers to speculators) is really common since it is the essence of

derivatives which "reduce or control the unwanted risk of price change [by the hedgers], by transferring it to others more willing to bear the risk [the speculator] (Kavussanos & Visvikis, 2004, p. 928)."

4.3.1.2.1 Buying hedgers with selling speculators

In the case that the hedgers are buying FFAs and have speculators as counterparties, the forecast realised by the speculators is illustrated in Figure 13.

There is a deviation between the FFA agreed price and the forecast of the speculator which correspond to the total transactions costs: transaction costs + speculative margin.

Transaction costs include broking (commissions or spread), a cost equivalent to the counterparty credit risk (clearing), trading cost (opportunity costs, administrative …) and legal costs.

First of all, the transaction cost mentioned in the literature and above is slightly confusing because it will apply only to hedgers. Speculators looking at FFAs as a source of income will have other requirements. Speculators will incorporate a margin in relation with the perceived risks. It is hard to quantify the total transaction cost (transaction costs + speculative margin) since it fluctuates, and differs according to the value of the agreement and the value of the perceived risks.

Nonetheless, broking and clearing are easy to assess since commission and spread are known in advance and clearing fees are published. Also, legal costs are present but marginal. These costs will oscillate between 0.55% and 0.70% depending on the route and the clearing house.

Trading cost is more complex since it is taking into account many aspects either fluctuating or specific to each organisation:

- Cost of borrowing (interest rate and bank margin)
- Opportunity cost (interest of a risk free investment)
- Administrative cost

The speculative margin is the key to all speculative houses. It should be calculated after the preparation of forecasts, probabilities and safety margins. Taking into consideration that a risk free investment like a US treasury bond is remunerated at 5% and that the monthly fluctuation of a capesize can reach 22% within a month (C4 in June 2007), the speculator can not expect less than a 15% return.

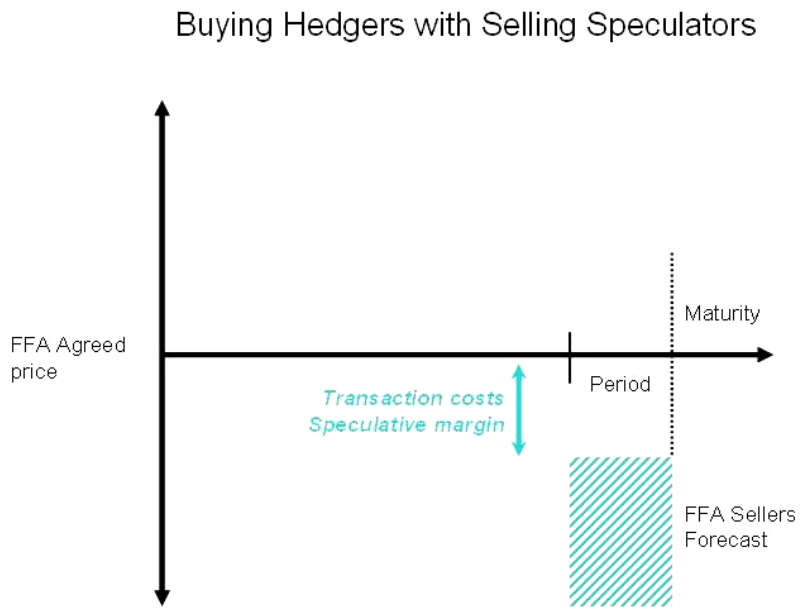

Figure 13: Buying hedgers and selling speculators

Source: Author

Figure 14 shows that the FFA agreed price is a biased indicator if buyers are hedgers and sellers are speculators. The deviation between the FFA agreed price and FFA sellers forecast of the spot price at maturity is at least 15% of the FFA agreed price.

4.3.1.2.2 Selling hedgers and buying speculators

In the case that the hedgers are selling FFA and have speculators as counterparties, the forecast realised by the speculators is illustrated in Figure 14:

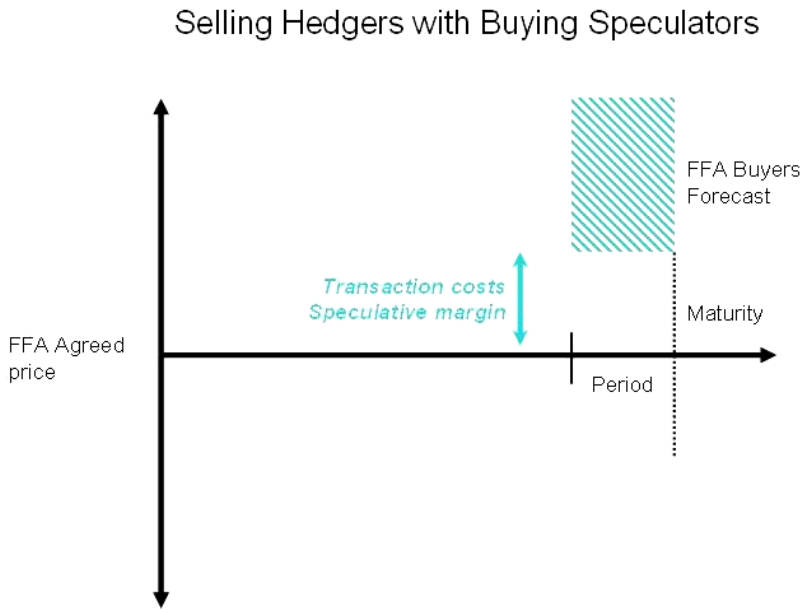

Figure 14: Selling hedgers and buying speculators

Source: Author

Figure 14 illustrates that the deviation between the FFA agreed price and FFA buyers forecast of the spot price at maturity is at least 15% of the FFA agreed price.

4.2.2.3 Contradicting forecast for speculators to speculators agreements

The situation is even more confusing when the counterparties of an FFA trade are two speculators because they will both trade in order to make profit; therefore, their forecasts will be importantly different (at least 30%). As mentioned by Kavussanos and Visvikis (2006, p. 234), "One counter-party takes the view that the price of an agreed freight route, at an agreed time, will be higher than the current level and buys FFA contracts. The other party takes the opposite position, and sells FFA contracts."

Figure 15 illustrates the two contradicting forecasts of the speculators.

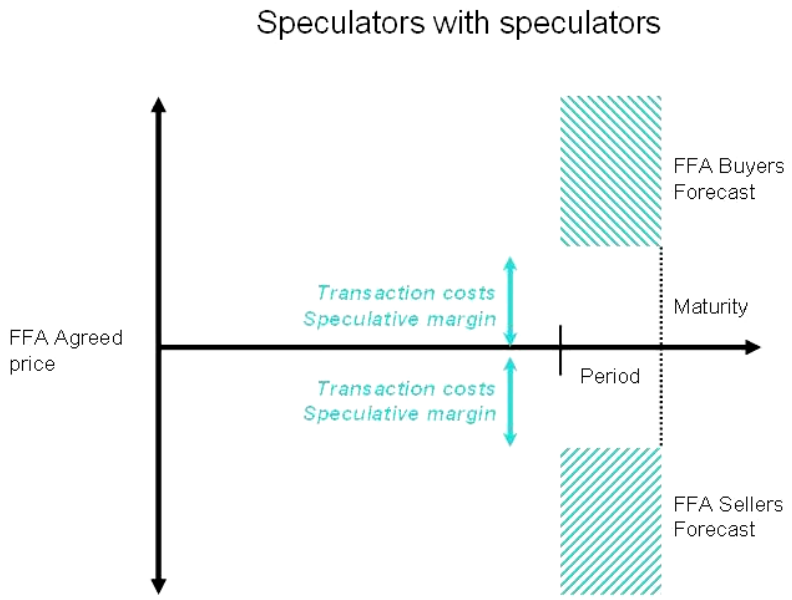

Figure 15: Contradicting forecasts of the speculators

Source: Author

Figure 15 demonstrates that the deviation between the two FFA speculators' forecasts of the spot price at maturity is at least 30% of the FFA agreed price.

In part 4.2.2, it has been demonstrated that the FFA market participants have different forecasts. The deviation between the forecast of the spot price at maturity and the FFA agreed price is at least 15% of the FFA agreed price. The sign of the deviation has to be related to the principals' background (hedgers or speculators) and position in the market (buyers or sellers). The situation is even more confusing since real hedgers are scarce and since it is almost impossible to assess per contract (example: C4 maturity in September 2007) the proportion of buying speculators, selling speculators and hedgers.

Therefore, it can be concluded that the FFA price is an average of biased perceptions and as such should not be considered as precise market forecasting tool.

In conclusion, a high forecasting performance as soon as detected by market participants will lead to a lack of liquidity in the market and therefore will decrease the forecasting performance of the FFA agreed price which is only an average of biased perceptions of the spot prices at maturity.

4.3. Freight risks related supply and demand of FFAs

"The price of each FFA contract is determined at the balance of demand and supply for the particular contract (Batchelor et al., 2007, p. 111)".

As a service, the production and consumption of FFA are simultaneous. However, as an OTC product, there is no production of FFA. The demand of FFA emanates from the buyers and the supply from the sellers. Every market participants can be part of the demand or the supply or even change along the maturity. Consequently, it is more relevant to focus on the uses of FFAs for each market participant. Furthermore, since the FFA market is the aggregate of each market participant's actions, the focus will be on the shipping companies. In this section, some tools from the management arena will be used such as decision tree or SWOT.

The demand and supply balance is influenced by the two main uses of FFAs, either to transfer freight risks (hedging) or to take freight risks (speculation). Then, a SWOT analysis will be performed to understand the relation between the strategic decision to use FFAs and the environment. Since, in the perspective of risk management, FFA is a way to convert freight risk into counterparty credit risk, the former issue will be considered.

4.3.1. To transfer freight risks: Hedging

First of all, the substitution of hedging should be investigated to understand the demand of FFAs. Then, the demand will be subdivided into sub-categories according to the main hedging strategies.

4.3.1.1 Substitution of traditional hedge

Shipping is an old industry and has not waited for the FFAs to create ways to transfer freight risks.

The bareboat charter excludes the shipowners from all operational responsibilities that are transferred to the charterers. Therefore, shipowners will act as an asset manager and will only finance and own the vessel. That is the reason why this kind of charter will be excluded from the following decision making analysis.

The period time charter secures for a period the income of the shipowners since the commercial function (chartering) will be outsourced to the charterers. It presents numerous advantages such as:

- voyage costs transferred to charterers (including bunker costs)
- some liabilities transferred to charterers
- employment security, even ballast legs will be remunerated
- positive cash flow management (income guarantee)
- useful as collateral.

As recommended by Mohanan (2000, p. 420), Figure 16 is a decision tree built to describe the decision making under uncertainty to select FFA (modern risk transfer), forward period time charter (traditional risk transfer) or forward spot market (risk retention) for a hedging strategy. The decision tree applies to either supplier or demander of maritime transportation.

Figure 16 illustrates that either one vessel will terminate its time charter in a forward position such as two months or that a charterer owns a contract of affreightment starting in a forward position such as two months. The decision tree presents in Figure 16, maximum three consecutive steps (left column) and leads to four alternative decisions (terminal nodes in the right column). In each step, hedgers should reply to one question (decision nodes in the column in the middle) by yes or no (Mohanan, 2000, p. 456).

Step one: Hedging effectiveness.

The physical risk should be correlated to one available route or index. If the vessel being open in two months is similar to vessel description of one of the index, the physical risk (trading the vessel) can be considered as highly correlated to the available route/index (see appendix 1). If the owned contract of affreightment starting in two months is for a cargo described in the routes or requires a type of vessel and routes incorporated in the index, the physical risk of the charterer can be considered highly correlated to the available route/index. The issue of representiveness has already been introduced in part 4.1.

Step two: Forecast and risk aversion.

If the market forecast is positive (increase for shipowner or decrease for charterer) and freight risk is acceptable (high probability that the forecast will happen), the hedgers should refuse to trade FFA and fix forward vessel on the spot market.

Step three: Substitution of time-charter.

The forward time-charter should be compared with FFA as a substitute. For the shipowner, if the T/C available for his vessel is at acceptable rate and/or more competitive than FFA, the vessel should enter in a time-charter period. For the charterer, if the T/C available for a vessel able to move the cargo efficiently and/or more

competitive than FFA, the charterer should fix forward a time-charter. Otherwise, FFA can be traded.

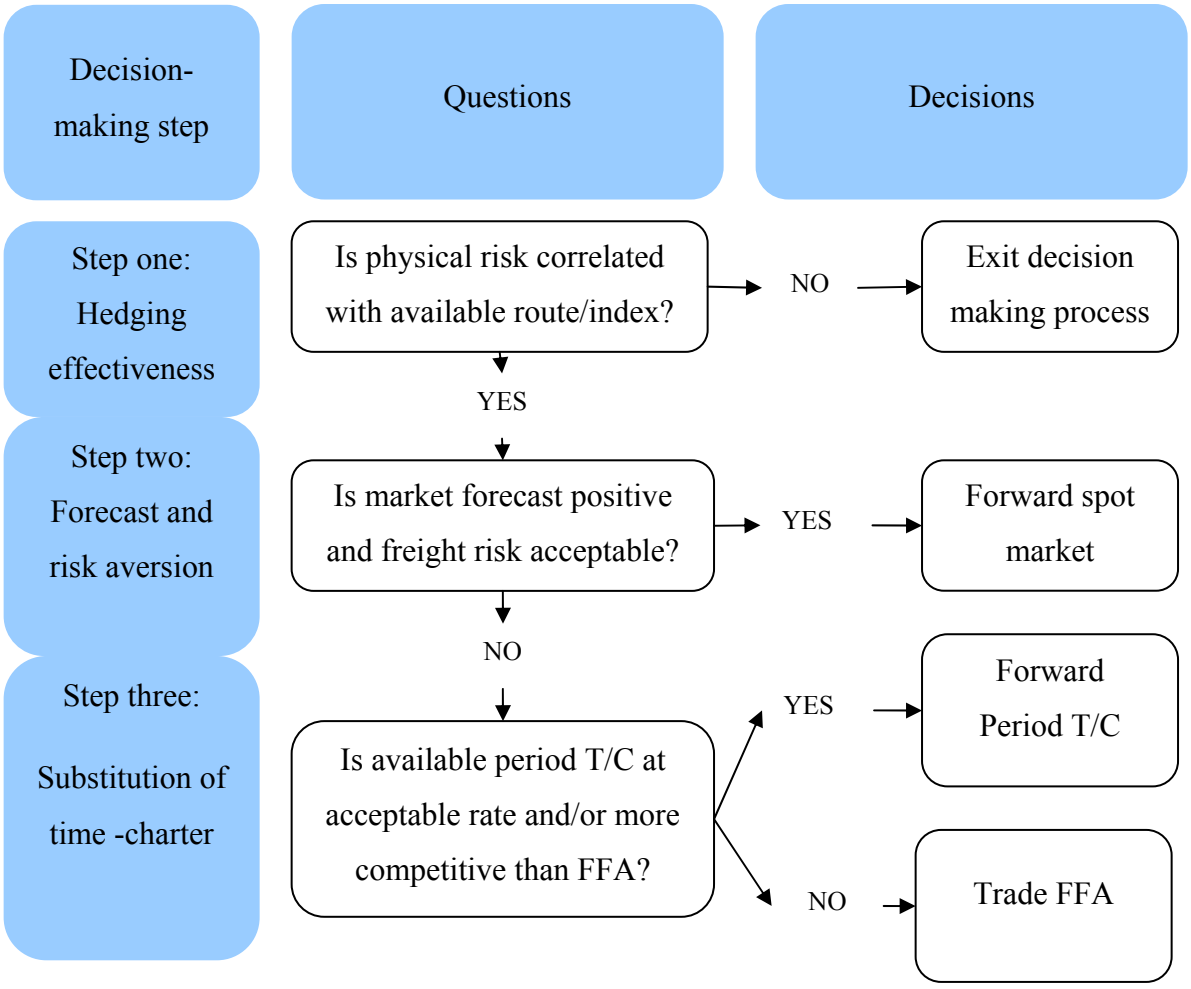

Figure 16: Decision tree to select FFA for hedging strategy

Source: Author, inspired by Gray, 1990, pp. 39-40 and Mohanan, 2000, p. 456.

This decision tree has been designed for shipping companies like charterers, cargo owners or shipowners to select between the substitute of forward spot, forward period T/C and FFA. Yet, the demand/supply of hedgers will be the aggregate of each

organisation' actions. The amount of supply and demand will be affected by the hedging strategy implemented by the market participants.

4.3.1.2 Hedging strategies

Gray (1990, pp. 42-43) presents four major classical strategies used while hedging on derivatives. These strategies can still be applied to FFA. Consequently, after having decided to trade FFA, hedgers are normally applying one of the four following strategies.

4.3.1.2.1 The expansion hedge

On the one hand, charterers restrict their activities to the normal level of their risk portfolio. This level of accepted risks can be expanded by hedging risks coming from a new contract of affreightment.

On the other hand, some risk adverse shipowners may normally charter out their vessels on period time charter in order to maintain their income. Their acquisitions of tonnage are directly related to new period time charter contracts signed. Nowadays, they can purchase a vessel, operate her on the spot market and guarantee their income by hedge of FFA.

4.3.1.2.2 The positioning hedge

A principal forecasts a positive market in a couple of months. He can remain on the spot market hedging FFA upto the moment the market is in his favour and then benefits directly from the market without hedge. Therefore, FFA can be a fantastic tool of flexibility.

4.3.1.2.3 The basis hedge

As explained by Gray (1990, pp. 42-43),

> A charterer and a shipowner may both wish to fix a given very forward position, but be unable to agree a rate (…). They can now fix fully firm, all terms and details agreed, except the rate. The rate can be based on a formula derived from the spot index at the time of shipment. Both parties will have the security of knowing that the voyage will be performed and (…) can take out the appropriate freight futures hedge.

This exact strategy is being used by Quintana Maritime Ltd and Cargill, fixing M/V Barbara for one year time charter based on the 4 T/C routes based on Baltic Average (Quintana, 2006, p.1).

4.3.1.2.4 The blanket hedge

This hedging strategy permits the hedgers to limit the freight risk without loosing the gain opportunity from the spot market. Hedgers will use FFA to cover only one part of their risks and benefits of the spot market for the rest.

This section has proven that the supply and demand of the FFA market was determined amongst other by the willingness of market participants to hedge risk, the decision to hedge with substitute and the choice of hedging strategy implemented.

4.3.2. To take freight risks: speculation.

The second part of the supply and demand determinant is the speculation. As mentioned by Gray (1990, p. 119), an "essential element in any futures market will always be

speculation". FFAs are no exceptions to this and options (put, call, swaps…) are the best tools for speculators. Options will not be dealt with in this dissertation since it is beyond its scope.

Also, similar to other derivatives, FFAs are "used to transfer risk from the risk-averse hedgers to the risk-hungry speculator" (Gray, 1990, p. 119). Actually, only a minority of hedgers tends to fully cover their risks in the paper market since a majority prepares a forecast and speculates that the market will follow their expectations or implement some strategies requiring only partial hedge (e.g. blanket hedge). The specialised press is frequently reporting some major losses in the FFA market and its bad effect on shipping companies' finance. However, a pure hedger should never complain about losses on FFA since they will be offset by incomes in the physical market. Therefore, the official statements present in the press can be taken as illustrating the fact that most companies using FFAs for hedging purposes are simultaneously speculating.

In order to speculate, two major types of analysis are realised. Firstly, a fundamental analysis will focus on the levels of supply and demand and factors (causality analysis) of the underlying market. Secondly, the technical analysis (time series analysis) scrutinized prices movements to extrapolate those movements (Gray, 1990, pp. 121-123).

4.3.3. SWOT analysis: Hedging or speculating FFAs

This section will enable the investigation to go further, to understand internal and external elements that will be taken into consideration to either hedge or speculate, which ultimately will affect the level of supply and demand.

The SWOT analysis is an acronym for Strength, Weaknesses, Opportunities and Threats. This recognized tool of corporate strategy will be used to identify to which extent hedging or speculating FFAs is relevant to the fast moving shipping industry.

Strengths	Weaknesses
SHIPOWNERS / FFA SELLERS ▪ Maintain commercial control of vessel thus give flexibility[1] to asset players to enhance 2nd hand market value ▪ Increase market share without new purchase[1] CHARTERERS / FFA BUYERS ▪ Simplicity: Remove operational risks[2,3] ▪ Possibility to offer hedging services to customer[1], like within Klaveness pool[4]. BOTH FFA BUYERS AND SELLERS ▪ Speculation "directional play"[5]. ▪ Possibility of clearing[6] ▪ Guarantees forward incomes/costs of transportation[1], positive cash flow management ▪ Clear and easy contract[7]. ▪ FFA used as price discovery tool. ▪ Complete traditional physical risk management techniques[8]. Alternative / Substitution of T/C, ▪ Flexibility: Tailored hedge: choice of route, size, period, date of settlement. Hedge better than locked charterparty hire level[5,8] ▪ Cheap: transaction costs lower commission than physical trade[8] ▪ Confidentiality[8]	BOTH FFA BUYERS AND SELLERS · Knowledge required in a highly fragmented industry[5, 13] · No visibility/transparency "Private and Confidential contracts"[14] ▪ No atomicity of the market/Pareto rule: Few current active main players [14] ▪ Cost of clearing. · Limited liquidity, difficulty to find counterparty for OTC FFA[10] ▪ Difficult hedging effectiveness: Choose the appropriate hedge. ▪ Limit of price discovery. ▪ Difficult balance between speculation and hedge.

Opportunities	Threats
▪ Market risk[9]. Increased fluctuations. Need to hedge[10] ▪ Difficulty to find "amicable" charterers[5] enhanced by consolidation in the sector. ▪ Arbitrage opportunities between physical and paper market[2] ▪ Clearing houses and stock exchange developments. ▪ Longer dated settlement options "will attract a whole category of user to the markets."[11] increasing liquidity. Possibility to trade FFAs option upto 2012 "increasing the utility in structured finance deals[11] ▪ Development of education on FFA will increase liquidity [12]	▪ Bad image: Legacy of BIFFEX, a historical failure[5] ▪ Innovation in a conservative industry [5] ▪ Quickly spread "bad news" [14] such as counterparty failure or attempts of manipulation. ▪ Credit/Counter-party/payment default risk[15, 10] ▪ Attempt of index manipulation[16].

Figure 17: SWOT analysis: hedging or speculating FFAs

Source: Author

1: ABN AMRO, 2006, p. 11

2: Raghunath, 2006, p. 26

3: Clarkson, 2004, p. 8

4: www.klaveness.com

5: Jupe, 2006, p. 17

6: Raghunath, 2006, p. 23

7: Perrot, 2006

8: Clarkson, 2004, p. 8

9: Brau, 2006, p. 13

10: Jagani & Thabel, 2005, p. 19

11: "SSY claims", 2007

12: Yao, 2006.

13: Macqueen, 2006, p. 22

14: Jupe, 2006, p. 22

15: Jupe, 2006, p. 23

16: Reference is made to 0

This SWOT analysis has listed the major elements that are considered to enter into the FFA market and possible trade FFA. Depending on the weighting of each element by the corporation added to the company specific considerations, the decision of trading FFA is taken. This analysis made it possible to understand what major elements both internal and external have either a positive or negative impact in the decision to negotiate an FFA.

In conclusion, the agreed price of FFA is defined by the negotiated power of counterparties and affected by the level of demand and supply of FFA. This level of supply and demand is itself related to the intention of hedging and speculating of the market participants. Numerous elements have an impact on the level of supply and demand such as the substitution to hedge, the choice of strategies and many others presented above in the SWOT.

4.3.4. Risk conversion: the counterparty credit risks

Risk management identifies the FFA as a product to transfer freight risks into counterparty credit risk. Counterparty risk, named as well credit risk, is of paramount importance in the FFA trade. Counterparty defaults of payment could lead to a double loss for hedgers (loss in the physical market and loss of the settlement price). For the speculators, the loss will be limited to the FFA transaction costs and speculative margin (see parts 4.2.2.2 and 4.2.2.3) but the risks taken in the transactions have doubled (freight risk and credit risk).

That is the reason why clearing is well developed. Nowadays, for dry bulk FFAs, 10-15% of the FFA trades are cleared (Mortensen, 2007). Reference is made to Table 2: Dry bulk FFA volume in lots (1 T/C or 1,000 tonnes). Clearing share of the FFA trade is expected to grow ("LCH Clearnet", 2007). The current market share is already high

taking into consideration that the market as mentioned by the director of information services of Imarex, Mikal Boe, that Pareto's rule of imbalance is respected: "around 20% of participants have accounted for around 80% of the transactions" (Boe, 2005, p. 89). Those major 20% of participants do not need to be covered by clearing since they are generally humongous trading houses of turnovers of several billion dollars.

Four clearing houses are currently competing in the FFA clearing market:

- NYMEX Clearport: New York Mercantile Exchange clearport
- LCH: London Clearing House
- NOS: Norwegian Options and Futures Clearing House
- SGX Asia Clear: Singapore Exchange Asia Clear

As per Lloyds List (7th June 2007), "Competition heated up last month between the clearing houses". Several services are offered by clearing house such as the elimination of counterparty credit risk and the netting of position.

The FFA is a risk conversion of freight risk into counterparty credit risk; the clearing house services permit to remove the counterparty credit risk.

To conclude, the level of supply and demand of the FFA market is the aggregate of the willingness of market participants to either take or transfer freight risks.

In conclusion, the Baltic Exchange is struggling to adjust its indices to market fluctuations. Some gaps between the indices and the underlying market can be interpreted as the fulfillment of FFABA needs. The increase of consideration of the FFABA by the Baltic Exchange shows that the Baltic indices became a "marketing product" for FFAs. The gaps will not only decrease the representativeness of the indices but also diminish a large amount of maritime companies' interests in FFA trading (hedgers missing the correlation of their freight risks and the traded index).

Furthermore, a high forecasting performance as soon as detected will decrease. Also, it has been demonstrated that it is not correct to use FFA agreed price as a forecasting tool since it is only an average of biased perceptions of the spot prices at maturity.

Lastly, the price of FFA is not equal to the expectations by the market of the freight rate that will prevail at the maturity. However, it is also affected by the level of supply and demand of the FFA market that corresponds to the demand to either take or transfer freight risks.

Chapter 5 - Analysis of possible price distortion using seasonality analysis

During perusal of the press for the purpose of this dissertation, some articles regarding the allegations from FFA market participants that some "manipulations" of the indices occurred have attracted attention. If confirmed, these manipulations are an impact of the FFA trade on the indices and can be considered a further interrelation between FFA and the spot market. This chapter will first analyse the friction in the FFA market (5.1) in order to define an objective of the analysis (5.2) and to select the data to be investigated (5.3). Then, the implementation of the appropriate methodology will make it possible to fulfill the objective (5.4).

5.1. Frictions in the FFA market.

This section will consider the allegations of price distortion of some FFA market participants. Then, the preventive measures that the Baltic Exchange has undertaken will be presented. Finally, the experience in other derivative markets will be used as benchmark of potential manipulations within the FFA market.

5.1.1. Allegations of price distortion: "route manipulations"

Some rumours of "manipulations" of the freight indices have been reported in the press ("Holidays", 2004). Some market participants argued that some reported fixtures were far below from the market level ("Italians turn", 2005). In addition, it has been alleged that some vessels are wrongfully open on the spot while employed for other contracts ("Dirty Dry Tricks", 2004). The objective of these "manipulations" is to pull the market down ("Manipulations spurs", 2005). Further equivalent methods are used to lift up the market in order to support FFA traders' position in the FFA market.

On the one hand, the dry bulk spot market can not be “driven” because of its tremendous size compared to the atomicity of its suppliers and demanders. On the other hand, part of the FFA market participants are very large shipowning companies or humongous trading houses; the continuous consolidation in the mining and commodity trading sectors has reinforced the latter. Therefore, a niche (for instance a route of the index) within the spot market during a short period could be affected by one market participant. When 20% of the FFA market participants accounts for around 80% of the transactions (Boe, 2005, p. 89), it can be understood that some traders have some interests to see the indices moving in their favour.

That is the reason why it has been alleged that most of the voyage routes were affected by those manipulations since their settlement price is estimated on the spot average of the 7 last index days of the month (“Accusations of 'rigging'”, 2005). These “manipulations” are decreasing the entire demand of all FFA routes and reorienting to FFA whose settlement price is a monthly average (Baltic, 2006a, p. 31). Also, for OTC FFA, it is common to amend the FFABA standard form with a monthly settlement date. The period of index for the calculation of the settlement price has been identified long ago as being the weakest link of the freight derivatives. On 1st November 1999, the BIFFEX extended this period from 5 days to 7 days because it “addresses a concern voiced some time ago that the contract was potentially subject to manipulation over a period as short as five days” (“IT matters”, 1999).

5.1.2. Prevention of the Baltic Exchange

The Baltic Exchange has always been willing to prevent misuse of its indices. In the section entitled “good practice to avoid market abuse”, the Manual to panellists forbid the Baltic Exchange employees to trade FFAs and point out that the panel report is confidential and “must not be available to anyone else including other staff or

departments in the [panel] companies". However, employees of panel companies are allowed to trade FFAs either as brokers or principals but should report their activities to the Baltic Exchange.

Even though "Panellists will not normally be influenced by (…) movement in the derivative markets or period market, unrelated to the positions being assessed" (Baltic Exchange, 2007b, p. 10), the Baltic Exchange recognized in the same document that "occasions have arisen when it has been suggested that the physical market is being affected by principals seeking to influence panel returns, and hence the settlement rate which will be applied to their FFA positions" (Baltic Exchange, 2007b, p.13).

In order to avoid manipulation of the indices, the Baltic Exchange advices their panellists to "bear in mind the following points" (Baltic Exchange, 2007b, p. 13):

- Panellists are entitled to take into consideration all relevant market information. Whilst panellists will give due weight to reported fixtures, they are not bound to return a 'last fixed' rate if, in their opinion, other factors, such as tonnage offering below last done, or charterers bidding higher, suggest the fixture no longer represents the market;
- When business is concluded at varying rates, panellists are entitled to exercise their discretion in determining the relative influence of each fixture to their returns;
- Fixtures which have not been fully concluded but which are subject to outstanding approvals should be assessed appropriately.

- If panellists are aware of any outside party directly attempting to influence their returns, the matter should be reported to the Baltic Freight Market Reporter.
- Panellists are not expected to consider the motives underlying any bona fide, properly reported market activity. (Baltic Exchange, 2007b, p. 13).

Further, the Baltic Exchange to illustrate their intention to circumvent any manipulation of the indices states that the panellist should disclose its participation "in any form of freight derivatives trading (whether as broker or principal), always bearing in mind that any panellist, or any employee of the panellist, may have direct or indirect interests in freight derivatives" (Baltic Exchange, 2007b, p. 16).

Moreover, "neither the Baltic Exchange nor its employees are permitted to trade in any freight derivatives market" (Baltic Exchange, 2007b, p. 21), FFA activities are controlled during the audit of the Baltic Exchange: "The statutory annual audit carried out includes (…) disclosure to the satisfaction of the Baltic of the extent of any involvement in freight derivatives business" (Baltic Exchange, 2007b, p. 29).

Furthermore, the Baltic Exchange is trying to separate the panelist reporting for the calculation of indices in the shipbrokers' office to their FFA brokers colleagues.

> Daily reports from panellists are strictly confidential between the Baltic Exchange and the nominated representative of the panel company. Panellists are bound by the confidentiality clauses in the letter of appointment. Their daily reports must not be made available to anyone else. This includes other staff or

departments in the company, and in particular to any department or staff involved in the derivatives markets (Baltic Exchange, 2007b, p. 21).

5.1.3. Benchmark in other derivative markets: basic types of manipulation

It should be borne in mind that other derivatives markets have already seen abuses. The Financial Policy Forum is a reliable think tank, which aims to "conduct economic policy research into financial markets, analyze how they impact the overall economy" (Financial Policy Forum, www.financialpolicy.org). In its report entitled "Consequences of liberalizing derivatives markets", the Forum maintains that market abuses such as fraud and manipulation are "threats to market integrity and efficiency". In addition, some scenarii will be imagined based on the basic types of manipulation which are presented in the same report:

- Information-based manipulation involves communication of partial information: vessels wrongfully open on the spot market, fake tonnage requirements or false report of the market to orientate one route of the spot market.
- Action-based manipulation involves the deliberate distortion of the indices underlying the FFA trade by reporting fixtures which are not representative of the market.
- Trade-based manipulation involves using one market (one route of the indices) to capture the gains from creating a price distortion in another interrelated market (FFA trading the same route).

In conclusion, price distortions have been alleged by several concordant sources. It seems that the risk of manipulations is serious and can badly damage the hedging performance and the trading of FFAs. Therefore, the following section will analyse the data of the underlying market to trace some possible evidence of price distortion.

5.2. Objective of the seasonality analysis

The objective of this research is to assess if the underlying routes of the dry bulk indices are affected by the way the FFA settlement prices are calculated either with an average of the 7 last index days for voyage routes or a monthly average for time charter.

5.3. Data analysed

Focus will be kept on the routes composing the BCI i.e. the index representing the Capesize vessels because it is the only index which includes some voyage routes since it is composed of 40% of the time-charter routes and 60% of the voyage charter routes.

Daily spot prices of the routes have been obtained thanks to the Baltic Exchange. The daily spot prices from their date of introduction till May 2007 of the voyage routes C3 (from May 1998), C4 (idem), C5 (from March 1999), and C7 (idem); time-charter route C10A (from November 2002) and P2A (idem); and the basket of 4 time-charters of BCI (from march 1999) have been chosen to compare the behaviour of the 7 last index days of each month.

For the sake of comparison of the seasonality of the daily spot prices of the routes, Figure 18 differentiates the analysed routes.

Analysed routes differentiation		Settlement price period	
		Monthly	7 last index days
Commonly FFA traded	Yes	4 TC BCI - P2A	C4 - C7
	No	C10A	C3 - C5 - C12

Figure 18: Matrix of the analysed route differentiations

Source: Author

5.4. Two-steps methodology and consequent findings

After trial of several methodologies, it has been decided that the most suitable method will be inspired by the variance-to-mean analysis. This method makes it possible to study the monthly seasonality of the spot market represented by the indices.

5.4.1. Choice of the centered moving average of 21 index days

Indices are only published on United Kingdom business days. On average 21 index days per month are published. A period of 21 index days has been chosen since it corresponds to the average of index days per month.

The moving average has been preferred to a monthly average since the high volatility of the spot market will increase the variance for the two extremes of the period i.e. beginning and the end of the month.

The analysed data has a strong positive trend since all routes have increased from their introduction to May 2007 from 150% for route C12 up to 1,016% for the average of 4 T/C BCI routes. Thus, choice of the moving average is very critical. On the one hand, unsuccessful trial has been made to calculate the moving average on the 21 index days before the data analysed but the results were strongly and structurally positive. On the other hand, unsuccessful trial has been made to calculate the moving average on the 21 index days after the data analysed but the results were strongly and structurally negative. Therefore, a centered moving average will be used. Thus the moving average starts 10 index days before the analysed day and finishes 10 days after, as shown in Figure 19.

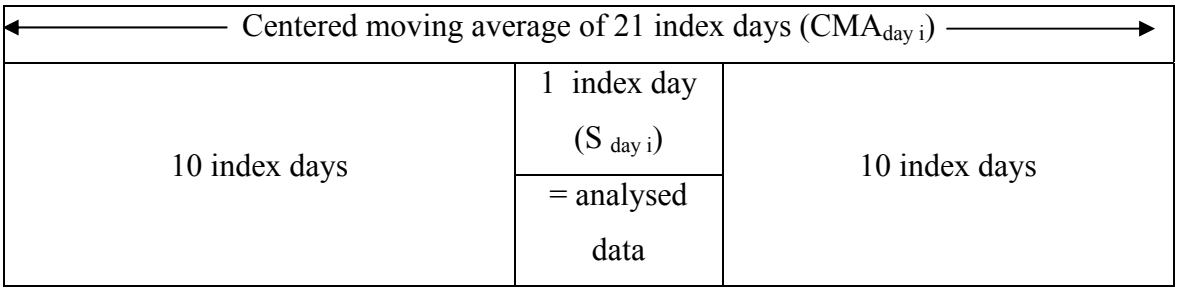

Figure 19: Centered moving average of 21 index days

Source: Author

5.4.2. Mean of the daily gap analysis using a standardised month

5.4.2.1 Daily gap calculation

The daily gap ($GAP_{day\ i}$) is calculated by subtracting the moving average ($CMA_{day\ i}$) to the spot price ($S_{day\ i}$).

$$(1) \qquad GAP_{day\ i} = S_{day\ i} - CMA_{day\ i}$$

The daily gap ($GAP_{day\ i}$) is expressed in USD. A positive (negative) sign in front of the daily gap ($GAP_{day\ i}$) will mean that the spot price ($S_{day\ i}$) is higher (lower) than the 21 index days centered moving average ($CMA_{day\ i}$). These results will be compiled in the Table 6.

5.4.2.2 Mean of the daily gap

Table 6: Table of calculation of mean of the daily gap

	Year 1	Year 2	Year N		
Month / Day	Jan. ……Dec. 1 ……12	Jan. …….Dec. 1 ……..12	Jan. …….Dec. 1 ……..12	Mean	
1	GAP_i … … …	… … … … …	… … … … …	Mean $_i$	W.Mean$_i$
:	:				
:	GAP_j … … …	… … … … …	… … … … …	Mean $_j$	W.Mean$_j$
:	:				
31 = n	GAP_n … … …	… … … … …	… … … … …	Mean $_n$	W.Mean$_n$

Source: Author

The mean of the daily gap (Mean $_i$) is calculated as follows:

(2) $\text{Mean}_i = \Sigma (\text{GAP}_{\text{day } i}) / N_{\text{day } i}$

Where $N_{\text{day } i}$ is equal to the total number of index days falling on the same day of the month for the entire period.

However, the total number of index days falling on the same day of the month for the entire period ($N_{\text{day } i}$) is consequently different for each day of the month. In order to avoid over-representation of infrequent index days, a weighted mean of the daily gap (W.Mean $_i$) is calculated as shown below:

(3) $\text{W.Mean}_i = \Sigma (\text{GAP}_{\text{day } i}) \times N_{\text{day } i} \times 31 \text{ days} / N$

Where N is equal to the total number of index days per each data series.

5.4.2.3 Bar chart of a standardized month

The mean of the daily gap (Mean $_i$) and the weighted mean of the daily gap (W.Mean $_i$) are compiled in a bar chart in Figure 20 for each index to illustrate a standardized month entitled “Mean of the daily gaps from centered moving average of 21 index days”.

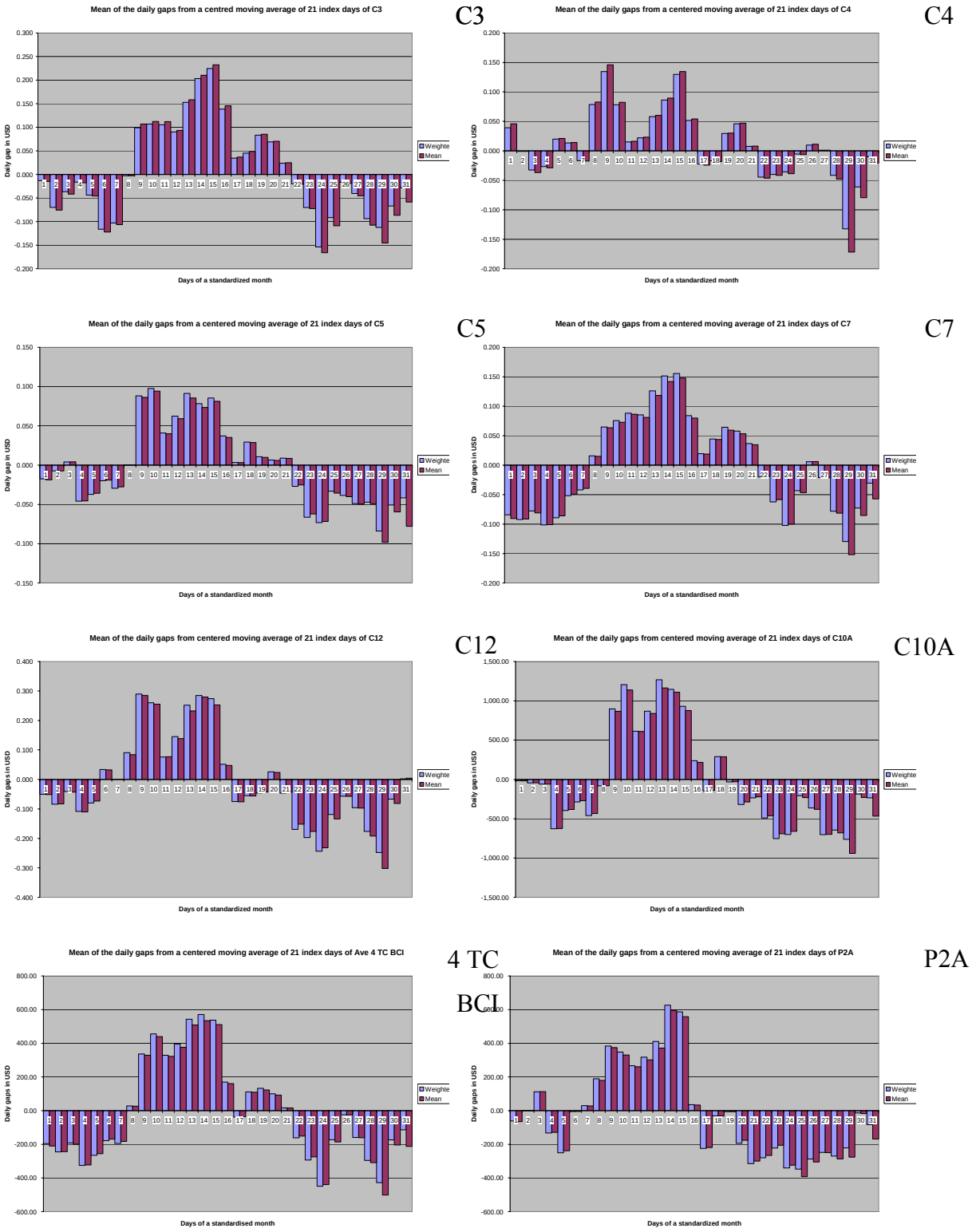

Figure 20: Bar chart of standardised month for analysed routes

Source: Author

5.4.2.4 Main findings from the standardised month

The previous bar charts clearly show seasonality within the studied data. It is clear that the last index days of the month are lower than the centered moving average of 21 index days.

A pattern of seasonality can be seen thanks to the standardised month. The first 6 daily gaps are slightly negative up to the pivot 1 from 6th to 8th of the standardised month. After pivot 1, the daily gaps are increasing a lot and are strongly positive up to the peak on the 15th. After the peak, the daily gaps remain positive up to pivot 2 falling on the 22nd of the standardised month. Following pivot 2, the daily gaps are really negative reaching the nadir on the 29th. Finally, from the 29th up to the 31st the daily gaps are increasing but remain negative.

Five out of the eight studied routes have a similar pattern of seasonality. They are the basket of four time-charters of the BCI which is well FFA traded, the voyage routes well FFA traded C4 and C7, and voyage routes not well FFA traded C3 and C5. However, the pattern of seasonality is different for the routes C10A and C12 which are not directly traded as well as the P2A route that is part of another segment.

Therefore, it can be concluded that at least three factors are influencing the pattern of seasonality:

- Type of route: T/C or voyage
- Route segment: Capesize, Panamax…
- Intensity of the FFA trade.

However, it is hard to assess the level of the price distortion of the 7 last index days using this method. In the following section, another method will be used to overcome the methodology drawback.

5.4.3. Mean of the daily gap analysis by period segmentation

Since the fact that spot prices were following a monthly seasonality pattern has been confirmed, this second analysis objective is to assess the level of the seasonality of the 7 last index days of each month.

5.4.3.1 Segmentation of the month by period

In order to estimate the real impact of the 7 last index days, further calculations based on the segmentation of the month by period have been realised. Each month, the data is segmented into three periods for the entire duration of the analysed data as follows:

- Period 1: Entire month
- Period 2: 7 last index days
- Period 3: Rest of the month

5.4.3.2 Calculation of the average and standard deviation of the daily gaps by period

Table 7: Calculation of the average and standard deviation of the daily gaps by period

		Year 1	Year 2	Year N	Average
Month / Day		Jan. …….Dec. 1 ……..12	Jan. …….Dec. 1 ……..12	Jan. …….Dec. 1 ……..12	
1 : : 31 = n		GAP_i … … … : GAP_j … … … : GAP_n … … …	… … … … … … … … … … … … … … …	… … … … … … … … … … … … … … …	
Period 1	Average	$ave.GAP_1$	$ave.GAP_1$	$ave.GAP_1$	$AVE.GAP_1$
	Standard deviation	$sd.GAP_1$	$sd.GAP_1$	$sd.GAP_1$	$S.D.GAP_1$
Period 2	Average	$ave.GAP_2$	$ave.GAP_2$	$ave.GAP_2$	$AVE.GAP_2$
	Standard deviation	$sd.GAP_2$	$sd.GAP_2$	$sd.GAP_2$	$S.D.GAP_2$

Source: Author.

The average of the daily gaps of the entire month ($AVE.GAP_1$) is calculated as follows:

(4) $AVE.GAP_1 = \Sigma (ave.GAP_{1, month\ i, year\ i} + \ldots + ave.GAP_{1, month\ n, year\ n}) / N_{month\ n}$

Where

$ave.GAP_{1, month\ i, year\ i}$ is the average of the daily gaps of index days falling under period 1 (entire month) for the selected month.

$N_{month\ n}$ is the number of month for the full period.

The average of the daily gaps of 7 last index days ($AVE.GAP_2$) is calculated as follows:

(5) $AVE.GAP_2 = \Sigma (ave.GAP_{2, month\ i, year\ i} + \ldots + ave.GAP_{2, month\ n, year\ n}) / N_{month\ n}$

Where

$ave.GAP_{2,\ month\ i,\ year\ i}$ is the average of the daily gaps of index days falling under period 2 (7 last index days) for the selected month.

The average of the daily gaps of the rest of the month ($AVE.GAP_3$) is calculated as follows:

(6) $AVE.GAP_3 = (AVE.GAP_1 \times 31 + AVE.GAP_2 \times 7) / (31-7)$

The average of the standard deviation of the daily gaps of the entire month ($S.D.GAP_1$) is calculated as follows:

(7) $S.D.GAP_1 = \Sigma\ (sd.GAP_{1,\ month\ i,\ year\ i} + \ldots + sd.GAP_{1,\ month\ n,\ year\ n}) / N_{month\ n}$

Where

$sd.GAP_{1,\ month\ i,\ year\ i}$ is the standard deviation of the daily gaps of index days falling under period 1 (entire month) for the selected month.

The average of the standard deviation of the daily gaps of the 7 last index days ($S.D.GAP_2$) is calculated as follows:

(8) $S.D.GAP_2 = \Sigma\ (sd.GAP_{2,\ month\ i,\ year\ i} + \ldots + sd.GAP_{2,\ month\ n,\ year\ n}) / N_{month\ n}$

Where

$sd.GAP_{2,\ month\ i,\ year\ i}$ is the standard deviation of the daily gaps of index days falling under period 2 (7 last index days) for the selected month.

These results ($AVE.GAP_1$, $AVE.GAP_2$, $AVE.GAP_3$, $S.D.GAP_1$ and $S.D.GAP_2$) are compiled in a table. Further, some other indicators are calculated to compare time-charter and voyage charter even though their spot prices (S_i) are really different.

Firstly, the mean of each index for the entire period is calculated as follows:

(9) $Mean = \Sigma\ (S_i) / N_{day\ i}$

Secondly, the relative average of the daily gaps of the 7 last index days is estimated thanks to index 1:

(10) Index 1: $AVE.GAP_2$ / Mean x 1,000

Thirdly, the consistency/stability of the average of the daily gaps of the 7 last index days is estimated using index 2:

(11) Index 2 = S.D.GAP2 / AVE.GAP_2

5.4.3.3 Summary of results: average of the daily gap analysis by period segmentation

Table 8: Average of the daily gaps from the centered moving average of 21 index days for all studied routes (in USD, except for index 1 &2)

	AVEGAP 1	AVEGAP 2	AVEGAP 3	Mean	Index 1	S.D. GAP_1	S.D. GAP_2	Index 2
C3	0.005	-0.078	0.030	18.654	-4	0.448	0.259	3.32
C4	**0.009**	**-0.043**	**0.024**	**10.977**	**-4**	**0.400**	**0.227**	**5.30**
C5	-0.003	-0.055	0.012	9.217	-6	0.264	0.154	2.81
C7	**-0.004**	**-0.052**	**0.009**	**11.575**	**-4**	**0.284**	**0.187**	**3.60**
C12	-0.009	-0.150	0.032	24.836	-6	0.592	0.345	2.29
C10A	-29.84	-580.87	130.87	51,182	-11	2563.43	1574.07	2.71
Ave 4TC BCI	**-17.24**	**-245.51**	**49.34**	**35,751**	**-7**	**1292.68**	**790.77**	**3.22**
P2A	**-16.50**	**-272.52**	**58.17**	**29,846**	**-9**	**1104.66**	**749.80**	**2.75**

Source: Author.

Note: In bold are represented most FFA traded routes (>4%)

5.4.3.4 Main findings from the period segmentation

The average of the daily gaps of the entire month (AVE.GAP_1) is small, showing that the moving average of 21 days gives homogenous data and appears to be an appropriate time span to limit structural variance due to price volatility.

The average of the daily gaps of the 7 last index days (AVE.GAP_2) is negative for all studied routes. Therefore, seasonality can be confirmed; the last 7 index days of the month are on average inferior than the entire month. Thus, spot prices are dropping from

the centered moving average for the 7 last index days between USD0.04 to USD0.15 for voyage routes and USD245 to USD581 for time-charters.

The average of the daily gaps of the rest of month ($AVE.GAP_3$) is positive for all studied routes. This result confirms that the sign of average of the daily gaps of the entire month ($AVE.GAP_1$) is due to the level of impact of the average of the daily gaps of 7 last index days ($AVE.GAP_2$).

This analysis has the advantage to provide figures directly communicable in USD. However, to compare the average of the daily gaps of 7 last index days, it is necessary to establish an index in order to understand the relative size of the seasonality. Thanks to index 1, it can be concluded that the type of contract of the route has an influence on the seasonality. The seasonality is relatively smaller for voyage routes C3, C4, C5, C7 and C12 than for time-charter routes C10A and P2A, as well as the basket of time-charter routes (Ave. 4 TC BCI). This finding is in direct contradiction with the presumption that voyage routes are more targeted by manipulations since the time span of the price settlement calculation is smaller.

Index 2 estimates the stability of the average of the daily gaps of the 7 last index days; in other words, the consistency of the seasonality. For all studied routes, index 2 is above 1 ($S.D.GAP_2 > AVE.GAP_2$) showing that the seasonality is not steady; thus, it is punctual. Routes C5, C12, C10A and P2A have a more consistent seasonality since the index is relative lower (below 3). It can be concluded that routes C3, C7 and Ave. 4 TC BCI are relatively instable because the index 2 is between 3 and 4. Finally, route C4's seasonality is truly unstable. Taking into account that route C4 is the most traded route (it concentrated in 2005 30% of the FFA transactions), it might be a coincidence that its 7 last index days of route C4 have the highest inconsistency.

Inconsistency / FFA traded	Low inconsistency	Relative inconsistency	High inconsistency
Yes	P2A	4 TC BCI – C7	C4
No	C5 - C10A – C12	C3	

Figure 21: Matrix of inconsistency of the seasonality and FFA trade intensity
Source: Author.

From this matrix, it can be concluded that FFA traded routes have a higher inconsistency of its seasonality. However, two exceptions appeared P2A and C3.

P2A is part of the Panamax segment of the index. It has been estimated that the Panamax segment would be the most FFA traded in 2007. Further studies would permit to conclude if the seasonality can only be seen in the Capesize index or if it is general.

C3 is the route transporting Iron Ore from Turabao, Brasil to the range of Beilun-Baoshan, China. In practice, few vessels are open next to Turabao, Brasil but more tends to be open either in European seas or in Chinese seas. Therefore, charterers need to fix vessels coming under ballast condition to load the cargo. On the one hand, vessels ballasting from Europe are closer to Puerto Bolivar (route C7). One the other hand, vessels ballasting from the Pacific Basin are closer to Richard's Bay (route C4). In these conditions, it is clear that C4 and C7 rates could spill over route C3.

To conclude, it has been proven that 5 out of 8 routes are following the same seasonality. The three routes not following the same pattern of seasonality belongs either to another segment or are not traded by FFAs. In addition, it has been demonstrated that the 7 last index days of the month are lower than the centered moving average of 21 index days. In this analysis, it is not possible to understand if this seasonality is only to be related to a price distortion of FFA market participants. The relevant conclusion to FFA practitioners is that the 7 last index days are affected by the seasonality and could be manipulated. Therefore, it is recommended for all FFA buyers of voyage routes to amend the FFABA contract and to trade on a monthly average basis.

Further analysis demonstrated that time-charter routes are relatively more affected than voyages routes. No conclusion can be extrapolated thanks to this analysis. However, it should be noted that the types of manipulations presented in part 5.1.3 and therefore the price distortion can affect both voyage charter and time-charter routes.

The inconsistency is higher for voyage routes than for time-charter routes showing that irregularly the market deviates from its “normal seasonality” and rise. These irregular rises of the index mostly affecting voyage routes can be a price distortion on the up side. Finally, the fact that route C4 has a disproportionate inconsistency of its seasonality confirmed that it has concentrated the largest price distortion from May 1998.

Chapter 6 - Conclusion

6.1 Major findings of the dissertation and possible recommendations

In addition to improving the knowledge of the author on FFA, the dry bulk spot market and the BDI, this dissertation has revealed the following:

1. Pure and perfect competition

The FFA market is not in a state of pure and perfect competition mostly because of large barriers at entrance (financial and knowledge hindrances) that have caused an oligopoly/oligopsony market.

In order to obtain a more competitive thus efficient market, the barriers at entrance should be lifted. All initiatives aiming at reducing these barriers should be promoted.

2. The impact on the BDI of the growing influence of FFA traders

The Baltic Exchange indices are partially representative of the market since the Baltic Exchange serves FFA traders' interests. The change of the index multiplier due to the pressure of index users reduces the representativeness of the BDI.

The Baltic Exchange should be clearly reorganised to limit the influence of the FFA traders within its organisation. On the longer term perspective, maintaining representative indices is the only way to maintain the reference both as a market indicator and a data provider of derivative settlement price.

3. The Baltic indices became a "marketing product" for FFAs

The fact that only young tonnage is considered in the index has marginalised shipowners of older tonnage to trade FFAs and to be represented in the BDI. The decision to incorporate 85% of time-charter routes in the BDI has permitted shipowners to attract many charterers and operators trading 30% of FFA value.

4. The empirical limitation of the forecasting capabilities

The limitations of the forecasting capabilities have been proven. High performance forecast can only be temporary. In addition, FFA prices are only an average of biased perceptions of the spot prices at maturity and as such can not be used as a valid forecasting tool.

Even though the shipping industry is always looking for forecasting tools, FFAs' proven limited forecasting capabilities should prevent its utility.

5. FFA pricing thanks to supply and demand of FFAs

In contradiction to Kavussanos and Visvikis (2006, p. 245), the price of FFA is not equal to the expectations by the market of the freight rate that will prevail at the maturity. Its pricing is far more complex. FFA is due to the level of supply and demand of the FFA market that corresponds to the demand to either take or transfer freight risks. The demand and supply is the aggregate of companies' actions that could be affected by many aspects, both internal and external summarised in a SWOT analysis.

6. Monthly seasonality of the capesize routes

It has been proven that five out of eight studied routes are following the same pattern of seasonality. It has also been proven that the 7 last index days of the month are lower than the centered moving average of 21 index days between USD0.04 to USD0.15 for voyage routes and USD245 to USD581 for time-charters.

7. Price distortion of the spot prices by FFA traders

This analysis does not allow for understanding if this seasonality is only to be related to a price distortion of FFA market participants. However, the fact that inconsistency of seasonality is higher for voyage routes and disproportionate for C4 can be interpreted as a piece of evidence of price distortion.

It is recommended that all FFA buyers of voyage routes should amend the FFABA contract and to trade on a monthly average basis.

6.2 Potential further research

The preparation of this dissertation has triggered many questions which have not been dealt within the literature. Regarding the representativeness of time-charter in the dry bulk market, is the current ratio 85% for time-charter and 15% for voyage charter representative of the freight market value, volume or just not representative?

Many other aspects of the research on FFAs can be developed such as a comparison between the characteristics of the vessels either owned or fixed by FFAs traders (the physical risk) and the vessel description in the index (the hedgeable risk).

The seasonality analysis used in this paper can be applied on all routes of the BDI and could lead to a conclusion if the seasonality can only be seen in the Capesize index and one Panamax route or if it is general. Also, the research can be implemented for the wet bulk indices. Furthermore, it would be of interest to analyse the causes of seasonality and to investigate why time-charter routes are more affected by the seasonality.

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APPENDIX 1: Routes descriptions

Table 9: Baltic Exchange Capesize Index Composition

Route	Shipment size	Cargo	Route description	Duration (days)	Weightings
C2	160,000	Iron ore	Tubarao to Rotterdam		10%
C3	150,000	Iron ore	Tubarao to Beilun-Baoshan		15%
C4	150,000	Coal	Richard's Bay to Rotterdam		5%
C5	150,000	Iron ore	West Australia to Beilun-Baoshan		15%
C7	150,000	Coal	Bolivar to Rotterdam		5%
C8	N/A	T/C	Transatlantic round voyage. Delivery: Gibraltar-Hamburg	30-45	10%
C9	N/A	T/C	Delivery: ARA or passing Passero, Redelivery: China-Japan	About 65	5%
C10	N/A	T/C	Transpacific round voyage. Delivery China-Japan,	30-40	20%
C11	N/A	T/C	Delivery: China-Japan, Redelivery: ARA or passing Passero.	About 65	5%
C12	150,000	Coal	Gladstone to Rotterdam		10%

Source: Baltic Exchange and Clarkson Securities Ltd, 2007.

The major elements of the time-charter description of the Baltic Capesize are as follows:

- "built in first class competitive yard"
- 172,000 mt dwt on draft 17.75 m
- max. loa 289 m, max beam 45m,
- 190,000 cbm grain,
- 14.5L /15.0B on 56 mts fuel oil, no diesel at sea;
- Non coated.
- Not ice classed.
- Special survey passed.
- Maximum age - 10 years.
- 2% total commission.
- Laycan 5/15 days in advance.

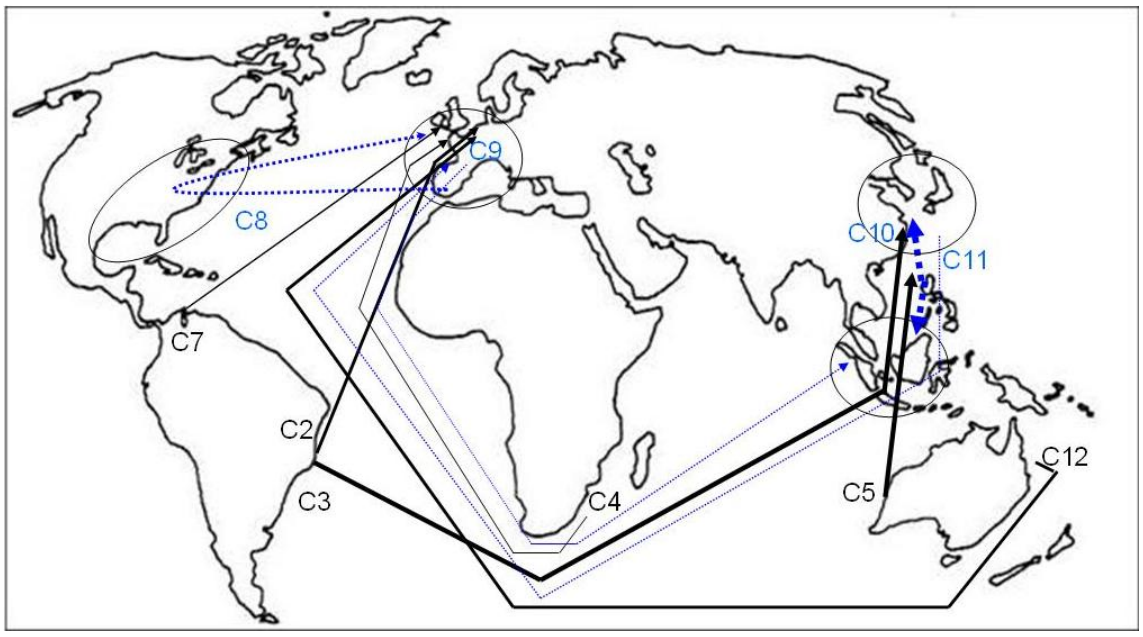

Figure 22: Mapping of BCI routes

Source: Author.

Note:

- The width of each represents its weighting within the BCI.
- Pointed routes are time-charter routes.
- Circle area corresponds to a range of ports.

Table 10: Baltic Exchange Panamax Index Composition

Route	Ship size (DWT)	Cargo	Route description	Duration (days)	Weightings
P1A	74,000	T/C	Transatlantic round voyage. Delivery: Skaw-Gibraltar. Redelivery: Skaw-Gibraltar.	50-60	25%
P2A	74,000	T/C	Delivery: Skaw-Gibraltar. Redelivery: Taiwan-Japan.	60-65	25%
P3A	74,000	T/C	Transpacific round voyage.	35-50	25%
P4	74,000	T/C	Delivery: Japan-Korea. Redelivery: Skaw-Gibraltar.	50-60	25%

Source: Baltic Exchange and Clarkson Securities Ltd, 2007.

The major elements of the time charter description of the Baltic Panamax are as follows:

- "built in first class competitive yard"
- 74,000 mt dwt on draft 13.95 m,
- 89,000 cbm grain,
- max. loa 225 m,
- 14.0 knots on 32L/28B fuel oil and no diesel at sea.
- Non coated.
- Not ice classed.
- Special survey passed.
- Maximum age - 7 years.
- 2% total commission.
- Cargo basis grain, ore, coal, or similar.
- Laycan 15/25 days in advance.

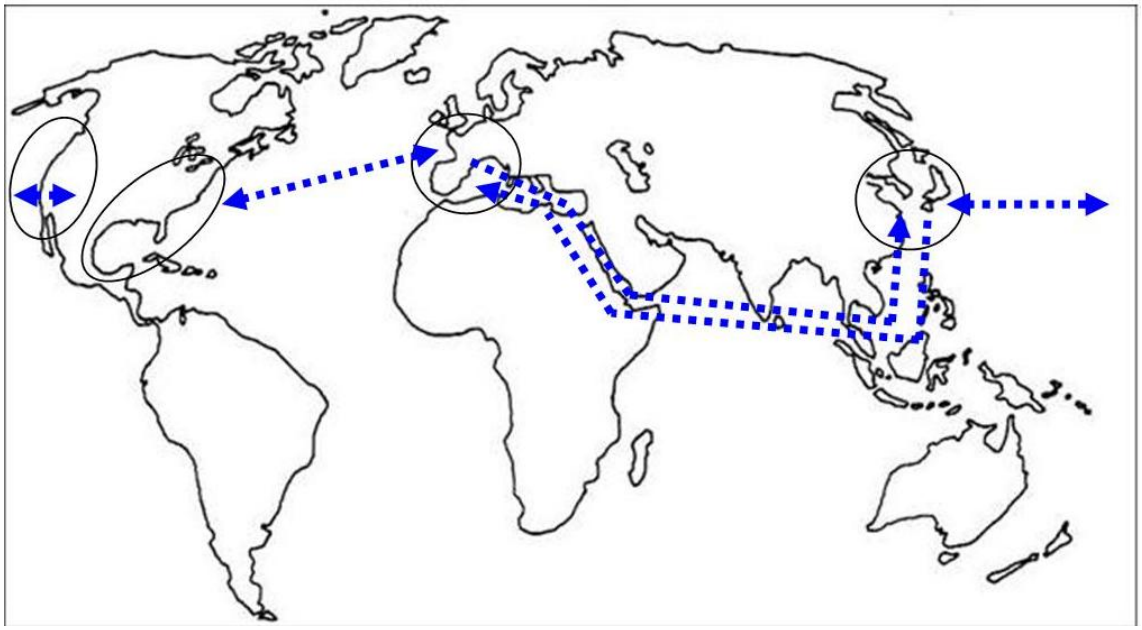

Figure 23: Mapping of BPI routes

Source: Author.

Note:

- The width of each represents its weighting with the BPI.
- Circle area corresponds to a range of ports.

Table 11: Baltic Exchange Supramax Index composition

Route	Ship Size (DWT)	Cargo	Route description	Duration (days)	Weightings
S1A	52,454	T/C	Delivery: Antwerp/Skaw range Redelivery: Singapore/Japan range incl. China	60-65	*12.5%*
S1B	52,454	T/C	Delivery passing Canakkale Redelivery Singapore/Japan range incl. China	50-55	*12.5%*
S2	52,454	T/C	Trans Pacific round voyage or Delivery South Korea/Japan range for 1 Australian port Redelivery South Korea/Japan range.	35-40	*25%*
S3	52,454	T/C	Delivery South Korea/Japan range Redelivery Gibraltar/Skaw range.	60-65	*25%*
S4A	52,454	T/C	Delivery US Gulf Redelivery Skaw-Passero range.	*30*	*12.5%*
S4B	52,454	T/C	Delivery Skaw – Passero range Redelivery US Gulf.	*30*	*12.5%*

Source: Baltic Exchange and Clarkson Securities Ltd, 2007.

The major elements of the time charter description of the Baltic Supramax are as follows:

- Standard "Tess 52" type vessel with grabs as follows:
- 52,454 mt dwt self trimming single deck bulkcarrier on 12.02 m ssw
- 189.99 m LOA 32.26 m Beam
- 5 holds / 5 hatches
- 67,756 cum.grain 65,600 cum.bale
- 14L /14.5B on 30mt (380 cst) no mdo at sea
- Cr 4 x 30 mt with 12 cum grabs
- Maximum age - 10 years
- 5% commission total
- Laycan 5/10 days in advance.

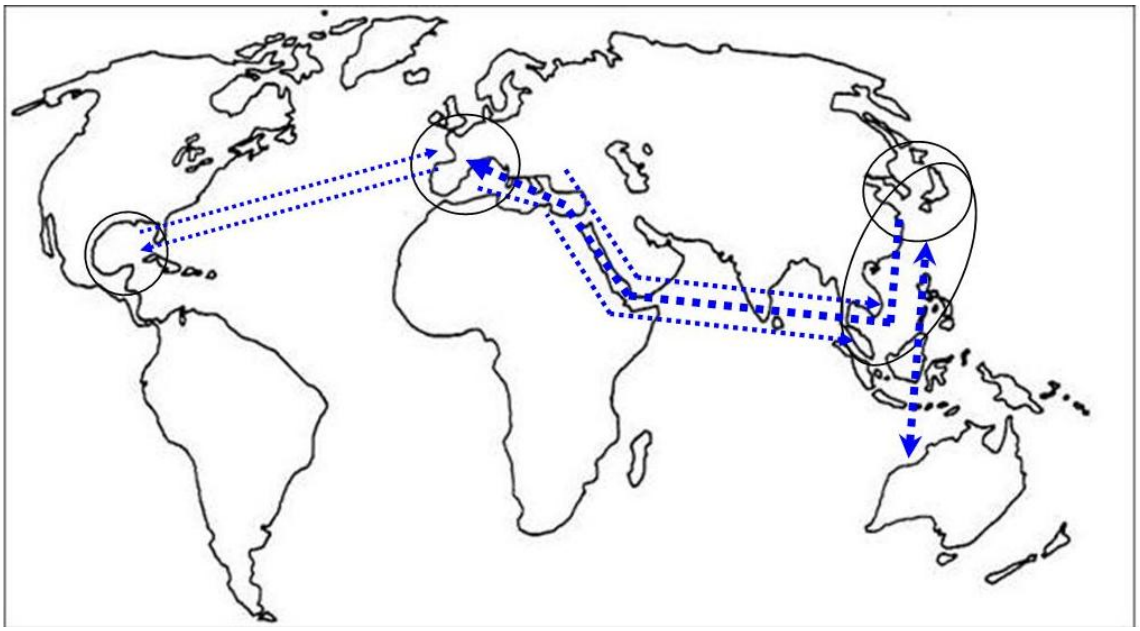

Figure 24: Mapping of BSI routes

Source: Author.

Note:

- The width of each represents its weighting with the BPI.
- Circle area corresponds to a range of ports.

Table 12: Baltic Exchange Handysize Index composition

Route	Ship Size (DWT)	Cargo	Route description	Duration (days)	Weightings
HS1	28,000	T/C	Delivery: Skaw – Passero range Redelivery: Recalada – Rio de Janeiro range.	35 - 45	*12.5%*
HS2	28,000	T/C	Delivery: Skaw - Passero range Redelivery: Boston – Galveston range.	35 - 45	*12.5%*
HS3	28,000	T/C	Delivery: Recalada – Rio de Janeiro range. Redelivery: Skaw – Passero range.	35-45	*12.5%*
HS4	28,000	T/C	Delivery: US Gulf Via US Gulf or NC South America, Redelivery: Skaw – Passero range.	35-45	*12.5%*
HS5	28,000	T/C	Delivery South East Asia. Via Australia. Redelivery: Singapore – Japan range including China.	*25 - 30*	*25%*
HS6	28,000	T/C	Delivery: South Korea – Japan range. Via North Pacific. Redelivery: Singapore-Japan range including China.	*40 - 45*	*25%*

Source: Baltic Exchange and Clarkson Securities Ltd.

The major elements of the time charter description of the Baltic Handysize are as follows:

- 28,000 mt dwt self trimming single deck bulkcarrier on 9.78m ssw
- 5holds/5 hatches.
- 37,523 c.um grain 35,762 c.um bale
- 4x 30 t cranes
- 69m loa 27 m beam.
- 14 knots on average laden/ballast on 22 mt ifo (380) no diesel at sea.
- Maximum age - 15 years
- 5% total commision
- Laycan 5/10 days in advance.

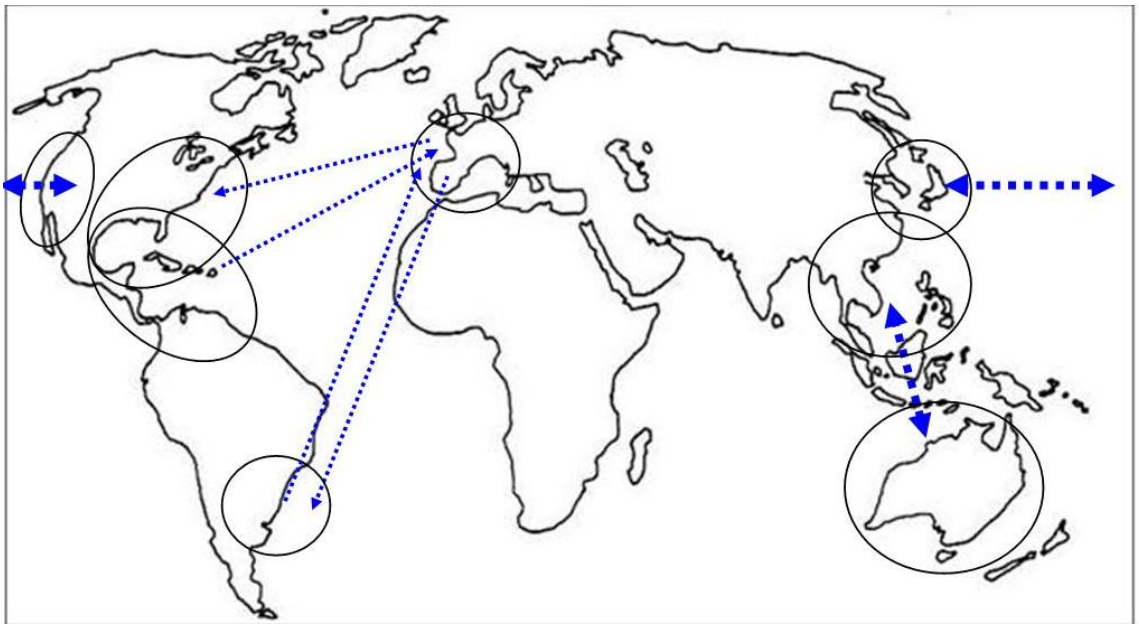

Figure 25: Mapping of BHSI routes

Source: Author.

Note:

- The width of each represents its weighting within the BCI.
- Circle area corresponds to a range of ports.

APPENDIX 2: Imarex Trade statistics - Drybulk

Table 13: Imarex trade statistics - Drybulk

Imarex trade statictics 2004 - Drybulk	# trades	# lots	Nominal trade value	Avg. Lots / trades	Avg. Nom value / trade	Avg. Lots / trades annual
Aug '04	27	4 013	101 000 000	149	3 740 741	
Sep '04	33	5 741	110 000 000	174	3 336 364	
Oct '04	22	3 711	89 900 000	169	4 086 364	148.20
Nov '04	42	5 386	142 300 000	128	3 388 095	
Dec '04	29	3 498	103 300 000	121	3 562 069	
Total (ytd)	**560**	**102 835**	**2 292 200 000**			
Jan '05	30	4 067	125 200 000	154	4 171 848	
Feb '05	24	2 641	70 700 000	110	2 944 208	
Mar '05	30	3 697	103 780 000	123	3 459 317	
Apr '05	24	4 085	105 600 000	170	4 399 832	
May '05	26	4 125	92 958 000	159	3 575 304	
Jun '05	32	5 414	97 286 000	169	3 040 198	
Jul '05	41	6 021	88 600 000	144	2 215 844	114.42
Aug '05	38	4 121	69 000 000	108	1 800 000	
Sep '05	79	6 212	117 000 000	79	1 480 000	
Oct '05	71	2 560	52 000000	36	726 000	
Nov '05	130	6 309	99 300 000	49	764 000	
Dec '05	45	3 223	46 000 000	72	1 067 000	
Total (ytd)	**570**	**52 475**	**1 067 424 000**			

Imarex trade statictics 2006 - Drybulk	# trades	# lots	Nominal trade value	Avg. Lots / trades	Avg. Nom value / trade	Avg. Lots / trades annual
Jan '06	151	9 292	$131 000 000	62	$870 220	
Feb '06	81	4 459	$ 71 000 000	55	$872 000	
Mar '06	85	4 968	$ 78 000 000	58	$917 000	
Apr '06	41	3 101	$ 48 000 000	76	$1 170 731	
May '06	176	11 200	$162 820 000	64	$935 747	
Jun '06	102	9 319	$162 648 000	82	$1 594 588	
Jul '06	102	10 038	$193 965 000	98	$1 901 614	79.17
Aug '06	165	20 157	$503 873 000	122	$3 053 778	
Sep '06	88	7 485	$224 400 000	165	$2 550 820	
Oct '06	77	5 485	$163 000 000	71	$2 116 883	
Nov '06	142	8 566	$251 000 000	60	$1 767 606	
Dec '06	46	1701	$ 53 000 000	37		
Total (ytd)	**1 256**	**95 771**	**$2 042 706 000**			
Jan '07	156	6 172	$183 mill	40	$1.2 mill	
Feb '07	178	9 462	$321 mill	53	$1.8 mill	
Mar '07	134	10 742	$370 mill	80	$2.7 mill	
Apr '07	92	8 006	$317 mill	87	$3.4 mill	67.60
May '07	180	14 111	$520 mill	78	$2 mill	

Source: Imarex

APPENDIX 3: Progressive introduction of the daily BFA

Following extracts of the history of the Baltic Exchange, the introduction of the daily BFA has been progressive (BFA related to tanker routes has been voluntarily excluded):

2 February 2003 – Trials begin on the Baltic Forward Assessment (BFA), initially for Routes P2, P2A and C4 and the panamax four-time charter average. Assessments for the routes are on the basis of the current month and one and two months forward, for the four timecharter average on the basis of one, two and three quarters forward. Assessments are produced on a weekly basis. (Baltic Exchange, 2007a, p. 20)

18 September 2003 –BFA is officially launched. (Baltic Exchange, 2007a, p. 21)

4 February 2004 – BFA assessment for Route P2 ceases. (Baltic Exchange, 2007a, p. 21)

25 February 2004 – BFA assessment for Route P3A_03 commences (Baltic Exchange, 2007a, p. 21)

7 May 2004 -The BFA commenced trials on a number of heavily dry and tanker routes on a daily basis. On the dry side on routes C4, C7, Capes 4TC, P2A_03, P3A_03, Panamax 4TC and Handymax 6TC. (Baltic Exchange, 2007a, p. 23)

01 September 2005 – BFA Reporting Changes.
C3 & C5 are introduced. The rollover date, for all routes, is now the first working day of each month. (Baltic Exchange, 2007a, p. 27)

APPENDIX 4: Calculation of geographical segmentation

Table 14: Calculation of geographical segmentation for BCI

Route	Shipment size	Cargo	Route description	Weightings	Atlantic		Pacific	
					Distance	%	Distance	%
C2	160,000	Iron ore	Tubarao to Rotterdam	10%		100%		
C3	150,000	Iron ore	Tubarao to Beilun-Baoshan	15%	3,201	30%	7,438	70%
C4	150,000	Coal	Richard's Bay to Rotterdam	5%		100%		
C5	150,000	Iron ore	West Australia to Beilun-Baoshan	15%				100%
C7	150,000	Coal	Bolivar to Rotterdam	5%		100%		
C8		T/C	Transatlantic round voyage. Delivery: Gibraltar-Hamburg	10%		100%		
C9		T/C	Delivery: ARA or passing Passero, Redelivery: China-Japan	5%	6,158	43%	8,229	57%
C10		T/C	Transpacific round voyage. Delivery China-Japan,	20%				100%
C11		T/C	Delivery: China-Japan, Redelivery: ARA or passing Passero.	5%	6,158	43%	8,229	57%
C12	150,000	Coal	Gladstone to Rotterdam	10%	6,158	46%	7,157	54%
					Atlantic	43%	**Pacific**	57%

Source: Author

Table 15: Calculation of geographical segmentation for BPI

Route	Cargo	Route description	Weightings	Atlantic		Pacific	
				Distance	%	Distance	%
P1A	T/C	Transatlantic round voyage. Delivery: Skaw-Gibraltar. Redelivery: Skaw-Gibraltar.	25%		100%		
P2A	T/C	Delivery: Skaw-Gibraltar. Redelivery: Taiwan-Japan.	25%	6,540	44%	8,229	56%
P3A	T/C	Transpacific round voyage.	25%				100%
P4	T/C	Delivery: Japan-Korea. Redelivery: Skaw-Gibraltar.	25%	6,540	44%	8,229	56%
				Atlantic	47%	**Pacific**	53%

Source: Author

Table 16: Calculation of geographical segmentation for BSI

Route	Shipment Size	Cargo	Route description	Weightings	Atlantic Distance	%	Pacific Distance	%
S1A	52,454	T/C	Delivery: Antwerp/Skaw range Redelivery:Singapore/Japan range incl. China	12.50%	3,732	32%	7,784	68%
S1B	52,454	T/C	Delivery passing Canakkale Redelivery Singapore/Japan range incl. China	12.50%	731	9%	7,784	91%
S2	52,454	T/C	Trans Pacific round voyage or	25%				100%
S3	52,454	T/C	Delivery South Korea/Japan range Redelivery Gibraltar/Skaw range.	25%	3,732	32%	7,784	68%
S4A	52,454	T/C	Delivery US Gulf Redelivery Skaw-Passero range.	12.50%		100%		
S4B	52,454	T/C	Delivery Skaw – Passero range Redelivery US Gulf.	12.50%		100%		
Source: Author					**Atlantic**	38%	**Pacific**	62%

Table 17: Calculation of geographical segmentation for BHSI and BDI

Route	Shipment Size	Cargo	Route description	Weightings	Atlantic Distance	%	Pacific Distance	%
HS1		T/C	Delivery: Skaw – Passero range					
			Redelivery: Recalada – Rio de Janeiro range.	*12.50%*		100%		
HS2		T/C	Delivery: Skaw - Passero range					
			Redelivery: Boston – Galveston range.	*12.50%*		100%		
HS3		T/C	Delivery: Recalada – Rio de Janeiro range.					
			Redelivery: Skaw – Passero range.	*12.50%*		100%		
HS4		T/C	Delivery: US Gulf					
			Via US Gulf or NC South America,					
			Redelivery: Skaw – Passero range.	*12.50%*		100%		
HS5		T/C	Delivery South East Asia.					
			Via Australia.					
			Redelivery: Singapore – Japan range including China.	*25%*				100%
HS6		T/C	Delivery: South Korea – Japan range.					
			Via North Pacific.					
			Redelivery: Singapore-Japan range including China.	*25%*				100%
					Atlantic	50%	**Pacific**	50%
				Total BDI	**Atlantic**	45%	**Pacific**	55%

Source: Author