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ΕΠΙΒΛΕΠΩΝ ΚΑΘΗΓΗΤΗΣ : ΜΑΡΙΑ ΠΑΝΑΓΟΠΟΥΛΟΥ

ΘΕΜΑ : COSTS AND FREIGHT RATES

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Ο ΔΙΕΥΘΥΝΤΗΣ ΤΗΣ ΣΧΟΛΗΣ : ΤΣΟΥΛΗΣ ΝΙΚΟΛΑΟΣ

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Introduction

In this paper entitled Costs and freight rates we are called to refer to the formation of fare prices at different levels. In particular, we will begin by talking about the formation of fares in airlines. In this context, we will refer to the basic fare code and its importance, and we are going to describe the way it is used by airlines. In fact, we will expand on the importance of the Fare basis code for each air fare.

In the next section we will come across multiple basic freight codes by referring to the reason why an airline is using this kind of tactics, but also about the limitations placed on the fare by using the multiple fare basis code.

Next, we will refer to the booking codes used by each company as well as to the standards it sets up to form its own freight rates.

The next section will include fare listing and ticketing. Basically, in this chapter references will be made to fare pricing and to the components that form fares.

We will then refer to the pricing policy pursued by airlines in the global market as well as to the role of the marketing department in determining freight rates. Here we will develop the way in which the price of each fare is shaped. In addition, we will talk about the pricing strategies that an airline can follow when pricing.

In the second chapter we will refer to freight rates. We will start by talking about the way in which fare prices are determined on bulk carriers as well as their function.

In the next section we will deal in particular with the level of freight costs and the factors that shape the final freight rate.

We will then elaborate the factors that affect the level of freight rates and often even demand or supply.

Subsequently, we will deal with the fluctuation in fare prices and specifically we will provide the content of various studies that have been conducted on the subject.

Furthermore, we will refer to and clarify the concepts of 'freight rate index' and 'tariff rate'.

In the third chapter we are going to deal with the fluctuation of fares in shipping. Initially we will talk about the factors that affect fares and are related to shipping cycles.

In the next section, we will refer to the relationship of fare prices to ship pricing. At a more fundamental level we will see the interaction between the two values.

The fourth chapter, entitled "Cruises", will contain the components that contribute to the formation of charter and liner freight markets in relation to the correlation of freight rates

Subsequently, we will talk about applying the wordscale index used for reports on fare fluctuations.

We will then develop the main types of fares in the freight market always in line with the prices that are shaped.

Furthermore, we will talk about the structure of the maritime transport market based on fares as shaped by shipowners.

In the next section we will talk about instant fares that are directly related to the relationship between supply and demand in the tankers' freight market.

Subsequently, we will refer to the deadline fares as reported in \$ per ton and DWT.

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In the last section, we will focus on the curve between supply and demand as they link fare to demand at a given point in time, and thus freight rates for maritime transport are affected.

Chapter 1 - Airline fares

1) Fare basis code

The code of basis fare, or the basic fare code or more commonly the fare basis code, is an alphabetic or alphanumeric code used by the airlines to determine the type of fare which allows the staff of each airline company and any travel agency to be able to identify the rules that should be enforced and applicable to the fare concerned.

The fare code starts with a letter called reservation code or class. This letter corresponds to the code of the reservation letter under which it is held, followed by other letters or numbers. Characters that form a fare code range from three to seven. Sometimes, of course, there may be eight. Typically, the letters stating the code are capitalized, so that there are no misconceptions due to the handwriting of the person who will enter the code. But even if the code is printed, capital letters are always clearer than small ones.

It should be noted that the basic fare code lies on the air ticket. In the case of paper tickets it was found in the relevant ticket coupon and it only concerned the specific

flight. Nowadays, where electronic tickets are used, it usually takes place during printing the ticket under the referred details of the flight¹.

2) Multiple fare basis code

When we come across a multi-sector ticket, there are usually more than one freight code. This is particularly the case where passenger transport involves moving with more than one airline. For this reason, the airline that issues the air ticket to each passenger frequently makes interline agreements with other airlines so that it is given the right to issue an air ticket itself and on their behalf.

The term interline is a voluntary trade agreement that has been made by individual airlines, also known as interline tickets. The agreement includes the handling of passengers traveling and in order to reach their destination several routes are required and for that reason several airlines should be used.

Of course, some drawbacks are encountered in implementing this system. For example, if the passenger or the company decides to make any change, then the change should be applied to the entire ticket and not just to the part that the passenger

¹ <https://crankyflier.com/2007/07/25/fun-with-fare-basis-codes/>, Fun with basis codes, 2007

or the company wants to make the change. In addition, a rule limiting the fare is the higher end that is imposed if the change mentioned occurs².

3) Booking codes and templates

Although each airline sets its own fare code, some specific patterns have been formed over the years that have evolved and are still being used today in the modern era. As it was mentioned the first character of the code is a letter that should match the reservation code. However, the reservation code should not, in this case, be linked or confused with the corresponding code on the registry locator³.

Reservation code is the identifier provided by the company's revenue management service and allows it to check at any time how many seats are available for sale at a certain fare level. Some codes can not be sold by travel agencies. This is the case when these places are for specific circumstances. These are:

- International connections
- Affiliate programs, which are loyalty programs of committed customers of the company

² David Kelly, Understanding airlines fare basis codes, 2018 (<https://www.tripsavvy.com/what-is-fair-basis-468272>.)

³ Galileo travelport, Galileo 360 (degrees), 2009

- Airline staff relocation

These codes, which are used to make a reservation, have been determined by IATA and are clearly standardized. Of course, in modern times, airlines typically deviate from the basic standards given by IATA and the codes they use now are special codes used by airlines⁴. Each airline gives a different meaning to the code of each ticket it issues. However, some booking codes are standard concepts and almost all airlines use them for the same qualification. Some of these standards are:

- R: super sonic class
- F: first class
- C or J: business or commercial position
- Y: economy class
- W: premium economy, this category is a very recent addition and is intended for positions that have both economic and business status
- The first letter of the common standards specifies the reservation code or the level of the service
- When E is the second letter means that the value denotes excursion fare. This kind of fare usually has a maximum and a minimum length of stay so that it can be used to buy holidays rather than business trips

⁴ Galileo Travelport, Galileo 36 (degrees), 2009

- The numbers in the last sections of the fare basis refer to the maximum stay allowed for a destination⁵
- H or L, indicates the high or low seasonality (high, low)
- W or X: are mainly used on European air tickets and indicate the validity of the ticket for working days or weekends
- OW: is the one way ticket
- RT: round trip
- Two-lettered country code: Many fare codes have the ending of the two-lettered code of the country of departure. This is particularly the case for airlines with international fares in both directions. In this way, the same rules can be adopted, with small differences in switching fees or companies complying with local trade restrictions
- CH: child fare. It is valid for children from two to twelve years old. Some airlines, of course, do not accept minors without accompanying an adult. However, other airlines accept them under the condition that the child has completed a certain year
- IN: Infant fare or junior fare.

There are also codes that are mostly for short-term use. Some of them are:

- Codes that indicate the name of an airline for a single fare.
- Codes that limit a fare to a particular company or organization.
- Codes that are used for military personnel or federal government officials.

⁵ <https://crankyflier.com/2007/07/25/fun-with-fare-basis-codes/>, Fun with basis codes, 2007

Usually the last codes are used in the United States of America and are not subject to the obligation to pay fees for any changes⁶.

4) Fare quote and ticketing

The location where price data is stored includes fare tariffs, set of rules, routing charts, even tables with service categories, but also some data related to the taxes on which the price is formed, the so-called fare. Inventory control can be monitored manually through availability feeds, provided that a dynamic check of the number of offered seats at a specified price takes place by opening and closing specific categories of positions (seats).

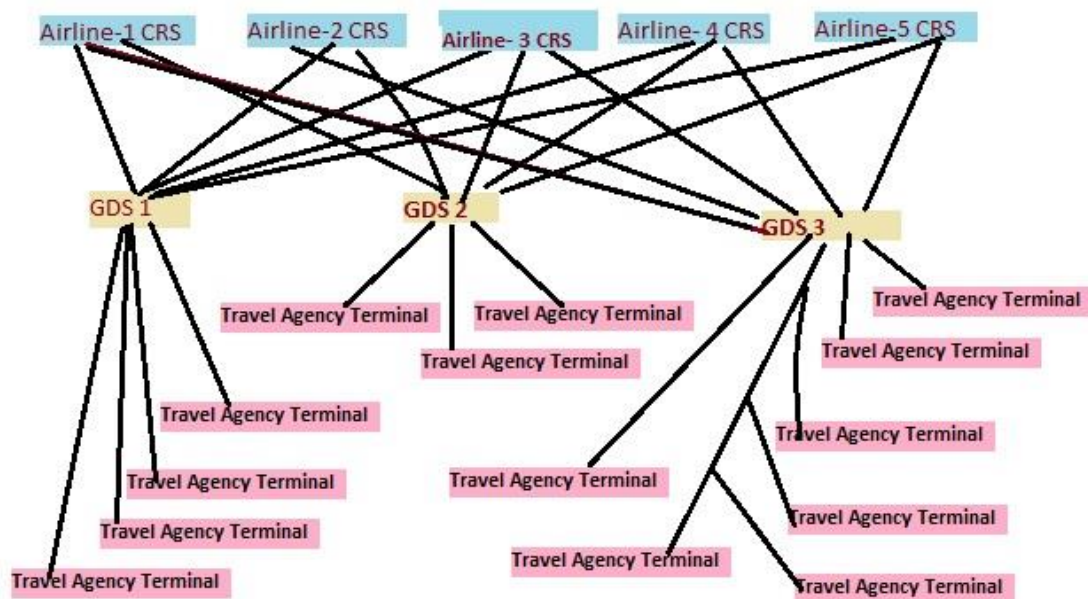
The basic fare code represents the whole of the fare terms. Two systems have been created to exchange data tariffs. The ATPCO system and the SITA system. In addition, connections that are made directly from one system to another can be used. This system is based on which tariff rates and rules sets are allocated to all subscribers and GDSs.

Each airline has employees who code the air fares based on the intention of Yield management. Indeed, there are people who are in charge of managing revenue and keep track of fares as long as they are put on public bills and thus make their competitive proposals. Check for inventory is actually guided by this level, using availability feeds, to open or close service positions.

⁶ Galileo Travelport, Galileo 360 (degrees), 2009

The most difficult and complicated thing about tickets is the issue and storage of electronic ticket records as well as some paper tickets that continue to be issued by some airlines. The Miscellaneous Charges Order (MCO) continues to be a paper document until 2010 when the IATA set up working groups which would have to replace the MCO with the Electronic Multipurpose Documentation (MCO) EMD).

The electronic ticket has information stored in a database that includes all the data that would otherwise have been printed on the paper ticket. This includes information such as the number of the ticket, the fare, the tax rates shown on the ticket and the parity information⁷.



⁷ www.wikipedia.org

Airline distribution network

5) Pricing policy

The pricing policy that airlines are required to follow in the global marketplace is an important field of marketing for each company individually. In addition, ticket prices are those that are appropriately designed to generate revenue for an airline, therefore the pricing strategy should be very careful and well-designed.

In order a company's pricing policy to be successful, it is needed to meet the needs of all the passenger segments it serves. This means that the marketing department should identify a specific price for the fare, which is a particularly complex process. Fares are constantly adjusted according to the following:

- Complexity of the existing requirements of individual categories of passengers, such as age, income, sex, occupation, social status, habits and more
- Seasonality
- Differentiation speed
- Demand flexibility

When a pricing policy is formulated by a company, specific factors are taken into consideration, which substantially affect pricing. The main factors influencing the fixing of fares in the air transport industry are as follows:

- The interaction of IATA meetings, given that the results will have to be approved by the governments of the member states
- Agreements between airlines and governments
- Competition in the airline's free market, where each airline can make any offer concerning its fare

At IATA's meetings on price coordination, freight rates are based on the positions of the majority and their final configuration is related to the conditions found on the world market during that time period. Of course, the volatility of the revenues of each airline is always being considered. In order to accept these final prices, state governments make it conditional on each level of price to meet the costs of providing airline and transport.

The pricing policy that each airline's marketing department must form should be in line with the company's goals and orientation. This is directly related to the level of profit that each company is targeting. Thus, price levels are determined on the basis of promotion, labor, costs, and other individual financial information of each company. Of course, the main objective of each airline is to attract passengers who use the services offered by the first and the business class. For this reason, the fare price is usually formulated in such a way as to achieve a combination of high service and attractive price.

The main goal, of course, does not cease to be the viability of the company, as there is great competition among airlines. Another goal related to the implementation of a specific pricing policy may be maximizing profit. In addition, the development of pricing policy is also related to the maintenance of a fixed factor in the investments of a company, or to the market share of the airline concerned in relation to the others⁸.

When it comes to pricing policy, we should not overlook the importance of tour operators who are also managing part of the ticket availability.

An airline may therefore follow the following pricing strategies:

- Valuing pricing. Based on this policy, the airline may set a relatively high price so as to be able to provide services of prestige and high quality. This strategy is mainly found in the first and business fares. In this way, the product of prestige is adopted, thus increasing demand in the market. Airline companies even put their first and business fares as the market's leading product. Many companies have been implementing this type of pricing since they started operating in order to gain the prestige of the services they offer

- Penetration pricing is related to the low price a service or product receives when it first enters the market to attract several new customers and to get the market share as soon as possible. In the context of this specific policy, there should be sufficient knowledge of market elasticity so that the strategy can be properly implemented. Essentially, there should be knowledge of whether to increase the company's market share by applying low prices

⁸ economictimes.indiatimes.com

- Wholesale pricing is associated with making discounts to customers who buy large amounts of service or product. An example of this type of pricing are travel agents who buy seats in bulk from an airline

- Cost-based pricing is the pricing where the strategy is based on data derived from the cost analysis. This criterion includes three methods:

- Cost-profit correlation pricing. The term refers to the simplest pricing method, which determines the profit rate that is satisfactory for the business and then added to the cost of an airline.

- Balancing pricing or pricing of balance. It is located among the revenues and expenses and the rate of coverage for which the revenues exceed the expenses is reached.

- Targeting for profit. The goal here is to ensure a profit margin and using the balancing chart to estimate how many units are needed to ensure this.

- Differential pricing is a pricing method that gives the company the opportunity to vary its pricing, depending on the financial capacity of its customers, as well as the other elements that characterize the customer relationship. This is because many categories of customers exist with different needs. This suggests that a separate pricing policy is a very complex process. We would say that this particular pricing strategy is mainly beneficial for economy class customers, as this may increase revenue. The fares applicable to the first and the business class are particularly costly. In these positions the price includes high quality services, which however are costly for the airline

- The unified pricing policy is the one in which prices do not differ greatly by market segment⁹.

⁹ <https://crankyflier.com/2007/07/25/fun-with-fare-basis-codes/>, Fun with basis codes, 2007

Chapter 2 - Freight rates

1) Setting fare prices for bulk carriers

The term freight is used to refer to the price paid by the shipper to the shipowner or the charterer in order to transport a cargo as a commodity to its destination. Payment is usually made in USD per ton of cargo carried. The terms of the charter as well as the fare price are shaped according to the charter agreement that has been made, which is called charter party.

However, the freight market is not a uniform market, as the different markets in which it is composed arise from the type of ship and the type of cargo to be transported. At this point we can talk about Bulk Carriers, which are merchant vessels designed to carry unpacked loads such as various minerals, coal, and even grains.

In modern times, bulk carriers are designed in such a way that they have the maximum capacity, better safety, better effectiveness, based on responsiveness to the requirements and the needs of the field of their work. In fact, today's bulk carriers account for 40% of the world's commercial fleet. Their size now varies and they are able to carry up to four hundred thousand tons of dead weight. There are certain types of bulk carriers, as some of them unload their cargo, while others depend on the port facilities available for unloading the ship.

As for the owners of bulkers, most of them are Greeks, Japanese or Chinese, and many of these ships are recorded in Panama. And then Korea is the country with the largest shipyard of bulk carriers.



Regarding the loading and unloading of ships, it must be noted that the crew is responsible for this process. The crew also participates in the navigation of the ship as well as in the maintenance of the machinery that it is equipped with. In fact, the loading and unloading of the cargo is a quite difficult and painful process, and its duration may range from a few days to several weeks, depending on the size of the ship, the amount of cargo and the type of cargo. For example, bulk cargo may be dense, corrosive or abrasive. This means that security problems can arise, such as shifting the load, sudden combustion and cargo saturation, resulting in a ship being

even in danger of sinking. That is why international regulations are in place to ensure compliance with security rules¹⁰.

2) The level of fares

The cost incurred for the transport of a bulk cargo is determined by a number of factors which constitute the final price of the freight. With regard to the bulk cargo market, it should be noted it is a fluid market with great variability. This variability is due to the type of cargo, the size of each ship, and its route (direction). Indeed, some charterers prefer to pay a certain amount per day rather than chartering a ship, where the price will be calculated per ton. For example, in 2005 a handymax bulk carrier was chartered daily with an amount between eighteen thousand dollars and thirty thousand dollars. A capesize bulk carrier was charging for forty to seventy thousand \$ per day, or a panamax (bulk carrier) chartered for twenty to fifty thousand dollars per day.

In order to have a clear image of dry cargo freight rates, the Baltic Dry Index is used. This particular charter is derived from the London Baltic Exchange. Based on the cost of dry bulk and raw materials, ocean freight rates are adjusted according to

¹⁰ Stopford M., Maritime Economics, Routledge, London, UK, 1997

the international trends that have been established in the market. Of course, the level of maritime fares can also be influenced by the rate of inflation¹¹.

3) Factors influencing the level of fares

The factors that affect the level of fares are varied and different. They are usually segregated into endogenous and exogenous. Indeed, some are able to influence the demand for capacity, while others (influence the demand) for offer. Of course, when supply and demand remain stable for a certain period of time, there are other determinants that cause the prices of fare to change. These factors play an important role in the transport of loads. Those who deal with this should be aware of the matter, as when someone is not properly informed about this issue, there may be damage and losses for shippers.

Some factors that affect the level of fares are:

- Destination
- Seasonality
- Exchange rates
- Terminal charges

The destination of the journey identifies the notion of the distance traveled. It is one of the most important factors on which fares are set. This is because each

¹¹ oceanfreightrates.info

company, after taking over the transport of a specific load, should take into account the distance it needs to travel in order to transport the products. This means that the bigger the distance to be traveled, the higher the fare values. The average distance we may encounter may be affected by the balance between export zones and consumer areas located either nearby or far away.

In cases where a load is to be moved to a nearby area, the fare value is lower, and as far as the load is to be transferred, the price is increased. Another case where the fare may be lower is the one where the travel ends at a port where the ship will find easy a new cargo to start a new route.

When the Suez Channel closes, the average distance a ship normally travels is naturally going to grow and as a result the demand for capacity increases. In fact, this is a factor, which in turn increases the price of the fare.

Moreover, apart from the increase in demand, depending on the shortage of distance, a relative fluctuation in travel expenses is also noted, which include elements such as fuel consumption. The fuel is one of the most important costs for the proper operation of a ship, and on this basis the fare is greatly affected.

Seasonality is another factor that affects the price of fares. This is because, for certain goods, the season in which they are used is an important factor in shaping their price. Products that are subject to seasonal fluctuations are cereals or agricultural products,

as their production depends on the crops of each season and on the weather circumstances. This means that the price of fares is also affected. When a period of new crop production is noted, then demand for capacity is growing and because of the given supply, fare prices are also rising.

In times when there is no demand for transportation, ie there is no new crop production, or even more production is reduced, then fare prices are falling. For example, in the US, from September until the end of the year, grain exports are up to 50%.

As far as the exchange rates are concerned, it should be taken into consideration that in the modern times, currency unit commonly used for international transactions is the dollar. In this way it is understandable that the amount of the fare is determined by the fluctuation of the foreign exchange rate and that is why it is possible to collect the amount according to the height at which each period is placed.

This suggests that the risk element is included for shipowners as well as for charterers, since when a ship charters a specific time period with a fixed exchange rate, when this changes immediately, it is reasonable that one side will benefit and another side will be harmed.

Terminal charges affect the fare according to the port that the ship is required to reach and that is the reason why the fare varies according to the port of departure and the port of destination.

In the event of a delay in approaching the port, either due to heavy traffic or delay in loading and unloading, there may be a financial penalty that may affect the final fare depending on which side it is pre-determined to pay under the conditions of the charter agreement. In some ports additional charges are imposed by the port authorities, such as security charges. These charges are included in the fare setting.

In case the load is large, then the fare is set at high prices. Sometimes, in order to determine a complete deal, there must be participation on the part of the agent or on the part of the freight forwarder. In order for this trade to take place, it should be taken a percentage of the profits of the transfer, resulting in some loss for the shipper.

In general, freight rate is a size that is very difficult to determine and constantly reformed. Of course, efforts have been made through surveys and studies to predict in a fixed and specific way the movement and the course of freight so that there are more and better choices for shippers when transporting goods¹².

4) Fluctuation of freight levels

In order to refer to the fluctuation of fare prices, we will prefer to quote the content of various studies and surveys that have been made on the subject.

¹² www.marineinsight.com

The first article that we will examine is written by Jostein Tvedt¹³ entitled A new perspective on price dynamics of dry bulk markets. It is stated here that freight rates as well as ship prices are static. Tvedt uses statistics as well as various tests that he applies to economic time series. In fact, the assumption that fares can take a random price at any time, and therefore can not be predicted, is rejected most of the time. Instead, according to the results of this survey, classic market models are the ones that survive, creating a stability in fares.

If all the observations fare converted from USD to YEN it seems that prices are stabilizing and ceasing to change. In this way the fares associated with dry bulk carriers remain stable. The conclusion drawn from the above is that high fares lead to increased supply and increased use in existing tonnage, while low fares make lay up and scrap of ships. In this way the offer is reduced.

Regarding the demand for services and shipbuilding, the bulk carriers market is influenced by Asia. However, international shipping is commonly accepted as a currency that prefers the dollar in its dealings. Through this study, it seems that dollar transactions are more disorienting than real, since when prices are expressed in MES, the major changes in industry are more clearly distinguished, and thus more reliable data are available for the researcher .

An investor, when investing in a particular shipping item, should be aware of the dependence on the MME, as the risk of the transaction is high on the part of the investor who prefers to raise his capital in dollars. For this reason, China has established itself in recent years in the dry bulks market.

¹³ Tvedt J., A new perspective on price dynamics of the dry Bulk makets, Maritime Policy and managment, Vol 30, No. 3 ,2003



The next article we are asked to examine is the one written by Jane Jing Xu, Tsz Leung Yip, Peter B. Marlow, The dynamics of between freight volatility and fleet size growth in dry bulk shipping markets¹⁴. Here, reference is made to the relationship between volatility of fares, which changes constantly over time, and to the change in fleet size. When the fare changes, then its dispersion is also distinguished. The bigger this differentiation, the more the fare changes.

The conclusion that is made is that fares change over time but also that their volatility is caused by the change in fleet size and of course that this change has a positive effect on how much the level of fare can change as a result of below:

- Study of freight volatility in relation to changes in fleet size for the period January 1973- October 2010, using the ARGARCH model, to measure volatility

¹⁴ Jane Jing Xu, Tsz Leung Yip, Peter B. Marlow, The dynamics between freight volatility and fleet size growth in dry bulk shipping markets, Transportation research, Part E 47

- Analysis of the relationship between freight variability and fleet size through GMM regression

As far as financial risk management is concerned, CAPM (Capital Asset Pricing Model) reports that when there is a high risk, high yields can be distinguished. Of course, the risk can not always be clearly identified. In the field of shipping, however, the supply appears to be determined in relative clarity, while in other places the offer is not easily measured.

Under normal circumstances and knowing how to develop the trade, it is clear that each change in fleet size indicates some specific growth conditions and in this way the fare purchase can be in line with the low and stable fare. If, of course, demand rises sharply, then fares will change automatically. In fact, their price is going to increase, which in turn will lead to an increase in supply. In addition, ship decommissioning will be interrupted and more new ships will enter the area.

In this way, there is increasing uncertainty about the immediate needs of the future, as well as the risk of excessive demand. Thus, the situation can lead to even greater instability for a longer period of time. Above we mentioned the risk of freight and here we have to emphasize that risk is a serious issue for the shipping industry as the markets tend to create alternative investments, which attracts the interest of new investors in modern times.

The next article, entitled A directional relationship between freight and newbuilding markets, Jane Jing Xu, Tsz Leung Yip and Liming Liu, examines the relationship between international fares and the price of new ships.

In particular, it is investigated whether the price of new ships affects the price of fares and vice versa. For the right observation and study, an econometric model based on the newcomer prices and freight rates for the period 1998-2009 has been used. The results indicate that there is a positive influence between the fare price and the price of the newly built ships, since the former directs the second. Still, it is obvious that fare prices change much more easily than ship prices.

The next article we examine is written by Amir Alizadeh, Nikos Nomikos¹⁵, entitled Dynamics of the Term Structure and Volatility of Shipping Freight Rate. Here we study the relationship between the dynamics of the structure of the freight market and the volatility of freight rates. The data used for this survey covers the period from January 1992 to September 2007. Based on this survey, freight volatility has been shown to be directly related to the form of freight market. It has also become apparent that there is an unequal relationship between them, as in the fare market, when fares are greater than those known to apply for long periods of time, the change is greater than in other periods.

¹⁵ Alizadeh A. ,Nomikos N., Dynamics of the term stucture and volatility of shipping freight rate, Transport economy and policy, Vol 45, Part 1, 2011

The last referred article is entitled An analysis of freight rate volatility in the dry bulk shipping market, and the researchers who have carried out the study are Lu Jing, Peter B. Marlow and Wang Hui¹⁶. Here the data on freight volatility and the bulk dry bulk market, in relation to the different sizes of the ships are recorded.

The purpose of the survey is to present a specific empirical effect on the action of freight volatility in relation to the different types of ships in the dry bulk market. In addition, research aims to focus on the asymmetry of volatility that governs freight rates under different circumstances.

For the completion of the survey, the rates of daily returns based on freight rates for three specific ship sizes were examined, namely capesize, panamax, handymax. For this study, the data from the period 1999 to 2005 were taken into account and the GARCH model was used.

The results indicate that sudden market shifts never diminish, on the contrary they tend to be boosted at all odds. It also shows that external influences play a different role and their impact is of different significance regarding the variability that distinguishes the different types of ships. This is because of the characteristic elasticity.

¹⁶ Lu Jing, Peter B. Marlow and Wang Hui, An analysis of freight rate volatility in dry bulk shipping market, Maritime policy and management, Vol 35, No 3, 2008

The sample taken by the scholars was split into two seasons so that they could study the asymmetric character of volatility about daily returns on different bulk shipping sectors and market conditions.

Based on the results of the survey, it appeared that the asymmetric character is distinct in the different sizes of the ships, but also the different conditions that the market is experiencing. The reasons for this are:

- Different elasticity
- Transferring different products to different routes

The survey has brought to light effects that are of particular benefit to investors due to the reduction in investment risk and the increase in profits they are expected to generate.

The international maritime market is particularly affected by the bulk carriers market, which in turn has been described as a subpopulation of high risk and high volatility due to the concern created by factors such as the intensity and shape of international trade but also the global economy and policy. Due to the high competition in this market sector, there is high volatility in fares, as was noted, which indicates an unexpected trend and poses a serious risk but also important opportunities for investors.

At the time of the investigation, there were significant effects on the global bulk carrier market, which became more pronounced after 2003 at that time. Market conditions started to become more complicated and there was an urgent need for further research into volatility.

Market volatility, which has been an important field of research for a long time, is characterized by the BFI. Over the years, market volatility has been the subject of research for many researchers who have focused on this feature by trying to find out the key element of this type of deviation based on econometric models that would be able to highlight short- market trends and risk avoidance.

Cullinane attempted to approach the issue with the Box-Jekkins model, which foresees the implementation of time series and forecasts. Veenstra and Franses approached their study of the monthly fares from September 1983 to August 1993, which related to three capesize routes, three panamax routes using the Dickey-Fuller test. The result of their research was that identifying long-term relationships does not imply improved security for short-term and long-term forecasts.

Tvedt, in turn, confirmed the application of the classic model to shipping markets, on the basis of which a fixed fare price should exist. In order to have a more visible effect, but also to reduce the rate of volatility, we have to convert prices from USD to YES.

Adlan and Cullicane were asked to present a simple argument to reject the application of the theory of expectations to show that the risk premium should be time-sensitive and fluctuate according to market conditions in the freight sector, but also the duration of time charter.

Kavussanos and his colleagues, dealt with their research on dry bulk market prices for the year 1990. To complete their study, they used data derived from monthly observations from 1973 to 1992. On the basis of the data they had in their hands were asked to look at the element of volatility in both the spot market and the time charter.

Kavussanos and Nomikos used the GARCH and GARCH-X model in order to make estimates of the time-shifted but also steadily hedged ratios in the BIFFEX market.

Kavussanos and Alizadeh dealt with the seasonality of dry bulk loads. Initially, they made a general reference to the dry bulk and fare market and then tried to study the seasonality between the different sizes of the ships as well as the duration of the contracts and the circumstances governing the market conditions. Their research has highlighted that investment risk can be reduced for investors and increasing their profit on the basis of market conditions and the type of each ship.

5) Freight rate index

The freight rate index, denotes the freight rate index which is not necessarily defined by the freight rate. The identification of the tax is based on the statistics and relates to a specific period of time. The results are represented either graphically or by diagrams.

The freight rate index is a component of the distribution of individual fares by type, weight, volume, and risk of cargo carried at a specific time. Typically, a different index is used for dry loads and another for liquids.

The freight rate index concerns all persons and carriers involved in transport. Its role is very important in the field of economy and in particular the maritime economy.

The freight rate index is the first indicator that determines a possible future recession in the shipping market or an upcoming economic crisis. This happens regardless of internal or external factors, or the rise or fall of fare prices.

It is important that the freight rate index is determined on the internal transports of countries from large commercial centers, but also on international transport between countries and in such cases it is called international freight rate index.

The graph for the scale is as follows: the right edge of the line representing it is in the form of an upward or downward arrow and is called index of freight rate

6) Tariff rate

The concept of tariff rate is referred to in two terms: firstly, as a price list of fares, and secondly, as a mandatory fare price.

In the first case, where we refer to the fare price list, we are talking about a list of freight rates, by type of goods, per unit of volume and per transport distance. The fare is mainly used by liners and most often by liner shipping companies known as associations or conferences.

In the second case, we are talking about the charter as an application of a mandatory price for freight or freight transport and in that case is examined mainly the determination for public transport or short sea shipping.

In the second case the tariff rate in Greece is determined by the competent body, namely the Ministry of Communications and, in the case of maritime transport, by the Ministry of Mercantile Marine. The tariff rate determined by these parties is valid only for a certain period of time¹⁷.

Chapter 3 – Fluctuations of fares in shipping cycles

¹⁷ el.m.wikipedia.org

1) Influence factors and maritime cycles

As we already know, each fluctuation of fares reflects the current phase of the maritime cycle we are in. Supply and demand for capacity are two major factors in the maritime cycles¹⁸.

The cause of cycles is reflected by the mechanism of changes in the balance between supply and demand of ships. When changes occur in this balance, we can either lead to a surplus of capacity or to a shortage of capacity and hence to an increase or decrease in fares. Here we will refer to the factors that lead to the fluctuation of freight rates with the direct consequence of shaping the shipping cycles. Concerning capacity demand, the factors are as follows:

(1) The global economic situation that shapes business circles. Changes in world trade also have an impact on shipping and freight by reducing or increasing demand for products channelled via sea

(2) The growth rate of developing economies, such as China and India

(3) Various political events or other extraordinary incidents such as wars, oil crises etc.

(4) Various types of technological developments

(5) Transport costs

¹⁸ Lyridis D.V., Zacharioudakis P., Ousantzopoulos G. ,A Multi-Regression Approach to Forecasting Freight Rates in the Dry Bulk Shipping Market Using Neural Networks, IAME 2004 Conf. Proc. International Association of Maritime Economists, Izmyr, Turkey, 2004

(6) Proportion based on distance, since the longer the distance is, the higher the fare

(7) Shipping routes

(8) Oil price, as the policy on which prices and quotas for OPEC oil production are determined affects the demand for tanker capacity

(9) The level of interest rates

(10) Inflation

(11) Variations in demand for transport capacity differentiated per period

(12) The demand for raw materials

(13) Industrial production

(14) Storage of products as stocks per periods

(15) Weather conditions

(16) The distribution of products on continents and geographical production, since world production of bulk imports and exports is constantly changing on the basis of the geographical structure

(17) The volatility of the prices transported and the flexibility in their demand

(18) The length of time required to carry out a shipment as it depends on the distance, speed, and on the time that the ship spends at each port for loading and unloading

(19) The location of the landing port, so as to show whether it is possible to find a cargo for return

With regard to capacity offerings, fares are subject to fluctuations due to the following factors:

- o The formation of congestion in ports
- o The infrastructure of each port, which depends on the rate at which it is served
- o The organization of decision-making groups
- o The capacity of the fleet, ie the global supply of ships
- o The number and pace at which new arrivals are delivered
- o The dismantling of ships, especially in times of crisis
- o Decommissioning
- o Expectations that have been created and are capable of influencing either the positive or negative course of freight. In addition, psychological parameters such as excessive investor optimism or shipowners' pessimism when it comes to making decisions related to the sale, purchase, scrapping or shipbuilding of ships
- o The investment activity of shipowners
- o The situation of the charter market and the drivers of the ratios
- o The current and future fare level
- o The statement of earnings and liquidity
- o In maritime financing
- o Governmental policies relating to the development of shipyards and shipping in general
- o The types of ships

o The duration of the charter, the longer the trip, the higher the fare will be. Also, the fare value varies depending on the freight tones. When we talk about long-time charter, the fare is set at lower prices

o The configuration of the ship's operating costs

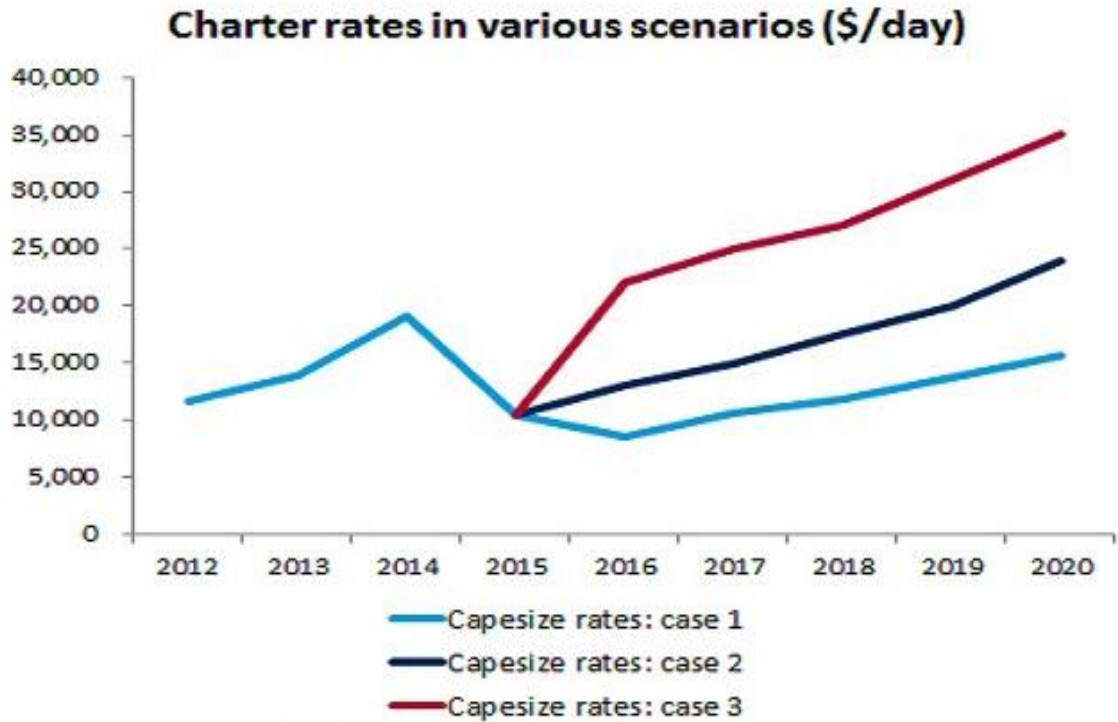
o The technical characteristics of the ship

o Costs arising from the use of ports and loading / unloading

o The volume of cargo per unit of weight, since in the case of a light load the freight is the same as in the case of a heavier load

o The properties of the load¹⁹

¹⁹ Stopford M., Maritime Economics, Routledge, London, UK, 1997



2) The relationship between fare and ship prices

As we can see, fare prices, as well as ship values, are constantly changing. With regard to this relationship between fares and ship prices, we must be aware that ship prices always follow fluctuations in freight rates whether we are talking about new constructions or we are talking about older ships. This means that there is an increase when there is a rise in the market and a decrease when there is a fall.

One element that plays an important role in shaping the ship's market are fluctuations that arise from the size of supply and the demand for used capacity. The

conditions encountered in the maritime transport market play an important role as well.

The key factors that can significantly affect the value of ships are as follows:

- The size of the ship
- Ship's capacity
- The age of the ship
- The conditions prevailing in the offshore market
- The kind of cargo being transported²⁰

When market conditions are considered good, the ships offered for sale are limited and demand is fairly high while their prices reach high levels. This is how the vendor's side is designed to secure a sale price that should exceed the profits that would have existed if the ship was transporting and in addition try to sell by waiting for a downturn in shipping.

When a shipping recession has occurred, the number of ships offered for sale is greater than the number demanded by the market.

²⁰ Forrester, J.W. , Industrial Dynamics. Cambridge, MA: The MIT Press. Reprinted by Pegasus, 1961

The best price to sell a ship is just before the recession of the freight market, so that the sales price is even higher. These are the elements that are distinguished by the vendor's point of view.

With regard to the buyer's side, the demand for a tonnage purchase is higher when the market has improved. When the buyer looks particularly optimistic about a good course in the freight market, which will also mean raising his own revenue, the more money he can make available to buy a second-hand ship, considering that the investment he has made will quickly dwindle.

We can understand that the proper assessment of market conditions and future prospects before the sale or purchase of a new or second-hand ship plays a crucial role²¹.

²¹ oceanfreightrates.info

Chapter 4 – Freight markets

1)Development of chartering and line freight markets

Maritime transport is divided into two categories based on their economic image.

These are charter and liner shipping, which have several differences between them.

The factors that identify these differences are as follows:

- The structure of the market
- The type of services offered
- The type of commodity
- The type of ship

As far as the structure of the market is concerned, the difference is high. The charter discerns perfect competition that occurs where the price at which a service or product is offered is unaffected or controlled by an individual vendor or buyer.

At the charter freight market, a shipowner can offer his boat for charter, while the charterer can use it to carry the cargo he wants. The types of contracts we have here are many. It should be noted that that fare prices are determined only by the interaction of supply and demand.

On the other hand, in liner shipping we do not find the perfect competition. Here vendors are organized into a cartel and are called joint ventures by setting freight rates themselves, separately for each item from the merchandise and for each different route. So we can understand that there is a kind of monopoly here and that it is difficult entering this monopoly.

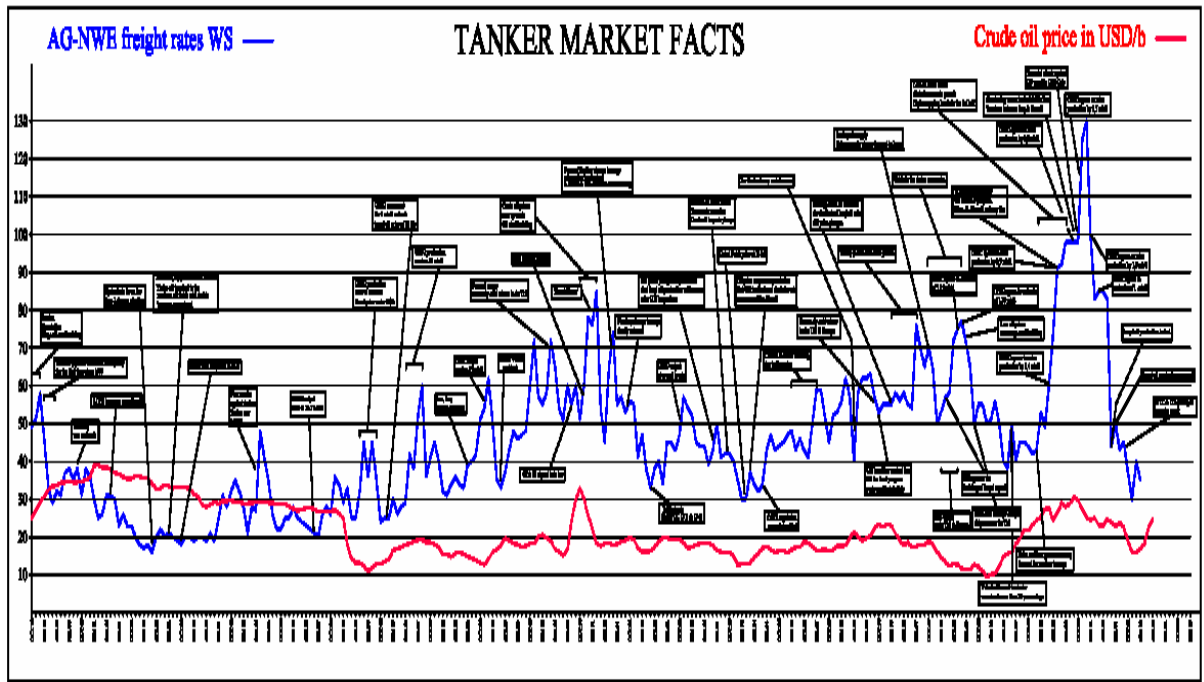
As for the type of services offered, there is another difference between the two markets. In the charter freight market after the charter contract is signed, the charterer is also considered the owner of the ship. This means that he has the ability to do whatever he wants with the ship for the time stipulated in the contract.

On the other hand, in liner shipping, the routes are predetermined and happen at regular intervals. The contract signed in this case is not related to chartering the ship but to the obligation to transport a particular commodity through a specific route.

Regarding the type of cargo carried, at charter charter we mainly transport bulk goods in large and homogeneous quantities. The goods here have a relatively low specific value. In this case, the ship is only loaded on one route, since during its return it does not transport cargo²².

2) the freight index WORLDSCALE

²² economictimes.indiatimes.com



The WORLDSCALE index is a distinctive mechanism that describes fluctuations in fares. The need to find a systematic way of describing the market has become the cause of this indicator. Due to the large number of routes made by the tanks, it is difficult to describe the market in absolute terms. Thus, the systematic description of the market appears in the following ways:

- By the consideration of a representative route where the instant fare is used to describe the market. This particular mode is mostly used in dry cargo charter charters.
- By the consideration of a representative shipowner and by the calculation of the instant fare that will force the shipowner to accept the fare instead of decommissioning his ship.

At this point we can give an example to make this clear. Speaking of a shipowner who has a 75,000-tonne DWT tanker with the following features:

- o Draft 30.5 ft
- o Average economic speed 14.5 knots
- o Fuel consumption on board 55 tons per day
- o Fuel consumption at the port 110 tons per journey
- o Time in port 96 hours
- o Shipowner's opportunity cost of \$ 12,000 per day
- o Real estate costs 2.5%

Based on the above, for a specific route and according to existing fuel and other costs, we can calculate the fare that will cover travel expenses, including fuel, harbor fees, tolls and 12,000 \$ per day for a tanker of 75,000 tons, as in the example. The resulting price denotes the basic fare for this route.

For all tanker routes, the basic fare is calculated and then issued in a special book at regular intervals. The basic fare, of course, can be changed depending on the conditions prevailing on the market each time.

The WORLDSCALE index for a route is denoted by the relation: $WS = \text{instant route fare to basic route fare per hundred}$. Of course the WORLDSCALE index depends on the route. In general, however, ²³ this indicator on different routes suggests that it is about the same.

This indicator is an internationally established unit of measurement for the fluctuations in the tanker market.

3) Fare types

The most important types of fare types are:

- One-way charter. Here the charterer signs an agreement with the shipowner to use the ship for a single trip in which he is allowed to carry the quantity of goods agreed for this journey. The price is set at \$ per ton of product and the shipowner makes all the operating costs. Here we have to say that the charter for a trip is either direct or recurring or a future charter.

²³ Lun Y. H., Lai K.H., Cheng T.C.E., Shipping and Logistics Management, 2006

- Time charter. In this fare type the charterer can rent a ship for a certain period of time within which he can use the ship the way he wants. The costs of operating the ship can be segregated on both sides. The shipowner has the responsibility to provide maintenance and crew and the charterer is responsible for refueling, port charges, and cargo-related costs. Here the price is set at \$ per ton and DTW per month. The categories of charters in this case may be: direct, future, or bareboat.
- Load (shipment) contract. The shipment contract resembles the recurring charter, although here the shipowner himself assembles direct control of his ships and is able to use at any time any ship he wants to achieve his schedule²⁴.

4) The structure of the market in maritime transport

Nowadays, around 25% of the world's fleet is owned by oil companies, which charterships by independent shipowners, who are currently in large numbers. The large number of these owners is due to the following factors:

All companies are looking for their independence, as the requirements in the transport sector are now covered by independent shipowners

- Especially oil companies are finding uncertain trends in their transport needs
- Independent shipowners offer their services at more economical prices and are in no way dependent on state policies

²⁴ economictimes.indiatimes.com

- As for oil companies, they are chartering ships by independent shipowners as they do not prefer to borrow to build
- Independent shipowners are not affected by bureaucracy and for this reason they make faster decisions and as a result they save time

At this point, we should refer to the basic features that structure the maritime transport market and characterize it as a market where perfect competition prevails:

- Mobility
- Ease of entry
- Lack of concentration
- Homogeneity

When we talk about maritime transport, mobility plays an important role. Each ship cannot be bound in a particular area, but has the ability to travel where it is needed and where the owner requests so. For this reason, entering and leaving them in a certain market is a better choice.

Regarding the ease of entry to the freight market and in particular the charter market, it is well known that it has a convenient entry. In this kind of market, no special administrative practices are needed and as a result loans and the system work. Most charter companies have a single ship because, due to the structure of the market, the smaller companies have more advantages than the larger ones.

The lack of concentration points to the difficulty of conciliation in order to affect fares. This mainly occurs in the charter market, while in the liner shipping we notice the opposite situation.

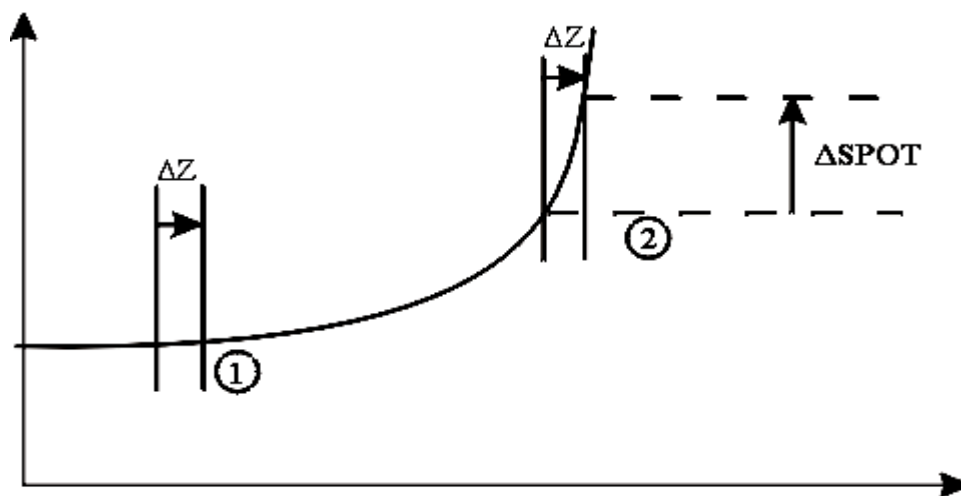
Homogeneity in relation to ships is distinguished in the field of technology, which is a homogeneous one. If special services are deemed to be offered then the fare price can not be increased²⁵.

5) Spot charters

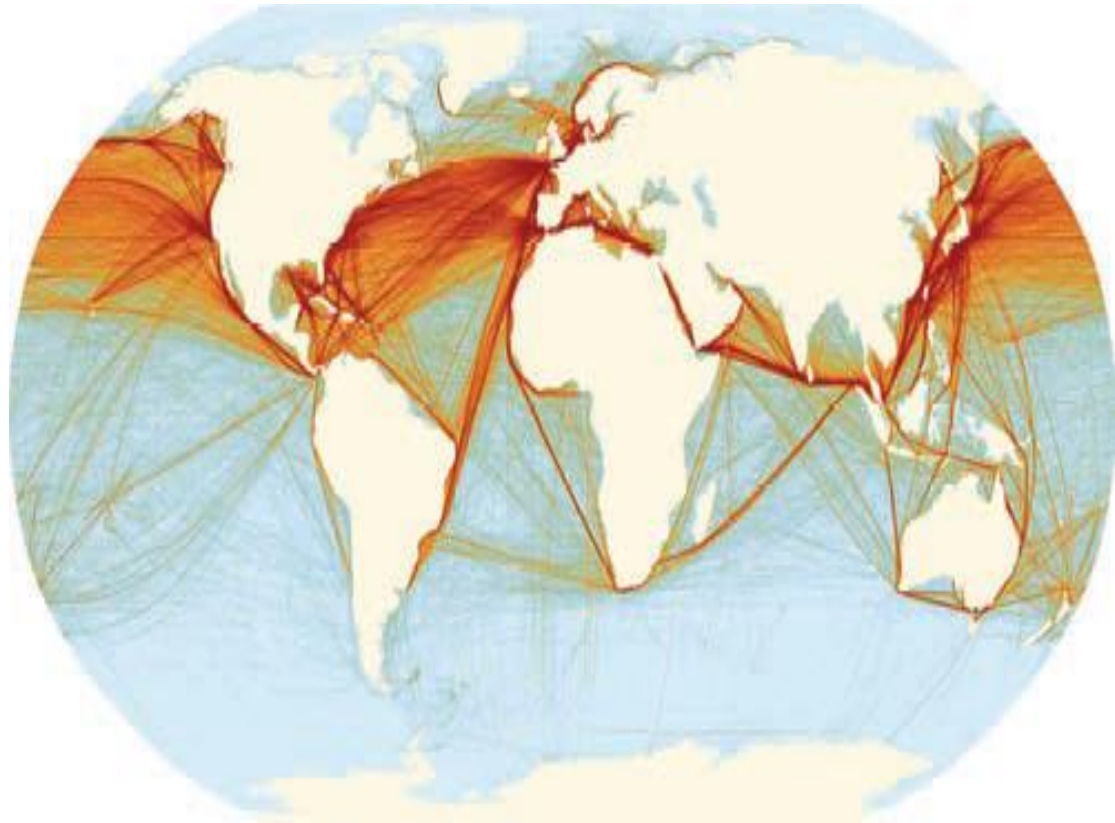
Spot charters are a key feature associated with tanker shipping. Spot charters are a function of supply and demand. Assuming that for a particular route all tankers are in the instant cargo market, the offer curve shows the capacity it holds in order to enter the market for a particular freight rate. So, the shipowner will have to make the decision whether to ship his ship on that market or to decommission it. This will be decided on the basis of price formation. The spot charter, which presents the equivalent of the price with the additional costs of the shipowner in order for his ship to operate and not decommission, is called Unit Spot Charter Cost- USCC.



This cost is high for smaller and older tankers and lower for larger and new vessels. The bid curve is derived from the calculation of all USCCs for single-ship vessels, which are placed in ascending and staggered order.



On the other hand, the demand curve is more difficult to export. By identifying the common point between these two curves, the fare value for a marginal ship is derived, which is the one having the $USCC = SPOT$. Thus, the shipowner is not particularly interested in whether to ship his ship to the cargo market or to decommission it.



Shipping routes and container ports

If demand is low, a possible increase is likely to create a minimal increase in spot charter or even none. Otherwise, when demand is high, a further increase in this price indicates a large increase in the fare price.



Quite often, we also come across the following situation: in times when fares are high, we also have orders for new ships, and in this way a supply of capacity is created, resulting in a large drop in fares some years later when ships are imported at the market.

6) Deadline freights

Deadline freights refer to \$ per ton and DWT per month or equivalent WS units. The amount of these fares remains stable as long as the contract lasts. Continuity in determining the amount of the fare depends on the fluctuations of the market.

Deadline freights are subject to the same fluctuations as the spot charter. The longer the contract lasts, the more the fluctuations are smoothed.

Regarding the behavior of the deadline freights, the following relationship has prevailed in many studies:

$$NP = A.N. + (SPOT - AN.) E^{-\lambda ((SPOT - AN.) / (SPOT)) t}$$

The above suggests the following:

- 1) NP = Freight Fee
- 2) AN = Required Freight
- 3) SPOT = spot charter
- 4) λ = positive constant
- 5) t = duration of a contract term

Thus we understand that the time charter is equal to the spot charter and together they are set in equivalent WS units, if the duration of the contract is low.

Unless the duration is long, the timetable setting for the required fare levels is feasible as the charterer does not have a larger amount while the shipowner is not willing to get a lower fare. For the average duration of a contract based on the above, we

understand that the time charter, when SPOT is high, is a decreasing function of the duration.



There are specific features that affect the deadline freight, as follows:

- Spot charters
- Decommissioned vessels
- the amount of orders
- The size of the ship
- Future expectations

- The duration of the fare
- The type of engine room
- The kind of cargo
- The currency in which the payment is made
- The time between the signing of the contract and the disposal of the ship²⁶.

7) Configuration of supply and demand curve

Demand is influenced by five determinants:

- Political factors
- Global economy
- Sea trade
- Maritime distances
- Transportation costs

Political factors are related to the strategies adopted by each government. These factors are based on the government's intervention in the trade and especially on shipping issues, as well as the trade policies adopted to protect local products from imports.

²⁶ Zannetos Z., The theory of oil tankship rates, MIT Press, 1966

The way the government intervenes depends on the way in which it is elected, but also on the economic relations it maintains with other countries. Demand is also affected by other political factors, wars, revolutions, national crises, and even strikes.

The global economy is also a factor which influences demand. Here, of course, we have a positive interaction between the world economy and demand because the global economy is creating the demand for transport through the import and export of various material products.

Maritime trade is related to the analysis of the relationship between the volume of the sea, trade, and the global economy. Seasonality is the main reason for the short-term volatility of sea commodity trade. For example, demand in the energy sector can be described as circular due to the high level of energy consumption in winter in the northern hemisphere. The long-term trends in commodity trade can be identified by observing the economic characteristics of the industries that produce and consume the products.

The demand effect is further influenced by the distance of travel. For example, when a ton of iron ore is transferred from South America to China, it is more demanding than to transport the same quantity of the same product from Australia to China.

In recent years, increasing technological developments have affected the shipping industry in a variety of ways. One of these is the construction of larger ships or the development of new transport systems. This has the effect of significantly reducing

maritime transport costs. Thus, demand for transport is increasing and it has an impact on the decisions taken by consumers, since these decisions are now being made on the basis of the transport costs and the quality of the products.

Demand is a functional relationship that links freight and demand for shipping services at a given point in time. The demand curve for maritime transport is shaped as a straight upright to the right according to the law of demand.

Under the law of demand, we know that buyers increase their purchases for a particular product when it decreases its price and decrease accordingly when the price increases. Sea trade is the most important factor on the basis of which demand is shaped. Of course, the demand for maritime transport can undergo changes that are based on increasing or decreasing the maritime volume of trade.

The concept of demand elasticity serves to illustrate the relationships that arise between gross revenues and output of the shipping industry and freight trades. Demand in maritime transport is a derivative demand.

The main characteristics of demand elasticity are as follows:

- The elasticity of demand for maritime transport depends on the elasticity of consumer demand for products dispatched by sea
- The lower the cost of shipping as a percentage of the total cost of the final product, the more volatile the demand for maritime transport

- Demand for maritime transport is likely to be more elastic if it is possible to replace it by another means of transport
- Demand for maritime transport is directed towards the inelastic form in relation to the price in the short term
- The number of demand for maritime transport increases in the long run when those who send the products have enough time to shape the shipping arrangements

As far as supply to maritime transport is concerned, it can be measured on the supply of capacity. The capacity offer represents the available capacity for carrying cargo from one or more ports in one or more ports via the sea.

An active fleet is called the ship's population, which is the subject of intra-market trading in the freight transport sector. On the contrary, ships that are not in the above category, ie not negotiated, are called available fleets. Both of these categories form the entire fleet offered.

The quantity of shipping services that are produced or are available are estimated by unit of measurement tons - miles per unit time. In order to assess the provision of maritime services, first of all of the cargo capacity together with the distance of the journey should be taken into account.

Four points are affecting the supply of ships:

- o Shipowners
- o Carriers
- o Bankers
- o Various regulators

The shipowners' side decides whether to order new ships and withdraw the older ones.

The charterer's side also affects the shipowners by concluding a contract to transfer the cargos.

Bankers, on the other hand, influence capital investment as lenders to finance the shipbuilding market.

Finally, regulators exercise their own influence on the fleet through legislation that is related to safety or even environmental protection.

The deliveries of new ships as well as the withdrawal of the older ones determine the rate at which the fleet develops. As the size of the fleet has risen in recent years, so fare prices have fallen.

On the other hand, the shipowners' decision to dismantle their ships depends on the forecasts that exist and influence the future of the operational profitability of ships. In addition, the dismantling of ships depends entirely on the shipowners' financial situation. For example, when there is a recession in the market and the shipowner believes that there is little chance of an immediate burst of freight, he is considered to be able to dismantle the ships he owns and not bring him the expected profit. Based on this practice, the size of the fleet in the maritime market is also determined.

In recent years, the world fleet has undergone significant technological advances. Thus, larger, faster and safer ships were built, which are used to provide maritime transport services at lower cost per ton-mile. New ships also have more ton capacity.

In the near future, the supply may increase due to the creation of new and more efficient ships, or reductions due to the dismantling of older ships. Therefore the average fare can be kept at a lower level based on a long-term horizon. Due to the low cost of transport, it is possible to open new trade corridors and to expand freight transport on the world market.

The concept of supply refers to the functional relationship between the freight and the quantity of cargo being transported. Here we have to emphasize that the supply of maritime transport is particularly affected by the fare. The slope of the supply curve is based on the following factors:

Larger ships make lower transport costs for each load unit. For this reason, larger ships have a lower point of reference. This, of course, affects even smaller ships,

which are characterized as ineffective and driven to buoyancy during times of recession.

- The older the ship is, the higher the cost of operation it forms. Thus, pruning occurs for a higher fare value.
- If the ship's available capacity is already in use, the offer may only be increased at higher speeds or improving the efficiency of ship's operations. In such circumstances, there is a steep slope of the supply curve.

The curve of maritime transport offers a strong J shape and it basically in this way the amount of shipping that transport is able to provide for all fare levels is shaped²⁷.



²⁷ Lyridis D.V., Zacharioudakis P., Ousantzopoulos G., A Multi-Regression Approach to Forecasting Freight Rates in the Dry Bulk Shipping Market Using Neural Networks, IAME 2004 Conf. Proc. International Association of Maritime Economists, Izmyr, Turkey, 2004

Epilogue

In our dissertation titled as ‘Costs and Freights rates’, we have tried to approach the way in which fares are formulated, looking primarily at the factors influencing it, as well as linking freight costs to other key elements of the maritime market. We have formed our work in four chapters, each of which contains sections that are relevant to the title of the chapter. So we came up with some conclusions that contain key elements that are accumulated in the following key concepts that we note per chapter:

Chapter 1 – Airline fares

- Fare basis code
- Multiple Fare basis codes
- Interline
- Booking codes and templates
- IATA Code Definitions
- Fare quote and ticket issuance
- Fares Tariffs - Pricing
- Adjustment of fares
- Complying of Pricing Strategies

- Chapter 2 - Freight rates

- Set fare prices for bulk carriers

- USD

- Time charter

- Capacity of bulk carriers

- Freight levels

- Bulk cargo

- Variability

- Influencing factors in freight rates

- Fluctuation in freight rates

- Freight rate index

- Tariff rate

Chapter 3 – Fluctuations of fares in shipping cycles

- Capacity supply and demand

- Relationship of freight rates to ship prices

Chapter 4 – Freight markets

- Configuration of charter market and liner market

- Perfect competition

- Supply and demand integration
- Uniformity of goods
- Worldscale Index
- Single Charter
- Time charter
- Load contract
- Spot charters
- Unit Spot Charter Cost
- Deadline freights
- Supply Curve
- Demand curve
- Flexibility of demand

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