DOKUZ EYLÜL UNIVERSITY

GRADUATE SCHOOL OF SOCIAL SCIENCES

DEPARTMENT OF MARITIME BUSINESS AND ADMINISTRATION

MARITIME BUSINESS AND ADMINISTRATION PROGRAM

MASTER'S THESIS

PRICE AND PRICE INDICES IN MARITIME TRANSPORT SERVICES: DRY BULK SHIPPING AND A RESEARCH ON APPLICATIONS IN TURKEY

Egemen ERTÜRK

Advisor

Assoc. Prof. Dr. İsmail Bilge ÇETİN

İZMİR - 2015

MASTER THESIS/PROJECT
APPROVAL PAGE

University	: Dokuz Eylül University
Graduate School	: Graduate School of Social Sciences
Name and Surname	: EGEMEN ERTÜRK
Title of Thesis	: Price ad Price İndices in Maritime Transport Services: Dry Bulk Shipping and A Research on Applications in Turkey
Defence Date	: 29.07.2015
Supervisor	: Assoc Prof.Dr.İsmail Bilge ÇETİN

EXAMINING COMMITTE MEMBERS

Title, Name and Surname	University	Signature
Assoc Prof.Dr.İsmail Bilge ÇETİN	DOKUZ EYLUL UNIVERSITY	
Prof.Dr.Durmuş Ali DEVECİ	DOKUZ EYLUL UNIVERSITY	
Assoc Prof.Dr.Sinan NARDALI	İZMİR KATİP ÇELEBİ UNIVERSITY	

Unanimity (✓)

Majority of votes ( )

The thesis titled as "**Price ad Price İndices in Maritime Transport Services: Dry Bulk Shipping and A Research on Applications in Turkey**" prepared and presented by EGEMEN ERTÜRKis accepted and approved.

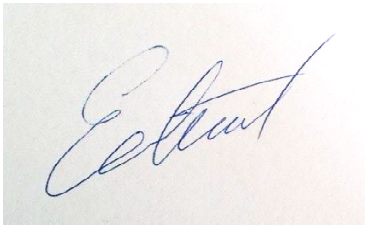
Prof.Dr. Utku UTKULU
Director

DECLARATION

I hereby declare that this master's thesis titled as "Price and Price Indices in Maritime Transport Services: Dry Bulk Shipping and a Research on Applications in Turkey" has been written by myself in accordance with the academic rules and ethical conduct. I also declare that all materials benefited in this thesis consist of the mentioned resourses in the reference list. I verify all these with my honour.

07.07.2015

Egemen ERTÜRK



ABSTRACT

Master's Thesis

Price and Price Indices In Maritime Transport Services: Dry Bulk Shipping and a Research On Applications In Turkey

Egemen ERTÜRK

Dokuz Eylül University

Graduate School of Social Sciences

Department of Maritime Business and Administration

Maritime Business and Administration Program

Dry bulk shipping is the main form of transport for world's most important raw materials and manufacturing goods. The seaborne trade and thus, the dry bulk shipping is highly sensitive to various number of factors. Fluctuations in global economy, global trade, oil prices, political conflicts, all have direct effects to the shipping industry as a whole. In such a volatile and sensitive industry, with high costs of investment and operation, it is important to know, to what and how much one is exposed to. In order to guide the actors of this industry, freight indices come in to play. Freight indices aim to shed light on the current situation of the market and provide guidance for what might happen in the future. With the contribution of experienced shipbrokers, freight indices report daily fixtures, compose data gathered from various routes and different size of vessels to provide useful information for both shipowners and charterers.

The purpose of this study is to determine the factors that have an impact on freight rates in dry bulk shipping and analyze the freight indices, investigate its applications in Turkey, gauge the perception of said applications among Turkish shipbrokers and provide a way to forecast future freight rates in the dry bulk shipping market.

This study is hoped to contribute to the actors of both the actors in Turkish dry bulk transportation by providing them with a tool to forecast freight rates and to the producer of the freight indices by determining the

perception of Turkish shipbrokers towards the usage of and expectations from freight indices.

Keywords: Price, Price indices, Freight, Dry bulk, Freight indices, Forecast

ÖZET

Yüksek Lisans Tezi

Deniz Taşımacılığı Hizmetlerinde Fiyat Ve Fiyat Endeksleri: Kuru Dökme Yük Taşımacılığı Ve Türkiye'deki Uygulamalar Üzerine Bir Araştırma

Egemen ERTÜRK

Dokuz Eylül Üniversitesi
Sosyal Bilimler Enstitüsü
Denizcilik İşletmeleri ve Yönetimi Anabilim Dalı
Denizcilik İşletmeleri ve Yönetimi Programı

Kuru dökme yük taşımacılığı ham maddelerin ve üretim emtialarının taşınmasında kullanılan en önemli taşıma modudur. Denizyolu taşımacılığı, ve dolayısıyla kuru dökme yük taşımacılığı bir çok faktörün etkilerine karşı son derece hassastır. Küresel ekonomideki, küresel ticaretteki, petrol fiyatlarındaki dalgalanmalar, ve politik sorunlar gibi bir çok faktörün deniz taşımacılığı sektörüne doğrudan etkileri mevcuttur. Bu kadar dalgalı, hassas ve yüksek yatırım ve operasyonel maliyetleri olan bir sektörde, tarafların nelere, ne derece zafiyetleri olduğunu bilmeleri önemlidir. Bu sektörün taraflarını doğru şekilde yönlendirebilmek adına, navlun endeksleri ortaya çıkmıştır. Navlun endeksleri piyasanın güncel durumuna ışık tutmak ve ileride neler olabileceğini öngörmek ve bu yolda rehberlik edebilmek amacını gütmektedir. Tecrübeli brokerlerin katkılarıyla hazırlanan endeksler, günlük gemi bağlantıları, ve çok sayıda rotadan ve değişik tonajlarda gemilerden elde edilen bilgilerin kompoze edilmesiyle hem gemi sahiplerine hem de kiracılara, gemi kiralama bedelleri, yeni gemi inşa siparişleri, ikinci el gemi alım-satım fiyatları ve gemi söküm fiyatları gibi konularda faydalı bilgiler sağlamayı amaçlamaktadır.

Bu çalışmanın amacı, kuru dökme yük taşımacılığı navlunlarına etkisi olan faktörlerin tespit edilmesi, navlun endekslerinin incelenmesi, Türkiye'deki uygulamalarının araştırılması, Türk gemi brokerlerinin bu uygulamalar konusundaki algılarının ölçülmesi ve gelecek navlun değerlerinin tahmini için bir araç oluşturulmasıdır.

Bu çalışmanın sonucunda gelecek navlun değerlerinin tahmini için bir araç oluşturarak Türk kuru dökme yük sektörüne, Türk gemi brokerlerinin konuyla ilgili algılarını ölçmek suretiyle navlun endeksi uygulayıcılarına katkıda bulunabilmek umut edilmiştir.

Anahtar kelimeler: Fiyat, Fiyat endeksleri, Navlun, Kuru dökme yük, Navlun endeksleri, Tahminleme

CONTENTS

CHAPTER 2
PRICE AND FREIGHT INDICES

CHAPTER 3
PRICEAND PRICE INDICES IN MARITIME TRANSPORT SERVICES: A RESEARCH ON DRY BULK SHIPPING AND APPLICATIONS IN TURKEY

ABBREVATIONS

BDI	Baltic Dry Index
BFI	Baltic Freight Index
CPI	Consumer Price Index
DWT	Deadweight Tonnage
PPI	Producer Price Index
SAC	Sample Autocorrelation
SFR	Senior Freight Market Reporter
SPAC	Partial Sample Autocorrelation
T/C	Time Charter

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

In today's world boundaries between countries are just lines on the map when it comes to trading, and 90% of this trading is done via sea transportation. In a world where information travels in the blink of an eye, and every change and every shift has its consequences, the delicate trade that is shipping is affected by those changes and shifts. Global trade trends, a newly emerged raw material source, a political power play miles away can all influence the freight rates. In order to keep up with all that is going on in and around this industry, one must use every resource in hand.

Freight indices aims to serve this purpose, keeping the interested parties up to date with daily freight rate updates, publishing market reports which includes comments of experienced players' opinions on certain routes, regions and commodities.

In order to understand the reasons behind the changes in freight rates, how those changes will be represented in an index and what purpose will that index serve, and if there is a way to forecasts what might happen to those figures, this study explains from the start, explains what is price, how it is formed, explains freight, which is the price for seaborne cargo transportation, then analyzes price indices and their applications in maritime transportation.

In the last part fourteen Turkish shipbrokers had been interviewed about the factors affecting freight rates and their perception of freight indices, as a second application, a model for forecasting freight indices was introduced.

CHAPTER 1
PRICE AND FREIGHT

1.1. PRICE

Price has been defined as the value of a good or service for both the buyer and seller in a market exchange (Ennew and Waite, 2007: 228). In economics perspective, the word "price" can be handled in two separate definitions, which are "absolute price" and "relative price". The absolute price can be defined as the number of dollars (or some other currency) that can be exchanged for a specific service or quantity of a given good, whereas the relative price is the quantity of some other good or service that can be exchanged for a specific service or quantity of a given good. The single word "price", always refers to relative price in microeconomics (Landsburg, 2007: 32).

Price, as a managerial decision, is essential as it can be easily modified. In free market economies, the rational setting of the price for products or services heavily relies on supply/demand theory (Zikmund and d'Amico, 2001: 578). The demand of the market for a certain product can be defined as the number of products a customer would like to buy at a certain price. The law of demand, states that demand for a product will rise, if the price of the product falls. This is the reason for the downward slope in the demand curve (Frank, 2007: 27-28).

Figure 1: Demand Curve

The supply for the market also relies on the same conditions as demand, but the law of supply states, as the price of a product increases, the supply for that particular product will increase as well.

Figure 2: Supply Curve

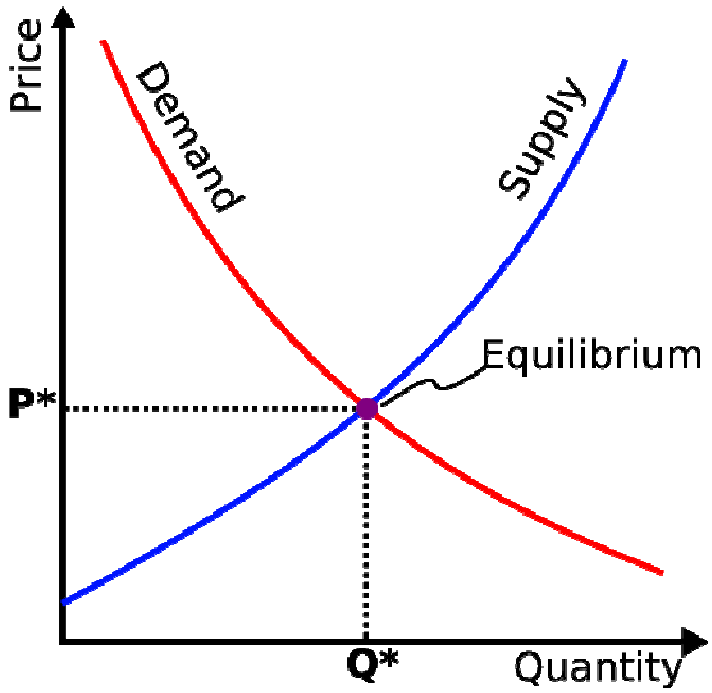
There can be two reasons behind the simultaneous increase of supply and product price. One reason is that, as the supplier sells out what it produced, and goes on to produce more, which leads to increase in costs and therefore the price, or; others in the market see that product doing well, and switch to producing that particular product themselves.

Of course this does not mean, it will go on forever, an equilibrium point will be reached at some point. Equilibrium point is the price-quantity pair at which both buyers and sellers are satisfied. Put another way, it is the price-quantity pair at which the supply and demand schedules intersect (Frank, 2007: 29).

As seen on Figure 3, equilibrium point is the intersection point of supply and demand curves. Any price under the equilibrium point will result in an excess demand as any price over this point would, in an excess supply. These remarks can be taken into consideration as markers for improving the market for suppliers, unsatisfied demand can be seen as room for increase in supply and similarly any kind of supply surplus should imply a decrease in overall production. Frank (2007) explains this concept as follows, when price differs from the equilibrium price, trading in the marketplace will be constrained—by the behavior of buyers if the price

lies above equilibrium, by the behavior of sellers if below. At any price other than the equilibrium price, one side or the other of the market is dissatisfied. At prices above equilibrium, for example, sellers are not selling as much as they want to. The impulse of a dissatisfied seller is to reduce the price.

Figure 3: Equilibrium point



In marketing sense, price can be defined as the total of all the values that customers are willing to give up to acquire the benefits of having or using a product or service (Kotler and Armstrong, 2011: 290). Table 1 shows the different definitions given for economic and marketing aspects.

Table 1: Comparison between the Economics and the Marketing Literature on Pricing

	Economics	**Marketing**
Firms' determination of prices	Emphasis on optimality issues through the use of formal models that attempt to maximize an objective function under certain constraints Profit maximization has been the most common objective but a wide variety of other joint objectives have also been investigated. Price is usually considered as the main business decision for gaining competitive advantage. Theoretical concepts and econometric tools have been developed in the context of optimizing models. A large number of empirical studies have been conducted to test econometrically the range of applicability of various optimizing models. Recent interest in behaviorist approaches seems likely to grow	Emphasis on how firms are actually behaving through the behavioral examination of issues such as pricing behavioral objectives, pricing methods, departments responsible for pricing decisions, pricing of new products and examination of the firm and business conditions that favor a price increase or decrease. Firms are considered to pursue a variety of pricing objectives apart from profit with the emphasis being placed on achieving satisfactory rather than maximum results. Price is regarded as a less important business activity compared with the other elements of the marketing mix. Some issues such as pricing over the product life cycle stage, service pricing, retail pricing, online pricing have been examined mainly, if not exclusively, within the marketing literature. Relatively few empirical studies have been conducted from a marketing perspective, while optimality models used tend to be less formal and incorporate managerial judgement. Concepts such as price discrimination, price skimming, price leadership and cost-based pricing have been borrowed from economics
Industry- and economy wide role of prices	Industrial economics examines how the nature of competition in a market affects pricing behavior General equilibrium theory shows how mutually consistent relative prices can be determined under conditions of perfect competition. It is the theoretical hard core of economics and provides an ideal standard for social organization and a platform for political action Macro-economics focuses on the overall price level and its rate of change and studies their interrelationship with other central macroeconomic aggregates, such as income, employment, rate of interest, investment, savings and consumption	These issues have been examined almost exclusively within the economics literature
Buyers' response to prices	Rationality assumed on the part of the buyer, which is essential to the utility maximization theory. Price is used as a determinant (i.e. independent variable in the function) of this utility Price is the most important criterion in buyers' decisions The focus is on rational buyers' behavior rather than on how actual buyers behave in reality	Rationality is not always evident as shown by research in psychology (price-quality relationship, Weber-Fechner Law, buyers' process prices from left to right, presentation of prices to buyers may alter their reference prices, assimilation and contrast theory, adaptation theory, difficulty in recalling prices) Price is not always the most important criterion in buyers' decision making especially in the business-to-business sector The emphasis is on how buyers are actually processing prices through empirical observation studies. Some concepts such as reservation prices, price elasticity or consumer's surplus have been borrowed from economics.

Source: Skouras, T., et al. (2005) "Economics and Marketing on Pricing: How and Why Do They Differ?", *Journal of Product and Brand Management*, 14(6): 370

1.1.1. Importance of Price as a Decision Determinant

One of the most difficult decisions facing any company is how to price the products or services it renders. Nevertheless, pricing cannot be examined in isolation from the other elements of a company's marketing strategy (Indounas, 2006: 415). Being one of the four main decisions determinants in the marketing mix, price is one of the main elements of economic structure, and in market oriented economies, price confronts supply and demand, only upon agreeing on it, the buyer and seller can conclude their exchange. Therefore in both macro and microeconomic aspects, price is of essential importance for customers and businesses (Mucuk, 2010: 154).

Pricing may play an important role in helping to accomplish company objectives at many levels. A firm can set prices to attract new customers or profitably retain existing ones. It can set prices low to prevent competition from entering the market or set prices at competitors' levels to stabilize the market. It can price to keep the loyalty and support of resellers or avoid government intervention. Prices can be reduced temporarily to create excitement for a brand. Or one product may be priced to help the sales of other products in the company's line (Kotler and Armstrong, 2011: 300).

In open and free markets, prices, to some limit, adjust the supply to demand and vice versa. If more goods are produced than customers willing to buy at a specific price, then in order for them to be sold, the prices must be reduced to a point at which all will be sold. If supply is insufficient to satisfy the demand, prices shall rise until purchases are curtailed or until the higher price attracts production and supply until an equilibrium is reached between supply and demand (Converse et al., 1965: 162). This means prices have a wide array of impact on both producers and customers. While lower prices can stimulate demand for a product by customer, it can also discourage newcomers to enter the market, higher prices can encourage the producers to increase supply.

1.1.2. Factors Affecting Pricing Decisions

Price setting can be complex if it is difficult to identify the closest competitors, but it should be borne in mind that no product is entirely without

competition; there is almost always another way in which customers can meet the need supplied by the product. Also, different customers have different needs and therefore will have differing views on what constitutes value for money – this is why markets need to be segmented carefully to ensure that the right price is being charged in each segment (Blythe, 2005: 180).

Sommers et al. (1992) lists the key factors influencing the price determination process as follows:

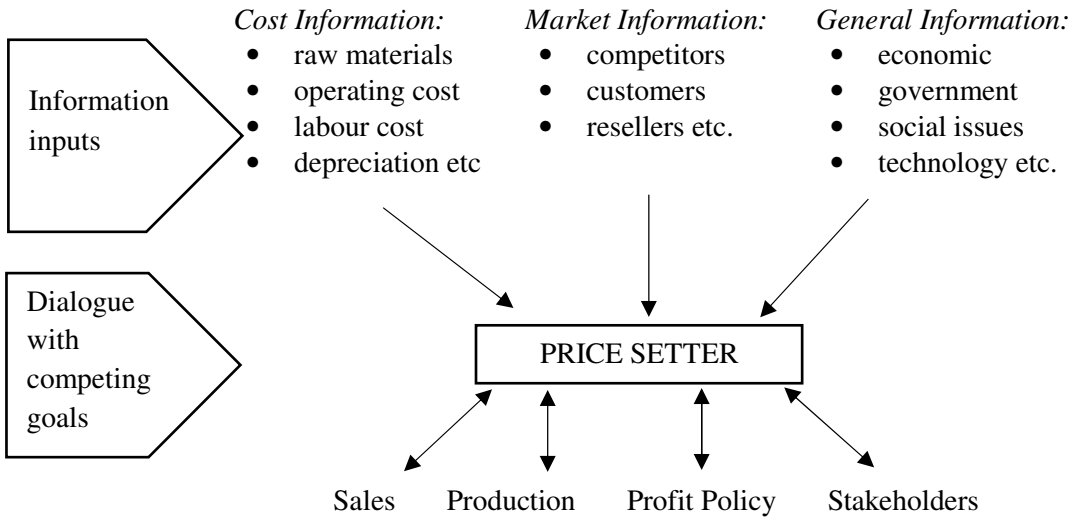
- Demand for the product
- Target share of the market
- Competitive reactions
- Other parts of the marketing mix.

While setting the price for a certain product or service, customers and competition are not the only parties to be considered. There are also other parties involved and these parties can be mainly listed as:

- Intermediaries
- Suppliers
- Governmental and legal considerations
- Other departments of the company (Mucuk, 2010: 157).

In Figure 4, the factors that arise within the company are shown as “cost information” which includes operating costs, production costs (raw materials, labour costs) depreciation etc. and “company goals” which includes sales, production, profit policy and stakeholders. Micro external factors affecting the pricing decisions are listed as the competitors, customers, resellers and suppliers; while the macro environmental factors are listed as economic, governmental, social and technological issues and etc.

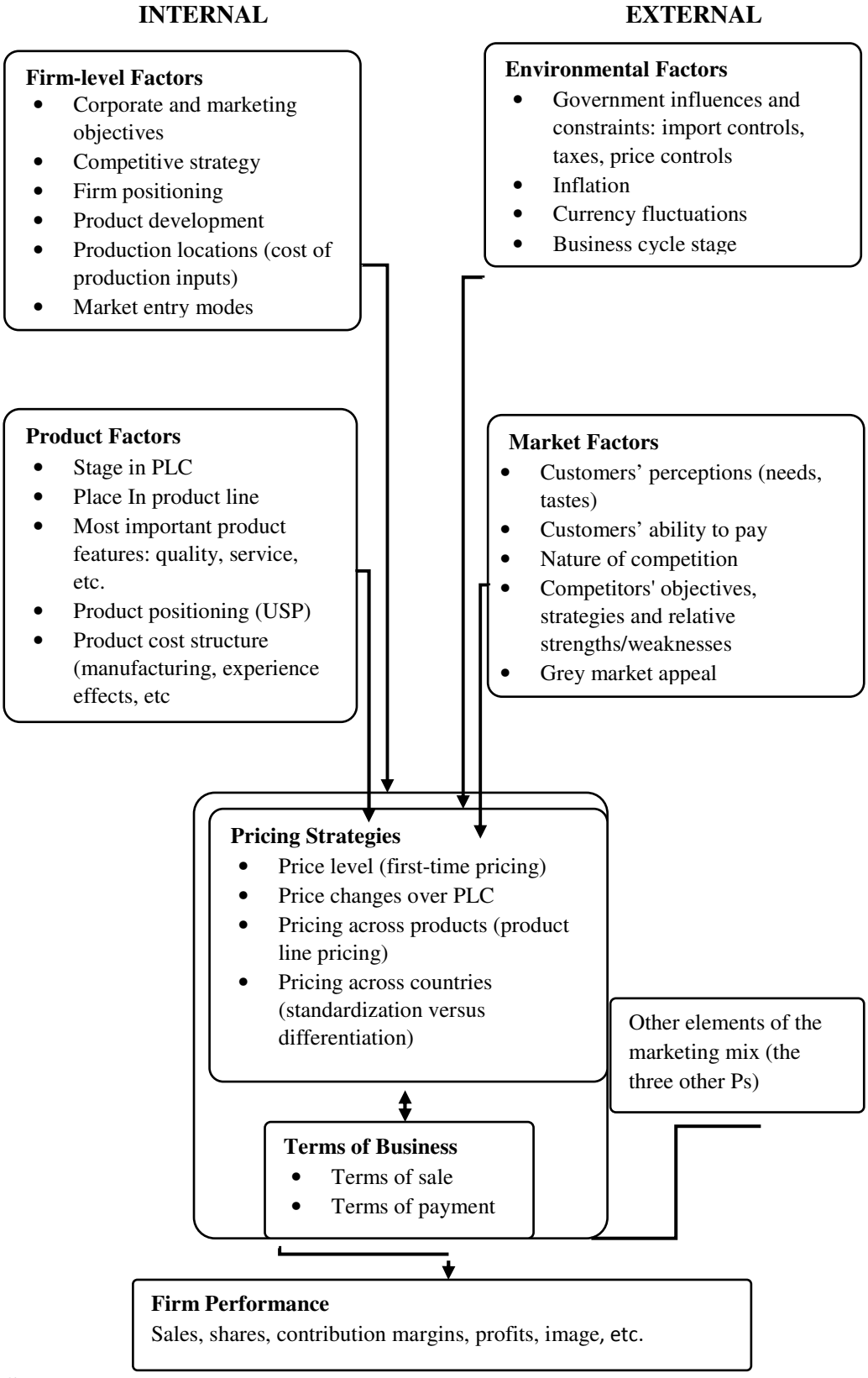
Figure 4: The Price-setting Process



Source: Wilmshurt, J., Mackay, A. (2002) Fundamentals of Marketing 4th edition: 281

Figure 5 breaks down the internal and external factors in the pricing decision process and gives out a more detailed look into above mentioned decision determinants by separating internal factors in two; firm-level and product factors; and external factors as environmental factors (macro-external) and market factors (micro-external). Evaluating these determinants would serve the basis for forming pricing strategies along with the other elements of the marketing mix.

Figure 5: Internal and External Factors Affecting the Pricing Decision Process



Source: Hollensen, S. (2010) Global Marketing – A Decision-oriented Approach 5th Edition: 519

Dibb et al.(1994) point out an eight-stage process for price setting as seen in Table 2 which takes above mentioned factors into consideration starting with firm's objective which sets a starting point for pricing strategy, then analyzes the target market and demand, thereafter analyzes the competition before choosing the pricing method and setting the final price.

Table 2: Eight Stages of Price Setting

Stage	**Explanation**
Development of pricing objectives	The pricing objectives derive from the organization's overall objectives; does the firm seek to maximize market share, or maximize profits?
Assessment of the target market's ability to purchase and evaluation of price	Buyers tend to be more sensitive to food prices in supermarkets than to drinks prices in clubs. Also, a buyer's income and availability of credit directly affect the ability to buy the product at all.
Determination of demand	For most products demand falls as price rises. This is not necessarily a straight-line relationship, nor is the line necessarily at forty-five degrees; for some products even a small price rise results in a sharp fall in demand (e.g. petrol) whereas for other products (e.g. salt) even a large price rise hardly affects demand at all.
Analysis of demand, cost and profit relationships	The firm needs to analyze the costs of producing the item against the price that the market will bear, taking into account the profit needed. The cost calculation will include both the fixed costs and the unit costs for making a given quantity of the product; this quantity will be determined by the market, and will relate to the selling price.
Evaluation of competitors' prices	This will involve a survey of the prices currently being charged, but will also have to consider the possible entry of new competitors. Prices may be pitched higher than the competitors in order to give an impression of exclusivity or higher quality; this is common in the perfume market, and in services such as restaurants and hairdressing.
Selection of a pricing policy	The pricing policy needs to be chosen from the list given in the early part of the chapter.
Development of a pricing method	Here the producer develops a simple mechanism for determining prices in the future. The simplest method is to use cost-plus or mark-up pricing; these do not take account of customers, however, so something a little more sophisticated should be used if possible.
Determining a specific price	If the previous steps have been carried out in a thorough manner, determining the actual price should be a simple matter.

Source: Adopted from Dibb, S., Simkin, L., Pride, W. and Ferrell, O.C. (1994) Marketing; Concepts and Strategies, 2nd edition, *London, Houghton Mifflin*

1.2. PRICING METHODS

As stated before, pricing is one of the key factors in the marketing mix, and the method of pricing should suit the marketing objectives of the firm, related government regulations, perceptions and demand of the targeted customer demographic (Bovee, et al. 2007: 443). As every actor in the environment of a firm has an impact on the pricing decisions, main methods for pricing a product can be listed as; cost-based pricing, customer-based pricing, and competition-based pricing (Blythe, 2005: 172).

Table 3: Alternative Approaches to Pricing

	Cost-based pricing	**Competition-based pricing**	**Customer-based pricing**
Main strength	Data readily available	Data readily available	Does take customer perspective into account
Main weakness	Does not take competition into account Does not take customers (and customer willingness to pay) into account	Does not take customers (and customer willingness to pay) into account	Data are difficult to obtain and to interpret Customer value-driven pricing approach may lead to relatively high prices – need to take long-term profitability into account Customer value is not a given, but needs to be communicated
Overall evaluation	Overall weakest approach	Sub-optimal approach for setting prices; appropriate for commodities (if – and only if – products/services in question cannot be differentiated)	Overall best approach, direct link to customer needs

Source: Adopted from Hinterhuber, A. (2008) Customer value-based pricing strategies: why companies resist, *Journal of Business Strategy* 29(4): 41

Cost-based pricing derives from data from cost accounting. Competition-based pricing uses anticipated or observed price levels of competitors as primary source for setting prices and customer-based pricing uses the value that a product or service delivers to a segment of customers as the main factor for setting prices (Hinterhuber, 2008: 41).

1.2.1. Cost-based Pricing

Even though the customers' perception of value sets the price ceiling for a product or service, the cost of providing the said product or service sets the floor for the price that the company can ask for. There are two sets of costs for accompany when producing. These are; fixed costs (also known as "overhead") and variable costs. Fixed costs are the costs that do not change regardless of production level or sales level; example for this type of costs can be building rents, employee wages and so on. Whereas the variable costs are the costs that change regarding the production level (Kotler and Armstrong, 2011: 295-296).

Cost-based pricing methods are the least customer-oriented; two methods that are still in use are cost- plus pricing and mark-up pricing.

Cost-plus Pricing

Cost-plus pricing is simple to use and in theory it guarantees the company achieves its pre-determined profit target. The price is set by adding a fixed percentage profit to calculated cost of manufacturing and distributed overhead costs (Blythe, 2005: 172). An example calculation for cost-plus pricing applied for an assumed 10000 units would look like Table 4.

Table 4: Cost-plus Pricing for Assumed 10000 Units

Item	**Unit cost**
Labour Raw Materials Electricity Overheads	\$2.37 \$4.56 \$0.74 \$3.28
Total production cost per unit Plus profit of 15%	\$10.95 \$1.64
Net price	\$12.59

The other way to implement cost-plus pricing is via the break-even point. This means a company first calculates the break-even point; the point that a company must sell number of units at a given price to cover all manufacturing and selling costs. Sales exceeding the break-even point would generate profit for the company (Bovee, et al. 2007: 445). Break-even point in number of units can be calculated as follows:

$$\text{Break even point} = \frac{\text{Fixed costs}}{\text{Selling price} - \text{Variable costs per unit}}$$

Next equation shows a calculation where the selling price is set at \$20, and how many units are needed to be sold for breaking-even with that selling price.

$$\text{Break even point} = \frac{\$150.000}{\$20 - \$5} = 10.000 \text{ units}$$

Naturally an increase in the set selling price would require fewer units to be sold to break-even. At this point it is a managerial decision to set the selling price which brings us to the main weakness of cost based pricing, as its main focus is costs, it does not factor neither the customer nor the competition. In that sense, this method should only provide insight to the price setter, the before mentioned factors should also be included in the pricing decisions and handled as a whole.

Mark-up Pricing

Mark-up pricing is similar to cost-plus pricing, and is the method used by most retailers. Typically, a retailer will buy in stock and add on a fixed percentage to the bought-in price (a mark-up) in order to arrive at the shelf price. The level will vary from retailer to retailer, depending on the type of product; in some cases the mark-up will be 100% or more, in others it will be near zero (if the retailer feels that stocking the product will stimulate other sales). Usually there is a Standard mark-up for each product category (Blythe, 2005: 173).

1.2.2. Competition-based Pricing

Competition-based pricing method involves setting prices on the basis of what competitors are charging (Stone and Desmond, 2007: 276). This does not mean the price should be same or somewhat less than the competition. In the case where the products are very similar, then the prices will also need to be similar but if the conceived value of the product by the customer is greater, the company can charge a higher price, naturally it goes both ways, if the perceived value is lower, the price for the product should follow that trend in order to compete (Blythe, 2005: 178; Kotler and Armstrong, 2011: 299).

1.2.3. Customer-based (Demand-based) Pricing

Customer-based pricing method takes customer demands and value perception into account while setting prices and not solely the cost of the product. Customer-based pricing focuses on what would be the demand level and the responsiveness of the customers on different price levels (Blythe, 2005: 174; Stone and Desmond, 2007: 275)

Experimental or *trial and error* pricing is what Davis (1961) describes as a method which relies heavily on customer demand, in which a firm either runs a market test or directly introduces the product to the market, knowing the price might have to be altered depending on the strength of the market demand. The more common one of these two options is the latter.

1.3. PRICING STRATEGIES

When choosing a pricing strategy, a company must select a course that is consistent with its long-term objectives and its basic pricing policy which is also susceptible to modification since market is continuously open to change by different circumstances, that taken into consideration, a firm can employ any of the several strategies to meet the requirements of the market (Buell, 1986: 30-14).

1.3.1. Market Skimming

In this strategy a high price is charged to 'skim the cream' from the top end of the market, with the objective of achieving the highest possible contribution in a short time. For a marketer to use this approach the product has to be unique, and some segments of the market must be willing to pay the high price. As more segments are targeted and more of the product is made available the price is gradually lowered. The success of skimming depends on the ability and speed of competitive reaction (Hollensen, 2010: 523).

This strategy is also particularly suited to niche products, which target customer needs more precisely and are tailored to meet those needs, again attracting a premium. Innovative products and new-to-market products also have the advantage of giving the company the ability to set the price benchmark for the industry (Lewis and Housden, 1998: 108).

According to Kotler and Armstrong (2011) Market skimming makes sense only under certain conditions. First, the product's quality and image must support its higher price, and enough buyers must want the product at that price. Second, the costs of producing a smaller volume cannot be so high that they cancel the advantage of charging more. Finally, competitors should not be able to enter the market easily and undercut the high price.

1.3.2. Market Penetration

A penetration pricing policy is used to stimulate market growth and capture market shares by deliberately offering products at low prices. This approach requires

mass markets, price sensitive customers and reduction in unit costs through economies of scale and experience curve effects (Hollensen, 2010: 523).

For penetration pricing to work, the company must have carried out thorough research to find out what the competitors are charging for the nearest similar product. The new product is then sold at a substantially lower price, even if this cuts profits below an acceptable level; the intention is to capture the market quickly before the competitors can react with even lower prices (Blythe, 2005: 179).

Lewis and Housden (1998) argue that this strategy does not encourage differentiation, and a cost-based strategy implied by penetration is often a hard position to defend if advantage is simply based on low price.

1.3.3. Pricing in Maturity

While the two previous strategies are to be chosen for new products or services, the pricing for a product or service later in its life cycle is equally important.

Buell (1986) explains it is vital to know when a product is approaching to its maturity and a new product is entering the commodity line, in order to promptly reduce the real prices when symptoms of deterioration appear, and lists these symptoms as follows:

- Weakening in brand preference
- Narrowing physical variation among products (standardization)
- Entry of competitors
- Market saturation
- Stabilization of production methods

1.4. FREIGHT

Mocatta et al.(1974) describes freight as the reward payable to the carrier for the carriage and arrival of the goods in a merchantable condition, ready to be delivered to the merchant.

1.4.1. Definition of Freight

The pricing of cargo ships' services, like all pricing, is dependent supply and demand, but the factors affecting both supply and demand are most likely to be more complicated than in the case of most other industries and services. As it is the case with all modes of transport, the demand for shipping is derived from the demand for the commodities carried, and is, therefore, affected by the elasticity of demand for these commodities (Branch, 2007: 181).

Stopford (1997) defines freight rates as the ultimate regulator which the market use to motivate the decision makers to implement their short-term and long-term strategies, whether it is adjusting capacity or finding ways to reduce their costs and points out that the pricing system is central and essential to the supply of transport. Freight rate basically reflects the balance of ships and cargoes available in the market. What can be understood from this basic explanation is that, the simple supply and demand theory comes in play, as in the ships in the market is higher than the demand, freight rates will go down, and if the ships are too few to meet the demand, freight rates will rise.

Table 5: Ten Variables in the Shipping Market Model

Demand	Supply
1. The world economy	1. World fleet
2. Seaborne commodity trades	2. Fleet productivity
3. Average haul	3. Shipbuilding production
4. Political events	4. Scrapping
5. Transport costs	5. Freight rates

Source: Stopford, M. (1997) Maritime Economics Second Edition, London: Routledge

World Economy

The single most important factor affecting the ship demand is the world economy, since the world economy creates most of the demand for sea transport,

through import of raw materials and the trade of manufactured products (Stopford, 1997: 118).

Seaborne Commodity Trades

The commodities can be discussed in two parts, short-term and long-term. Commodities that need short-term planning are seasonal goods such as agricultural commodities. Long-term commodities' examples include iron ore and crude oil. Seasonal cargo planning is difficult to make, so shippers of this type of cargo rely heavily on the spot market, as a result fluctuations in the grain market have more effect on the charter market than some much more larger trades. In long-term trends in commodities, identifying is done best by sudying the economic aspects of the related industries of the traded commodities and four types of changes that should be looked out for: change of demand for the said commodity, change of source ofthe said commodity is supplied by, change of the location of production and lastly changes in the shipper's policy regarding transportation (Stopford, 1997: 122).

Average Haul

The demand for sea transport depends on the distance over which the cargo is shipped. Same cargo shipped from the Middle East to Western Europe via the Cape stimulates 2-3 times as much demand as the same tonnage shipped from Libya to Marseilles. Average haul is the name given for this distance effect. In order to account for this matter, the sea transport demand is usually measured by the term "ton miles" which is the tonnage of the cargo shipped, multiplied by the average distance it is transported (Stopford, 1997: 124-125).

Political Events

The most characteristic aspect of the political events regarding ship demand is that when they occur, they cause sudden and unexpected changes in ship demand.

Even though the effects of this events do not directly affect the demand, it is usually their indirect consequences that are significant (Stopford, 1997: 126).

Transport Costs

Transporting goods from distant sources are only logical if the cost of shipping can be reduced to a reasonable level and/or some major benefit can be obtained in quality of the product. Over the last century, improved effciency, bigger vessels and effective organization reduced the transport cost steadily and increased the service quality (Stopford, 1997: 127-128).

The Merchant Fleet

Scrapping and newbuilding deliveries are what determines the rate of fleet growth in the long run. The average economic life of a vessel is 25 years, so only a small amount of the fleet is scrapped each year. this means the pace of adjustments to the aforementioned chnages can be measured in years. Supply's adjustment when the demand does not turn out as expected is one of the key features of the shipping market model (Stopford, 1997: 129).

Fleet Productivity

The fleet's size is fixed, but the productivity with the ships used are not. Days the ships carry cargo are counted as productive while the days spend on ballast, in incidents, in repair, laid-up, waiting and being used as short or long-term storage can decrease this value (Stopford, 1997: 132-133).

Shipbuilding Production

The main principal in shipbuilding is the level of output should adjust to the changes in demand, but as shipbuilding is along-cycle businessthe adjustments do not take place quickly. The time-lag can vary between 1-4 years depending on the

orderbook of the builder, keeping that in mind, placing an order must be done on the basis of an estimate of future demand (Stopford, 1997: 134-135).

Scrapping

Scrapping is of high importance when it comes to removing vessels from the market. Scrapping decision depends on various factors, the main ones being: age, technical obsolescence, scrap prices, current earnings and market expectations (Stopford, 1997: 137).

Freight Rates

Freight rates as the ultimate regulator which the market use to motivate the decision makers to implement their short-term and long-term strategies, whether it is adjusting capacity or finding ways to reduce their costs and points out that the pricing system is central and essential to the supply of transport (Stopford, 1997: 138).

1.4.1.1. Charter Forms

A charter means that the owner or the disponent owner in one way or another promises to put a vessel or a certain transportation capacity at the disposal of the charterer and the charterer, in return, promises to pay the freight agreed upon (Gorton et al., 2009: 101).

Charter agreements are generally divided into three categories: bareboat (or demise) charters, time charters and voyage charters. Bareboat charters are those by which, in return for payment of hire, possession of the chartered ship is given to the charterers, who provide crew and all supplies, pay all running costs and undertake the responsibility of shipowner to those whose goods are carried on the vessel. Time charters, whether for a period or for a trip, are those under which, in return for the payment of hire, the vessel's employment is put under the orders of the charterers, while possession remains with the owners who provide the crew and pay the ordinary

running costs, except specific voyage costs such as fuel and cargo handling and port charges which are the charterers duty to pay. Voyage charters are those by which the owner agrees to perform one or more designated voyages in return for the payment of freight and (if necessary) demurrage; the costs of and responsibility for cargo handling are to be specified by the parties in the specific agreement they reach (Cooke et al., 2007: 3).

1.4.1.1.1. Voyage Charter

The voyage charter is the most basic type of shipping contract. A voyage charter provides transport for a specific cargo from port(s) of loading to discharging for a fixed price per ton. Under a voyage charter the shipowner is usually responsible for all costs incurred on the voyage. Since voyage contracts are usually negotiated shortly (between a few days to two weeks) before the loading of the cargo, they are "spot" contracts, although carriers and shippers sometimes negotiate forward voyage contracts a month or more in advance of the agreed on loading date. Consecutive voyage charters are a special type of voyage charter where the vessel is contracted for several voyages which follow consecutively upon each other (Ozer and Cetin, 2012: 206).

In other words, in voyage charter, the vessel is employed for a single voyage. The charterer may hire the vessel for his own cargo or for someone else's account. In practical means, a voyage charter means that the owner is supposed to carry on board of a specific ship a particular cargo from one port to another and the vessel shall be present and ready to receive cargo at the first loading port on a certain day or period of time. Under a voyage charter, the owner has the operational control of the ship and is responsible for all the operating expenses such as port charges, bunkers, insurances, taxes, etc. (Gorton et al., 2009: 111).

1.4.1.1.2. Time Charter

A time charter contract in the shipping market is an agreement between a ship owner and a ship operator (charterer) in which the ship operator agrees to pay a fixed

(typically daily US dollar) charter rate to the ship owner for a fixed period of time. In return for the charter rate paid the ship operator acquires the right to operate the ship as he likes during the charter period. This will enable the charterer to capture the spot freight rate in the market for maritime transportation for the duration of the charter period (Jorgensen and De Giovani, 2010:401).

Time chartering can be sub-divided between period time charters (involving several years) and trip charters, a type of time charter agreement which has become particularly popular in recent years. As trip charters are just a special form of time charters which are issued for a single trip, they don't have a separate charter party form and are negotiated on standard time charter forms and slightly adapted when deemed necessary (Institute Of Chartered Shipbrokers, 2011: 82).

1.4.1.1.3. Bareboat Charter

In bareboat (Demise) charters, the shipowner provides the vessel for hire and takes no further part in the following proceedings, from that point on, the charterer becomes the vessel manager and operator in every aspect (McConville, 1999: 222). This means charterer will take over almost all of the owner's functions except for the payment of capital costs. These responsibilities include the commercial as well as the technical responsibility for the vessel and the payment of maintenance, crew costs and insurance, etc. (Gorton et al., 2009: 118).

Table 6 shows the distribution of responsibilities of each party depending on the charter contract type.

Table 6: Charter Party Responsibilities Depending on Charter Type

Cost Group	Items	Bareboat	Time	Voyage
Capital Cost	Ship Cost Interest			
Running Costs	Management Repair Maintenance Survey/Drydocking P&I – H&M Stores Crew Costs		SHIPOWNER'S	
Voyage Costs	Bunker Cleaning Port Charges Canal Dues Voyage Insurance Discharge Costs		CHARTERER'S	
	Loading Costs			

Source: Woods, P.J. (2000) Tanker Chartering, Witherby & Co., London

Fixing and Calculation of the freight

The freight can be fixed in several ways, one of which is to fix it on the cargo quantity, for example "X $/metric ton. The other way is to base the freight at a

certain amount independent of the cargo quantity, which is usually called “lump sum freight. A variation on the lump sum freight is to base the freight on the size of the vessel, for example “X $/deadweight ton” (Ihre et al., 1984: 174). A calculation example prepared by Çetin (2010) for freight determination and fixing of the freight are shown in the case below:

A Spanish exporter wants to export a cargo in bulk from Barcelona/Spain to Izmir. In order to set his export price, he needs freight rates. For this reason, he approaches a shipowner through a broker to get a freight idea for his carriage.

The details of the cargo and ships are given below. By using the given data, calculate freight per ton, time charter equivalent of freight. Suppose that shipowner will set his freight rate on cost base pricing. He decides to increase the rock bottom freight (break even point) 15 %.

Charterer’s order:

- Cargo stowage factor 60’ SF –cbf/ton
- 5,250 mtons more or less 10% owners option
- Loading/ discharging ports: Barcelona /Izmir
- Loading/Discharging rates : 2,000 mts/day sshex / 1,500 mts/day shinc
- Involved commissions are 5 pct ttl.

The characteristics of the vessel is as follows:

Sid, described as GRT/NRT/ 3500 /1500 , LOA 120 meters,
DWT: 5,700 tons
DWTCC: 5,300 tons
GRAIN/BALE 310,000 / 295,000 cubic feets
Total constant: 400 mts. (incl. Bunker, FW,L/O, Provision….)
Maximum Cargo Loadable: 310,000 cbf / 60 cbf/ton = 5,166 tons

Bunker consumptions and prices

Vessel’s bunker consumptions are 20 mts Fuel oil 180 cst per day and 4 mts of mdo per day for auxiliaries at sea and 2 mts at port . Vsl balast speed 15 knots, laden speed speed is 14 knots.

F/O : Usd. 669 / ton

MDO: Usd. 976 / ton

Vessel's running cost is usd. 3,500

Port expenses are :

Barcelona : Usd. 12,000 per call

Izmir : Usd 14,000 per call

Vessel open at Port of Alicante (Spain).

Distances:

Alicante / Barcelona route - Alicante/Barcelona is 250 miles

Barcelona /Izmir route - Barcelona /Izmir is 1335 miles

Sailing Time:

Alicante_____Barcelona_____Izmir

250 miles/15 knts 1335 miles/14 knts

----------=0.7 day ----------=3.97 days

24 24

0.7 +3.97=4.67 days x1.05=4,9 ~ 5 days (5% increase deu to weather conditon)

Port time:

a) Loading port: 5166 tons/ 2000=2.58 days x 1.45=3.74 ~ 4 days

b) Discharging ports : 5166/1500=3.44 days x 1.05 = 3.61 ~ 4 days

Total port time = 8 days

TOTAL VOYAGE TIME= 5 + 8 = 13 DAYS

FREIGHT CALCULATION

1) RUNNING COST= 13 days x 3,500 = $ 45,500
2) VOYAGE COSTS
    a) Bunker cost:

Bunker at sailing:

F/O= 5 days x 20 mts x 669 $ = $66,900

MDO=5 days x 4 mts x 976 $ = $ 19,520

Bunker at Port:

MDO= 8 days x 2 mts x 976 $ = $15,600

TOTAL BUNKER COST =$102,020

b) Port expences:

Barcelona : Usd. 12,000

Izmir : Usd 14,000

_____

Total : Usd 26,000

TOTAL VOYAGE COSTS = 102020 + 26000 = $128,020

ROCK BOTTOM FREIGHT = VOYAGE COSTS + RUNNING COSTS

RBF = 128 020 $ + 45500 $ = $173,520

15 % INCREASE IN ROCK BOTTOM FREIGHT AND FREIGHT PER METRIC TON

173,520 $ X 1.15 = $199,548 (15% PROFIT MARGINE)
199,548 $ X 100/95 =210,050 $ (5 % COMMISSION ADDED)
LUMPSUM FREIGHT = $210,050

FREIGHT PER TON = $210,050 / 5166 TONS = 40.66 $/ TON

TIME CHARTER EQUIVALENT

GROSS DAILY T/C = (LUMPSUM FREIGHT – COMMISSION - VOYAGE COSTS) / TOTAL VOYAGE TIME

COMMISSION= $210,050 X 0.05 =$10,502.5

GROSS DAILY T/C =($210,050 - $10,502.5 - $128,020) / 13 DAYS = $71,527.5/ 13 DAYS = $5,002

TIME CHARTER EQUIVALENT= $5,502 X 100/95 = $5,792 / DAY

(Çetin, 2010)

CHAPTER 2

PRICE AND FREIGHT INDICES

2.1. PRICE INDICES AND THEIR IMPORTANCE

Index numbers as a way of presenting proportionate changes in a common format. Their most common use is looking at changes over time. Indices can be constructed from 'simple' data series that can be directly measured, but are most useful for measuring changes in quantities that can not be directly measured normally because they are the composites of several measures (Bolton, 2007: 1).

The relationship between CPI and PPI is vital for the measurement of inflation, for the analysis of the process of inflation within an economy, and in order to help the monetary authorities to minimize the uncertainty introduced by price instability into economic analysis and any decision-making process (Tiwari et al., 2013: 151).To forecast inflation and manage inflation expectations, and to achieve (implicit) inflation targets, policymakers need a better understanding of what types of factors affect the inflation process (Mihailov et al., 2011: 2).

2.1.1. Types of Price Indices According To Methodology

The two main categories according to methodology of price indices can be listed as simple indices and aggregate indices (Akalın, 1977: 255).

2.1.1.1. Simple Indices

Simple Indices are calculated from one variable (a single item) to observe the changes of its price over time, while calculating a simple price index, one time period is chosen as a base and the price for every other period is expressed as a percentage of the base period price. Let p_0 be the price in the base period and p_1 be the price in a second period, the index formula would look like:

$$100(\frac{p_1}{p_0})$$

(Newbold et al., 2007: 714)

2.1.1.2. Aggregate Indices

Akalın (1977) divides aggregate indices into three sections as follows:

- Simple Aggregate Indices
- Unweighted Aggregate Indices
- Weighted Aggregate Indices

2.1.1.2.1. Simple Aggregate Indices

In calculation of price indices using this method, first step is to add up prices regarding each time period and get $\sum p_0$ and $\sum p_n$, then the total of each specific period is divided by the total of the base period and in order to achieve a percentage the result is multiplied by 100.

$$P = \frac{\sum p_n}{\sum p_0}(100)$$

(Akalın, 1977: 258)

2.1.1.2.2. Unweighted Aggregate Indices

An unweighted aggregate price index shows the average price in each year as a percentage of the average price in base year. It is obtained by calculating the average price of said items in each time period and then calculating an index for these average prices. In order to do that, the average price in every period should be shown as a percentage of the average price in base year (Newbold et al., 2007: 714-715). Let *k* be group of items, *p* the price and *i* the item:

$$100\left(\frac{\sum_{i=1}^{k} p_{1i}}{\sum_{i=1}^{k} p_{0i}}\right)$$

Above seen formula would be the unweighted aggregate index of prices for the second period.

Three widely used formulas that have been, or still are, in use by statistical offices to calculate unweighted price indices are Carli, Dutot, and Jevons Indices (IMF; 2010: 215).

Carli Index

Carli index is defined as the simple, or unweighted, arithmetic mean (average) of the price relatives, or price relatives, for the two periods, 0 and *t*, to be compared (IMF, 2010: 215).

$$\frac{1}{n}\sum\left(\frac{p_i^t}{p_i^0}\right)$$

Dutot Index

Dutot index is defined as the ratio of the unweighted arithmetic mean (average) prices (IMF, 2010: 216). The Dutot index can also be expressed as a weighted average of the price relatives, in which the prices of period 0 serve as the weights (IMF, 2009: 50).

$$\frac{\frac{1}{n}\sum p_i^t}{\frac{1}{n}\sum p_i^0}$$

Jevons Index

Jevons index is defined as the unweighted geometric mean of the price relative or relatives, which is identical with the ratio of the unweighted geometric mean prices (IMF, 2010: 217).

$$\prod \left(\frac{p_i^t}{p_i^0}\right)^{1/n} \quad \text{or} \quad \frac{\prod (p_i^t)^{1/n}}{\prod (p_i^0)^{1/n}}$$

Table 7: Properties of Main Elementary Aggregate Index Formulas

Formula Properties	**Carli-Arithmetic mean of price relatives**	**Dutot-Relative of arithmetic mean prices**	**Jevons-Geometric men of price relatives**
Proportinality	Yes	Yes	Yes
Change of units of measurement	Yes	No	Yes
Time reversal	No	Yes	Yes
Transivity	No	Yes	Yes
Allows for substitution	No	No	Yes

Source: International Monetary Fund (2010) Export and Import Price Index Manual Theory and Practice: 235

2.1.1.2.3. Weighted Aggregate Indices

Weights used to calculate weighted aggregate price indices are base-year quantity and reference-year quantity. Three main weighted aggregate price indices can be listed as follows (Akalın, 1977: 260):

Laspeyres Index

The Laspeyres index, in any time period, shows the total cost of purchasing the quantities traded in the base period at prices in the period of interest, shown as percentage of the total cost of purchasing the same quantities in the base period (Newbold et al., 2007: 716). This definition can be formulated as:

$$\left(\frac{\sum p_1 q_0}{\sum p_0 q_0}\right)100$$

The main advantage of the Laspeyres index is the fact that the same base-year quantities will be valid and apply to all future reference years, which helps simplifying the updating of the index, whereas the disadvantage of it lies in its incapability to adjust the weight for items that show drastic price increases (Kvanli et al., 2000: 795).

Paasche Index

Paasche index is a weighted aggregate index where reference-year quantity is used as weight (Akalın, 1977: 261) and calculated as follows:

$$\left(\frac{\sum p_1 q_1}{\sum p_0 q_1}\right).100$$

The complex nature of updating the quantities for the reference-year for the Paasche index make it almost impossible to apply, and when it is taken into consideration that this index reflects both the price and the quantity changes, it cannot be used to show and compare price changes between two time periods whereas the upper hand this method of calculation lies in its usage of current-year quantities, which provides a more realistic and up-to-date estimates of total expense (Kvanli et al., 2000: 795)

Fisher Index

Akalın (1977) describes Fisher index as the geometrical average of Laspeyres and Paasche indices. Thus the method can be formulated as follows:

$$\sqrt{\frac{\sum p_n q_0}{\sum p_0 q_0} \cdot \frac{\sum p_n q_n}{\sum p_0 q_n}}$$

Şimşek (1998) points out the origin for Fisher index on the fact that Laspeyres method reflects the price increases more than the actual and Paasche method reflects them lower, and both these methods require updating the ever changing weights every year.

2.1.2. Major Types of Price Indices According to Their Use

The four principal types of price indices in the system of economic statistics—the consumer price index (CPI), the producer price index, and the export and import price indices—are well known and closely watched indicators of macroeconomic performance. They are direct indicators of price inflation for various flows of goods and services. As such, they are also used to deflate series of nominal values of goods and services produced, consumed, and traded to provide measures of changes in their volumes. Consequently, these indices are not only important tools in the design and conduct of the monetary and fiscal policy of the government, but they are also of great utility in informing economic decisions throughout the private sector. They do not, or should not, comprise merely a collection of unrelated price indicators, but provide instead an integrated and consistent view of price developments pertaining to production, consumption, and international transactions in goods and services (IMF, 2009: 8).

2.1.2.1. Consumer Price Indices

The Consumer Price Index (CPI) is a measure of the average change over time in the prices of consumer items—goods and services that people buy for day to-day living. The CPI is a complex construct that combines economic theory with sampling and other statistical techniques and uses data from several surveys to produce a timely and precise measure of average price change for the consumption sector of the economy (The United States Bureau of Labor Statistic, 2007: 1).

In an aggregate CPI, price and expenditure data must be combined to produce an estimate that reflects some measure of average change, in either the cost of goods purchased or the cost of maintaining a given living standard for all or for some subgroup of households (Schultze, 2003: 3-4).

2.1.2.2. Producer Price Indices

Producer price indices (PPIs) reflect the prices of commodities produced or processed in a given country or region (Weieres, 2008: 725).

Producer Price Index Calculation

The calculation of PPIs usually proceeds in two stages. First, price indices are estimated for the elementary aggregates, and then these elementary price indices are averaged to obtain higher-level indices using the relative values of the revenue weights for elementary aggregates as weights (IMF, 2010: 213).

The index formula selection for the elementary aggregates can show differences on the function of the sampling method, information available, specific nature of industry and resource restrictions. When aggregating sample price relatives within elementary aggregates, in most of the cases the geometric average may be recommended as the best micro index formula especially when information on weights is not available. An advantage of using geometric averaging is also that

outliers have less effect on results. However weights may often be required for price relatives due to the sampling methodology used (OECD, 2005: 55).

2.1.2.3. Export - Import Price Indices

Export and import price indices (XMPIs) measure the overall change in the price component of transactions in goods and services between the residents of an economic territory and residents of the rest of the world. The prices of different goods and services all do not change at the same rate. A price index thus summarizes their movement by averaging over them. A price index assumes a value of unity, or 100, in some reference period. The value of the index for other periods of time provides the average proportionate or percentage change in price from the reference period (IMF, 2009: 1).

2.2. PRICE INDICES IN MARITIME TRANSPORTATION SERVICES

2.2.1. Baltic Dry Index

In 1985 the Baltic Exchange began to publish a series of route-assessments of the prompt physical market. A group of independent broking companies submitted their votes daily on precisely defined routes. In addition to publishing the average of these votes or assessments, the Baltic Exchange also used a formula, by which the routes were weighted by importance, to produce a number, which was initially to be called the Baltic Freight Index (Institute Of Chartered Shipbrokers, 2011: 66)

Methodology of Baltic Dry Index

The index model used by the Baltic Exchange was established in 1985 with the launch of the Baltic Freight Index (now known as Baltic Dry Index) and used to settle trades on the freight futures exchange, BIFFEX. There have been a few minor modifications along the way, but the model has essentially remained unchanged since its introduction and relies on panels of independent shipbrokers around the

world giving their professional judgement as to the prevailing level of the open market within the parameters of the route they have been asked to assess. The numbers produced by the Baltic Exchange are based on an underlying understanding of what is actually happening in the freight markets. The routes reported are as representative as possible of the world's principal bulk cargo trades and reflect trades within the Pacific and the Atlantic, as well as trades between the oceans, maintaining a balance between fronthaul and backhaul routes. All the routes reported have a steady and significant turnover of fixtures, while trades subject to seasonal closures such as the Great Lakes or Goa are avoided. Trades dominated by a limited number of charterers are also avoided and voyage routes where business is largely concluded on standard terms are favoured (www.balticexchange.com).

The Baltic Dry Index (BDI) is the successor to the Baltic Freight Index (BFI) and came into operation on 1 November 1999. Since 1 July 2009, the index is a composite of the Capesize, Panamax, Supramax and Handysize Timecharter Averages. The calculation until 30 June 2009 was based on an equally weighted average of the BCI, BPI, BHSI and the BSI index. The BDI continues the established time series of the BFI, introduced in 1985. However, users of the index should note that the voyages and vessels covered by the index have changed a great deal so caution should be exercised in assuming long term consistency of the data (The Baltic Exchange, 2015: 35).

Production Method

The Baltic production process is based on the confidential provision of assessments by panellists. The assessments represent the professional judgement of the panellist at the time of assessment of the prevailing open market level for the shipping route or (in the case of the forward curve) the instrument concerned. In the case of Sale and Purchase and Demolition assessments, the judgement is of the current value of the defined vessel.

In reaching their rate assessments, panellists will take cognisance of the totality of market information known to them at the time of reporting, making any appropriate adjustment to accord with the Baltic's route definitions. Where active

markets exist, reports are expected to be informed by and thus anchored in fixtures and current negotiations (transactional data). However, the relatively limited liquidity of the shipping markets when compared to some financial markets, together with their underlying volatility, mean that it is essential panellists have discretion over the relative value they attribute to transactional data, and to other data such as tonnage availability, order lists, sentiment and news flow in reaching their assessments.

It is a characteristic of the global freight market that although a route may be routinely fixed (traded) and therefore meet the criteria for assessment by the Baltic when first adopted, there may subsequently be little or no activity for a period of time. In these circumstances panellists cannot be guided by transactions specific to the route and will therefore use their knowledge of the wider market to provide an appropriate assessment (The Baltic Exchange, 2015: 12).

The criteria for selecting routes are broadly as follows:

a. Trade Volume - A steady and significant volume of trade on index routes, or on routes related to them, is important. Trades subject to seasonal closures (such as for example the Great Lakes) are avoided;

b. Transparency - A reasonable volume of accurately reported fixtures should be available. Where possible, trades dominated by a sole or limited number of interests are avoided;

c. Standard Terms - Voyage routes where business is largely concluded on standard terms are favoured;

Baskets and geographical balance

The Baltic provides calculations of composite rates which aim to reflect movements in the global or regional shipping market for the vessel types concerned. Weightings of routes used to create such a composite are not intended necessarily to reflect accurately actual underlying trade flows nor to be perfectly geographically balanced. The composition of these rates aims to meet the needs of market participants, who are consulted on their design.

Vessels

In defining timecharter routes, the Baltic specifies the outline details of the vessel to be assessed. The Baltic aims to base its description on a modern vessel design which can act as an appropriate benchmark for its category. (The Baltic Exchange, 2015: 13)

Selection, Appointment, Responsibilities and Audit of Panellists

The integrity of and respect for the Baltic indices are the result of the quality and nature of the panel reporting companies and the reporting process itself. Above all is the criterion that panellists must be competitive shipbrokers who do not invest in the markets they report and are therefore free from conflicts of interest. On rare occasions investment firms exist within the same group as panellist companies. Where this is the case the Baltic must satisfy itself that the panellist is managing any resulting conflict of interest appropriately.

The Baltic Exchange appoints panel reporting companies in accordance with the following criteria:

a. The main business of panellists should be shipbroking. Principals cannot be panellists;

b. Panellists must be recognised as competent, professional firms, actively engaged in the markets they report, with adequate personnel to deemed qualified to perform the role of panellist;

c. Panellists must be members of the Baltic Exchange, meeting all relevant membership criteria;

d. Panellists are bound by all of the relevant terms of this document. Each year they are reminded in writing of the key parts;

e. The Baltic aims to maintain a geographical spread of panellists;

f. The Baltic will not appoint as panellists firms who are the exclusive representatives of principals who are particularly influential in relevant trades;

g. The Baltic will not appoint as a panellist a firm which is dependent for its business on a particularly small number of clients;

h. The Baltic will generally not appoint as a panellist a firm which engages in principal trading (as opposed to broking) in the freight derivatives market.

No firm shall continue to be a panellist unless the firm:

- Satisfies and, whenever required to do so, continues to satisfy the Baltic as to the suitability and competence of the firm to report;
- Is a member of the Baltic Exchange;
- Having received notice of the responsibilities of a panellist, as amended from time to time, performs the task of panellist diligently and in accordance with this guide.

Panellists are appointed for an indefinite period of time. Their appointment is formally reviewed each year, but can also be reviewed at any other time.

The appointment and removal of panellists is the responsibility of the Board, which will be advised by the SFR. The decision to remove a panellist rests with the Baltic alone and the Baltic is not obliged to provide reasons for the removal or to enter into any correspondence on the matter.

Duties of Panellists

On appointment to a panel the shipbroking firm commits to:

a. Accept the index rules included in this guide.

b. Continuing to satisfy the Baltic Exchange as to its competence and suitability to report rates.

c. Carry out a process of self-assessment at regular intervals during its appointment having regard to relevant factors, such as the number of shipbrokers in their employment with special knowledge and experience on each route being reported.

d. Appoint a manager and deputy to be the representative and who are responsible to the Baltic Exchange for the performance of their firm's obligations as panellists. Such brokers shall have the expertise acceptable to the Baltic Exchange and will be replaced if reasonably required by the Baltic Exchange.

e. Accept that all information provided by the panellist to the Baltic Exchange remains confidential between the panellist and the Baltic.

f. Hold an annual "audit" meeting with the SFR for the purpose of reviewing submission quality and accuracy and compliance with this guide.

For the purposes of assessing suitability and competence of a firm to be a panellist or to continue to be a panellist the Baltic Exchange requires the firm to apply a process of self-assessment prior to consideration of the firm for appointment, at regular intervals during an appointment and prior to an appointment being renewed, having regard to a number of factors that may be considered relevant, such as:

a. Whether the firm has sufficient personnel who are acceptable to the Baltic Exchange and who have adequate knowledge and shipbroking experience to report on the agreed routes.

b. The location of the firm and its ability to report at the times stated in Appendix 1.

c. The ability of the relevant panel reporters to converse using the English language.

The ability of the panellist firm to meet these requirements forms a part of the annual "audit" visit by the SFR, but the Baltic should be notified by the panellist without prompting if at any time it considers it may fail to meet these basic qualifications.

Responsibility for providing data for the voyage and timecharter routes should be allocated to individual brokers in each panel company who have special knowledge of the specific trade.

Even if the data is input by a junior member of staff, the route assessments are always decided upon at a level of appropriate competence, and the Baltic is notified of the identity of the responsible staff.

The representative of the panellist listed with the Baltic Exchange is to have a nominated deputy in his absence. The principal or his deputy or nominee named to the Baltic Exchange should oversee the daily report for errors before it is sent to the Baltic Exchange. A nominee from each panellist should always be available between the reporting time and the publication time for consultation with the SFR as required.

Panellists should retain any available substantiating information for at least five years where such records exist in a suitable form. This would include, where practical, day books, email records, telephone records and/or messaging traffic.

An examplatory calculation for Baltic is shown below:

Table 8: Example Inception Date Weigthings

Route	Weighting %	Minimum number of reports required
1	20	7
2	20	7
3	15	6
4	5	5
5	5	5
6	5	5
7	5	5
8	5	5
9	5	5
10	5	5
11	5	5
12	2.5	5
13	2.5	5

After the weightings are decided for each route, the first reported rates and weigthings provide the required information for the calculation of the route weighting factor . An example for this calculation is shown in Table 9.

Table 9: Example Base Year Calculation of BDI

Route	Rate (usd)	Weighting %	Route weighting factor	Contribution to index
1	9.078571	20	22.029897717	200
2	14.287510	20	13.999999999	200
3	9.225714	15	16.258903684	150
4	11.671420	5	4.283965728	50
5	20.678570	5	2.417962003	50
6	10.314280	5	4.847645429	50

Table 9: Example Base Year Calculation of BDI (Continued)

Route	Rate (usd)	Weighting %	Route weighting factor	Contribution to index
7	5.778570	5	8.652657601	50
8	11.321420	5	4.416403785	50
9	13.142850	5	3.804347826	50
10	4.500000	5	11.111111111	50
11	16.416667	5	3.045685279	50
12	28.928570	2.5	0.864197530	25
13	13.542850	2.5	1.845991561	25
		Index		1000

- On the first day of reporting, the reported rate for route 1 was $9.078571
- Route 1 was required to have a 20% weighting in the index so that its contribution to the index this starting date, with the index initiated at 1000, was required to be 20% x 1000 = 200
- The weighting factor for this route was then calculated as that factor by which the average rate had to be multiplied in order to equal 200 on the starting day. (200/9.078571 = 22.029898.)
- Hence the route weighting factor for route 1 was fixed at 22.029898, factors were then derived for all of the other routes in the same manner.

The route weighting factors remain constant unless the composition of the index is changed. To compile the index each day it is necessary only to multiply the average rate on each route by its weighting factor, giving the contribution of each route, the sum of which is the index for the day.

Table 10 shows the changes that occur when in the following dates, updates to rates are reported while the route weighting factor stays fixed.

Table 10: Example of Index Changes

Route	Rate (usd)	Weighting %	Route weighting factor	Contribution to index
1	9.000000	20	22.029897717	198.269
2	14.285714	20	13.999999999	199.576
3	8.164285	15	16.258903684	132.742
4	11.642857	5	4.283965728	49.877
5	19.714285	5	2.417962003	47.668
6	10.021428	5	4.847645429	48.580
7	5.792857	5	8.652657601	50.123
8	10.992857	5	4.416403785	48.548
9	11.307142	5	3.804347826	43.016
10	4.307142	5	11.111111111	47.857
11	16.375000	5	3.045685279	49.873
12	28.785714	2.5	0.864197530	24.874
13	13.464285	2.5	1.845991561	24.854
		Index		966.288

For the creation of BDI the following Formula is being used:

Where TCavg = Time charter average.

(Capesize TCavg + PanamaxTCavg + SupramaxTCavg + HandysizeTCavg)/ 4) * 0.110345333

The multiplier was first applied when the BDI replaced BFI, and has changed over the years as the contributing indices and the methods of calculation have been

modified. The multiplier was last updated on 6 May 2014 (The Baltic Exchange, 2015: 35).

Each of these vessel sizes have their own indices published by Baltic and four of them together forms the BDI. Their detailed calculations are followed respectively:

Baltic Capesize Index

The Capesize Index is calculated using a combination of the rates for each of the reported routes and multipliers as follow. Full route descriptions are shown in Appendix 2.

Table 11: Routes and Description of Routes for Baltic Capesize Index

Route	**Description**	**Weighting (on 10 April 2014)**
C2	160,000 ore Tubarao/Rotterdam	5%
C3	160-170,000 ore Tubarao/Qingdao	15%
C4	150,000 coal Richards Bay/Rotterdam	5%
C5	160-170,000 W Aussie/Qingdao	15%
C7	150,000 coal Bolivar/Rotterdam	5%
C8_14	Trans Atlantic round voyage	5%
C9_14	ARA or Passero trip China-Japan (fronthaul)	7,5%
C10_14	Pacific round voyage	15%
C14	China / Brazil round voyage	15%
C15	160,000 coal , Richards Bay/China	5%
C16	Qingdao-Beilun trip UK-Cont-Med 65 days	7,5%

Table 12: Capesize 2014 Calculation Detail

Route	**Multiplier**	**Route Value**	**Index Contribution**
C2	10.276695630	7.572000000	77.815139310
C3	14.474995240	19.118000000	276.732958998
C4	10.178191930	7.985000000	81.272862561
C5	34.242287860	7.450000000	255.105044557
C7	10.096625310	9.140000000	92.283155333
C8_14	6.567770448	12.955000000	85.085466154
C9_14	0.011232800	11430	128.390904000
C10_14	0.005011588	25955	130.075766540
C14	0.019386696	11468	222.326629728
C15	0.020572868	11668	240.044223824
C16	0.087405223	-1814	-158.553074522
Sum			**1430.579076484**
Index			1430.579076484
Rounded Index			**1431**

Baltic Panamax Index

The Panamax Index is calculated using a combination of the rates for each of the reported routes and multipliers as follow. Full descriptions of the routes are shown in Appendix 2.

Table 13: Routes and Description of Routes for Baltic Panamax Index

Route	**Description**	**Weighting (on 10 April 2014)**
P1A_03	Trans Atlantic round voyage	25%
P2A_03	Continent-Mediterranean trip to China-Japan	25%
P3A_03	Trans Pacific round voyage	25%
P4_03	China-Japan trip to Continent-Mediterranean	25%

Table 14: Panamax 2014 Calculation Detail

Route	Multiplier	Route Value	Index Contribution
P1A_03	0.032280358	17308.000000000	558.708436264
P2A_03	0.031407559	24446.000000000	767.789187314
P3A_03	0.030123107	11303.000000000	340.481478421
P4_03	0.029755057	1923.000000000	57.218974611
Sum			**1724.198076610**
Index			1724.198076610
Rounded Index			**1724**

Baltıc Supramax Index

The Supramax Timecharter Average is calculated as a weighted average of the rates for each of the reported routes as follows. Full descriptions of the routes are shown in Appendix 2.

Table 15: Routes and Description of Routes for Baltic Supramax Index

Route	Description	Weighting (on 10 April 2014)
S1A	Continent trip Singapore-Japan inc China	12.5%
S1B	Black Sea trip Singapore-Japan inc China	12.5%
S2	Trans Pacific round voyage	25%
S3	South Korea-Japan trip Europe	25%
S4A	US Gulf trip Europe	12.5%
S4B	Europe trip US Gulf	12.5%

Table 16: Supramax 2014 Calculation Detail

Route	Multiplier	Route Value	Index Contribution
S1A	0.125000000	21529.000000000	2691.125000000
S1B	0.125000000	19667.000000000	2458.375000000
S2	0.250000000	7763.000000000	1940.750000000
S3	0.250000000	4458.000000000	1114.500000000
S4A	0.125000000	29688.000000000	3711.000000000
S4B	0.125000000	8306.000000000	1038.250000000
Sum			**12954.000000000**
Index			1238.882578872
Rounded Index			**1239**

Baltic Handysize Index

The Handysize Index is calculated as a weighted average of the rates for each of the reported routes as follows, with the weightings as shown. Full descriptions of the routes are shown in Appendix 2.

Table 17: Routes and Description of Routes for Baltic Handysize Index

Route	Description	Weighting (on 10 April 2014)
HS1	Europe trip east coast South America	12.5%
HS2	Europe trip east coast North America	12.5%
HS3	East coast South America trip Europe	12.5%
HS4	US Gulf trip Europe	12.5%
HS5	South East Asia, trip via Australia to Singapore/Japan inc China	25%
HS6	South Korea/Japan trip via north Pacific to Singapore/Japan inc China	25%

Table 18: Handysize 2014 Calculation Detail

Route	Multiplier	Route Value	Index Contribution
HS1	0.011479686	9825.000000000	112.787914950
HS2	0.009901618	8000.000000000	79.212944000
HS3	0.006995497	15025.000000000	105.107342425
HS4	0.009772844	19936.000000000	194.831417984
HS5	0.015174507	8378.000000000	27.132019646
HS6	0.015899136	8256.000000000	131.263266816
Sum			**750.334905821**
Index			**750.334905821**
Rounded Index			**750**

2.2.2. Istanbul Freight Index

Istanbul Freight Index (shortly ISTFIX) started operations on 1st of July, 2008 and since have been publishing weekly.

Consisting of statistics and data gathered from various resources, ISTFIX's main aim to provide information about the direction, quantity and routes of the trade in Mediterranean and Black Sea regions.

Vessels analyzed are coaster dry bulk and general cargo vessels sized between 2000 and 12000 DWT, and the routes are as follows:

- Black Sea – Marmara Region
- Black Sea – Eastern Mediterranean Region
- Black Sea – Central Mediterranean Region
- Black Sea – Western Mediterranean Region
- Black Sea – Continent Region

Tonnage of the vessels are also as follows:

- 2000 – 4000 DWT

- 4000 – 6000 DWT
- 6000 – 8000 DWT
- 8000 – 12000 DWT

Services provided by ISTFIX include weekly reports, annual reports, ship building and scrapping reports, weekly oil price updates, market reports, sale and purchase reports (www.istfix.com)

CHAPTER 3

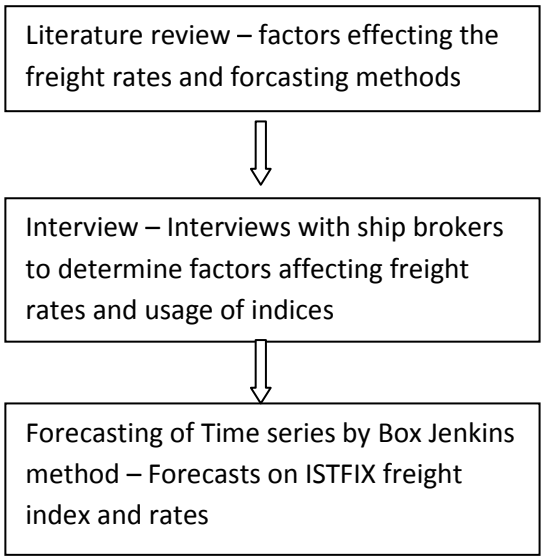
PRICE AND PRICE INDICES IN MARITIME TRANSPORT SERVICES: A RESEARCH ON DRY BULK SHIPPING AND APPLICATIONS IN TURKEY

3.1. AIM OF THE STUDY

The aim of this study is to analyze the example of freight indices in Turkey and how the freight rates mold, by which factors, to form them. The study was carried out by interviewing experts of the field and applying time series analysis on weekly data from ISTFIX dating back to 01.01.2008. The method and model of the study, the sample of the study are given in order and in the last part facts and findings are evaluated and the conclusion is given.

3.2. METHODOLOGY OF THE STUDY

In this study three methods have been used, which are shown below in an order. Each method is explained below its related title.



3.3. FINDINGS AND EVALUATION

In this part of the study, findings of the above mentioned research methods applied on the related subjects are presented in the following titles.

3.3.1. Literature Review On Factors Affecting Freight Rates

After analyzing the following articles and books, the found factors for factors affecting freight rates provided an insight and a ground for the preperation of the interview form.

Table 19: Litareture Review for Factors Affecting Freight Rates

Authors	Name of the article/book	Determinants
Alizedh, A.H., Talley, W.K. (2011)	Microeconomic determinants of dry bulk shipping freight rates and contract times	World economy, international seaborne trade, changes in shipping fleet(delivery of new ships, scrapping of old ones), ship characteristics(size and age), the route of employment of the vessel, terms of the charter contract(cargo size, loading date)
De Oliveira, G. F. (2014)	Determinants of European freight rates: The role of market power and trade imbalance	Transport costs, level of competition, port efficiency, service quality
Lun et al. (2010)	Shipping and Logistics Management	Government and political factors, world economy, seaborne commodity trade, average haul, transport costs
Slack, B., Gouvernal, E. (2011)	Container freight rates and the role of surcharges	Importance of the customer
Alizedh, A.H., Talley, W.K. (2011)	Vessel and voyage determinants of tanker freight rates and contract times	World economy, ship characteristics(size and age), the route of employment of the vessel, terms of the charter contract(cargo size, loading date)
McConville, J. (1999)	Economics Of Maritime Transport	Suuply and Demand Functions of shipping market, competition
Stopford, M. (1997)	Maritime Economics	World economy, seaborne trade, average haul, political events, transport costs, world fleet, shipbuilding production, scrapping

3.3.2. Interviews

The interview is a short-term, secondary social interaction between two strangers with the explicit purpose of one person's obtaining specific information from the other. Information is obtained in a structured conversation in which the interviewer asks prearranged questions and records answers, and the respondent answers (Neuman, 2006: 305).

There are many different types of interviews as well as interview methods and techniques. Based on the structure type, interviews can be categorized into 3 as structured, unstructured and semi structured.

Structured interviews are collections of specific and precisely formulated questions which are asked of a respondent by an interviewer. In the unstructured interviews, the researcher interviews in a very informal way, allowing respondents consider able latitude in what they say. There may not even be pre-formulated series of questions (Bryman, 2005: 23).

According to Berg (2000) semi-structured interview is a type of interview which involves the implementation of a number of predetermined questions and/or special topics. In this form of interview the questions are typically asked of interviewee in a systematic and consistent order, but the interviewers can change the direction of the conversation and come up with different point of views.

The fact that semi-structured interviews allow the participants the freedom to voice their views in their own terms, this structure type has been found as the most appropriate type for this study.

In this part of the study, fourteen shipbrokers had been interviewed by conducting semi-structured interviews. The interviews are carried out on several dates between September 2014 and June 2015 via phone and face to face. Profile of the participants are shown in Table 20.

Table 20: Profile of the Participants

Broker Type	Position	Experience (years)	Educational Degree
In-House/Shipowner	Chief of Chartering	14	Bachelor's
In-House/Shipowner	Chartering Broker	7	Bachelor's
In-House/Shipowner	Chartering Broker	15	Master's
In-House/Charterer	Chartering Executive	10	Bachelor's
In-House/Shipowner	Chartering and Operations Manager	20	Bachelor's
Competitive	Chartering Manager	24	Master's
Competitive	Chartering Broker	20	Bachelor's
Competitive	Chartering Manager/Partner	23	Master's
Competitive	Branch Manager – Chartering Manager	10	Bachelor's
Competitive	Chartering Manager	20	Bachelor's
Competitive	Chartering Broker	14	Master's
Competitive	Chartering Broker	20	Bachelor's
Competitive	Chartering Broker	13	Bachelor's
Competitive	Chartering Broker	8	Bachelor's

Profile of the companies represented by the participants are shown in the below table.

Table 21: Profile of the Companies

Number of Personnel		Location	Establishment Year
Office	Port/vessel		
600	5	Istanbul	1980
15	-/100	Istanbul	1990
13	-	Istanbul	2012
25	-	Izmir	1981
7	-	Izmir–Istanbul-Mersin	2003
2	-	Istanbul	2013
10	2	Istanbul	2012
12	3	Izmir	2010
1	-	Istanbul	2014
57	21/70	Izmir	1989
18	7	İstanbul	1999
5	-	İzmir	1996
Undisclsoed			
Undisclosed			

Fourteen participants interviewed for this study are all shipbrokers; of whom, 4 are in-house brokers for shipowning companies and one for an exporting company,

while the rest are independent shipbrokers. Answers gathered are analyzed with frequency analysis.

Participants were firstly asked to list "factors affecting the freight rates". Table below shows the frequency of the each given answer.

Table 22: Factors Affecting Freight Rates

Factors affecting freight	Frequency	Percentage
Global Trade	9	64.2%
Oil Prices	8	57.1%
Ship Supply and Demand	7	50%
Port and Canal Fees	6	42.8%
War, Piracy and Political factors	5	35.8%
Cargo Quantity and Type	5	35.8%
Running Costs	4	28.5%
Seasonality	4	28.5%
Port's Specifications	4	28.5%
Regional Factors (Trade – weather – economics)	3	21.4%
Loading/Discharging Rate	3	21.4%
Voyage Time and Cost	3	21.4%
Newbuilding	1	7.1%
Competition	1	7.1%

Secondly, participants were asked *"Does oil prices affect freight rates, if so, how?"* This question was answered in a general consensus on *"Yes"* while some participants elaborated on the matter with additional statements. One participant adds *"the effect of oil prices on freight made oil consumption in vessels a very important aspect"* and another participant words *"the importance of oil prices rises as the voyage takes longer and vessel spend more time at sea, which increases the consumption"*. Two other participants have more mild thoughts on the matter, one saying *"in low price bands, oil prices has no direct effect on freight and sudden drops of the oil prices do not mirror the same as the sudden spikes"* while the other

caps the matter with saying *“even the oil prices rise, if there is no demand in the market, the freight can not be raised”*

Third question that was asked to the participants was *“Does port fees and canal-strait dues affect freight rates, if so, how?”* Eight of the participants said straight forwardly that port and canal fees have considerable effect on freight rates, while two claimed as *"these costs are constants in a voyage estimation, on a competitive aspect these costs would not make a difference",* similarly one other participant weighed in on the matter noting *"in low freight levels such as today's, these costs have minimal effect on freight rates".* Remaining two participants answered similarly; one responded as *"canal (Suez Canal in particular)fees have a huge impact but the port charges depends on the port of call"* the other participant's response, almost mirroring the one before was *"Canal fees have a big impact, but the port charges' effect depend on how high is the cost"*

In the fourth question, participants had various answers and some important anecdotes. when asked *“Does running costs affect freight rates, if so, how?”* Two participants replied with a conditional yes, the condition being a ideal market, both added "*in today's market running costs would not affect freight rates*". While four participants labeled running costs as an important tool for competition, two participants made statements that complement each other with one saying *"high running costs lower the competitiveness"* and the other saying *"in order to compete, running cost savings are crucial".* Four participants settled with a straight forward *"yes"* where one participant noted *"if ship-owners do not operate even in a condition where they can't break even, their vessels will be laid up, in this market conditions."* One of the participants answered on a different line, saying "it has an effect on freight but that effect is minimal in comparison with the other factors" The remaining two participants opposed the rest with the statement *"as it is a constant cost it is almost affectless".*

Next question that was asked to the participants was *"Do you use freight indices?"* Answers given to this question are shown in the below table.

Table 23: Usage of Freight Indices

Usage of Freight Indices	Frequency	Percentage
Yes	8	57.1%
Just to keep updated	3	21.4%
No	2	14.3%
I do my own calculations	1	7.1%

Following up to that question, participants were asked *"Which freight indices do you use?"* Among the ones who answered that they used freight indices to the previous question, the given answers and the number of times they were given are shown in the table below.

Table 24: Freight Indices Used by Participants

Freight Indices Used by Participants	Frequency	Percentage
Just Baltic Dry Index	10	71.4%
Just ISTFIX	1	7.1%
Baltic and ISTFIX	1	7.1%

When asked why they do not prefer ISTFIX, the participants who do not use that index answered very similarly, stating, as coaster shipping deals with smaller tonnage, it is easier and more trustworthy to handle this market on a daily fixture-to-fixture basis and they gather their information from their own inner circle of fellow brokers who are experienced in the subject region.

In the seventh question participants were asked *"Which aspects of the indices do you use?"* Among the ones who answered that they used freight indices to the previous question, the given answers and the number of times they were given are shown in the table below.

Table 25: Properties of Freight Indices Used by Participants

Properties of Freight Indices Used by Participants	Frequency	Percentage
Index Numbers	8	57.1%
T/C Rates	7	50%
Market Reports	4	28.5%
Daily Fixtures	3	21.4%
Sale & Purchase Reports	2	14.3%

One participant that uses only Baltic Dry Index added to his answer the statement *"It is known that sale and purchase numbers includes false information and not to be trusted"*.

The next question asked was *"Which market reports do you use except the ones published by Baltic and ISTFIX?"* Four of the participants stated they do not use market reports besides these two, while one of them stated he does not use market reports at all. Rest of the answers given and the number of times they were given are shown in the table below.

Table 26: Market Reports Used by Participants

Market Reports Used by Participants	Frequency	Percentage
Market reports published by broker houses worldwide (Clarksons-SSY-Maersk-Fearnleys etc.)	3	21.4%
BMTI	2	14.3%
Platou	1	7.1%
Trade winds	1	7.1%
Rufco	1	7.1%
Nitro Shipping	1	7.1%

In the ninth question participants were asked *"Which aspects of the market reports do you use?"* Among the ones who answered that they used market reports to the previous question, the given answers and the number of times they were given are shown in the table below.

Table 27: Properties of Market Reports Used by Participants

Properties of Market Reports Used by Participants	**Frequency**	**Percentage**
Freight levels	3	21.4%
Sale and purchase reports	3	21.4%
Cargo types, movements and comments	3	21.4%
Demolition reports	3	21.4%
Global and regional trade and trends	3	21.4%
Newbuilding orders	3	21.4%
Oil prices and forecasts	3	21.4%
Market outlook and forecasts	1	7.1%

Participants were asked *"Does your company carry out freight forecasting, if not do you use the ones published?"* for the tenth question. Nine of the participants answered with a *"Yes"*. Out of those nine, only two participants *do not forecast themselves and used published forecasts*. Five of the participants answered with a *"No"* to the question. Among those who do not use forecasts, given reasons include *"The instability of today's economy prevents us from forecasting"* was the unanimous answer.

Following to that question, participants were asked *"Does the forecasts you use match with the actual market figures?"* Given answers to this question among the users of forecast are shown in the table below.

Table 28: The Matching of Forecasts and Actual Figures

The Matching of Forecasts and Actual Figures	Frequency	Percentage
Always	4	28.5%
Usually	3	21.4%
Sometimes	2	14.3%

In the final question, participants were *asked "How far a forecast could be made without losing its trustworthiness?"* Given answers to this question among the users of forecast are shown in the table below.

Table 29: Maximum Length a Forecast Should Be Made

Maximum Length a Forecast Should Be Made	Frequency	Percentage
Maximum of 1 month	2	14.3%
Maximum of 2-3 months	4	28.5%
Maximum of 3-6 months	1	7.1%

One participant answered *"Forecast might be done for 5 years, 3 years, 1 year, seasonal and 1 month periods depending on the action to be taken using the information provided by them"*

3.3.3. Forecasting

Time series analysis have an important place in statistical forecasting techniques. These techniques that depend on the data achieved form past happenings are used in many fields that require short or middle term forecasts (Horasan, 2011: 57). Time series are series that show the observation results of the same variable over a specific period (Türkbal, 1981: 208)

ARIMA (autoregressive integrated moving average) method, which is also called Box-Jenkins method explains time series with only its own past values and probable error terms, and is an atheoric method (Yalta, 2011: 3).

Most of the time series that can be encountered on daily life are known to be non-stationary (Akgül, 1994: 53). For series that are, by their nature, non-stationary, the regular difference method could be used to make those series stationary, this is called the ARIMA process. With "d" being the difference taken in order to make the series stationary, the process can be shown as ARIMA(p,d,q) (Güler, 1990: 84)

In the process of deciding the method to be used for this forecasting, following literature were reviewed:

Table 30: Literature Review for Freight Forecasting

Author/s	Published In	Title	Research Model/Method
Ching-Chih Chang, Chin et al. (2012)	Applied Economics Letters	A predictive model of the freight rate of the international market in Capesize dry bulk carriers	ARIMA
Okan Duru et al.(2010)	The Asian Journal of Shipping and Economics	Bivariate Long Term Fuzzy Time Series Forecasting of Dry Cargo Freight Rates	bivariate long term fuzzy interference system for time series
Emrah Bulut (2014)	Expert Systems with Applications	Modeling seasonality using the fuzzy integrated logical forecasting (FILF) approach	fuzzy integrated logical forecasting
Okan Duru et al. (2012)	Expert Systems with Applications	A fuzzy extended DELPHI method for adjustment of statistical time series prediction: An empirical study on dry bulk freight market case	Time series-DELPHI
Okan Duru (2010)	Expert Systems with Applications	A fuzzy integrated logical forecasting model for dry bulk shipping index forecasting: An improved fuzzy time series approach	Fuzzy time series

Table 30: Literature Review for Freight Forecasting (Continued)

Author/s	Published In	Title	Research Model/Method
Okan Duru (2012)	Expert Systems with Applications	A multivariate model of fuzzy integrated logical forecasting method (M-FILF) and multiplicative time series clustering: A model of time-varying volatility for dry cargo freight market	Fuzzy time series
Okan Duru & Shigeru Yoshida (2009)	The Asian Journal of Shipping and Economics	Judgmental Forecasting in the Dry Bulk Shipping Business: Statistical vs. Judgmental Approach	ARIMA-TRAMO/SEATS
Roy Batchelor et al. (2007)	International Journal of Forecasting	Forecasting spot and forward prices in the international freight market	VECM-ARIMA-VAR
Albert Wıllem Veenstra & Phılıp Hans Franses (1997)	Transportation Research Part A: Policy and Practice	A co-integration approach to forecasting freight rates in the dry bulk shipping sector	VAR
Yang Zhongzhen et al. (2011)	Journal Of Transportatıon Systems Engıneerıng And Informatıon Technology	Forecasting Baltic Panamax Index with Support Vector Machine	Support vector machine

3.3.3.1. Forecasting of Istanbul Freight Index

The data set which the time series analysis will be applied includes weekly data for the period between 05.01.2009 and 27.04.2015. For each data set, there are 380 single data. Some of the acquired data before the 2009 period has been left out from the analysis as they are not recent data and their different behaviour can affect the forecasting negatively. Modeling of the series is done by Box-Jenkins and exponential smoothing methods. In order to make the model work, the series have to be stationary. Firstly the data had been made stationary, then the best model for the series had been specified and the possible future values had been forecasted.

Figure 6 shows the general outlook of the series.

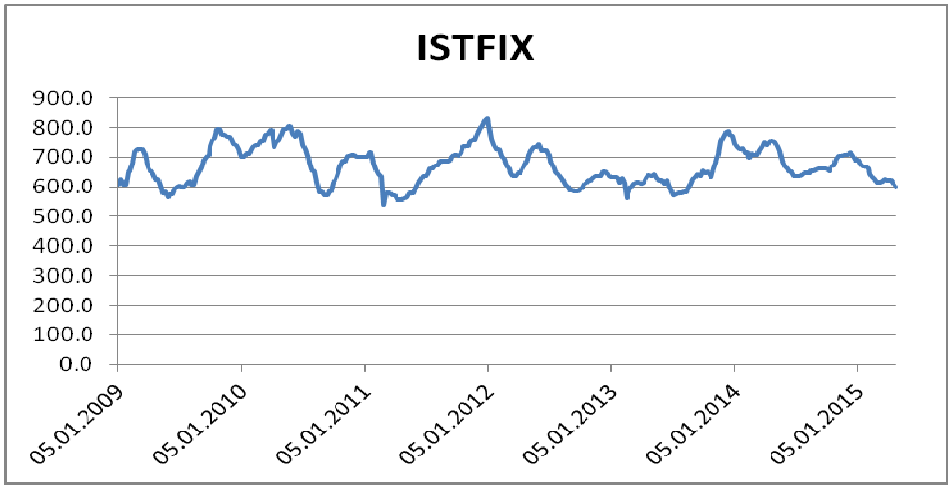


Figure 6: January 5th 2009 - April 27th 2015 Time Series Graph

When looked at the graph listed by the time index, it can be seen that there are no specific seasonality or trend. The fact that there are no widening or narrowing in the course of the series shows that, there are no state of heterogeneity of variance.

In order to make the modeling work, the data should show a stable distribution over a stable average. The analysis of the original data set shows that the data is not stationary. To achieve this stationary data, regular difference method had been used.

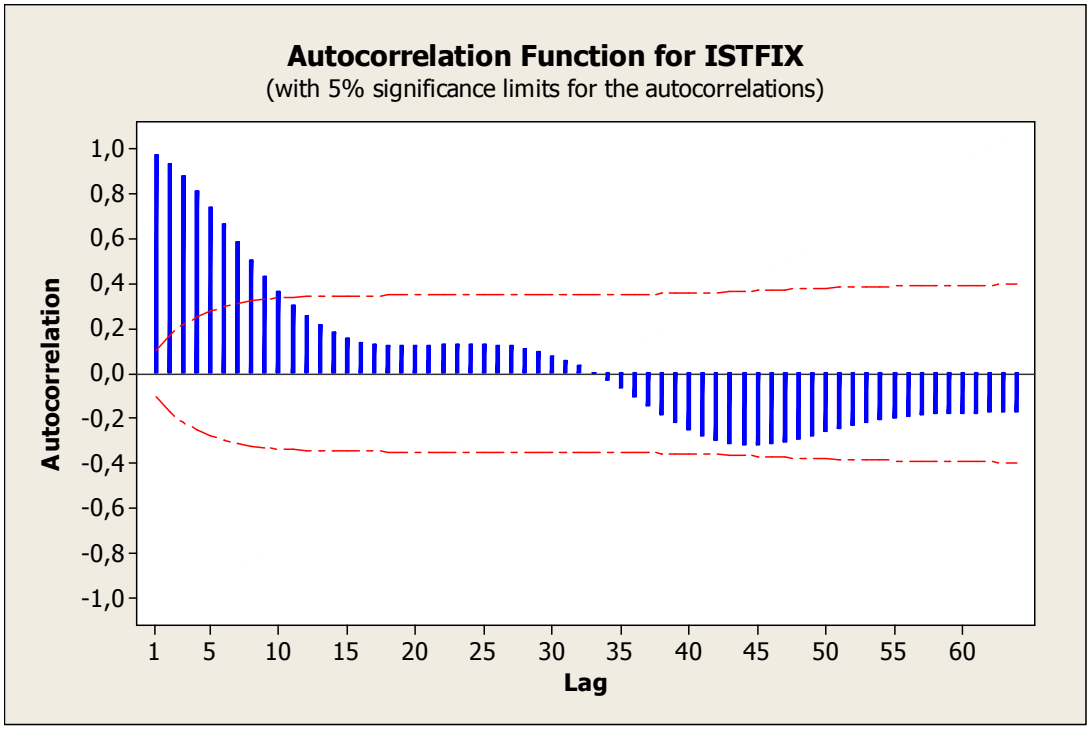


Figure 7: Autocorrelation Graph for the Original Data

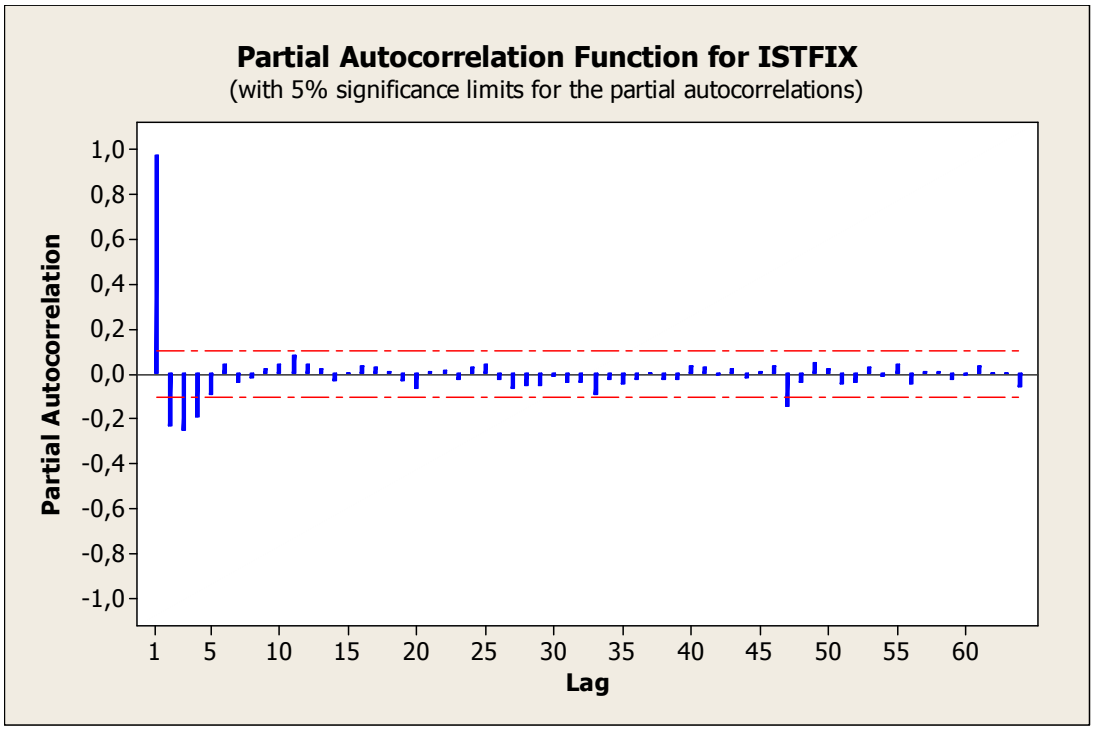


Figure 8: Partial Autocorrelation Graph for the Original Data

When the autocorrelation and partial autocorrelation graph for the original data is analyzed, the fact that the lag between different points of time not approaching zero shows that the data set is not stationary.

In order to make this data set stationary, regular difference method was used and difference had been set as 2. After this process, series appeared to have a stable distribution over a stable average and had achieved stationary status as seen on Figure 9.

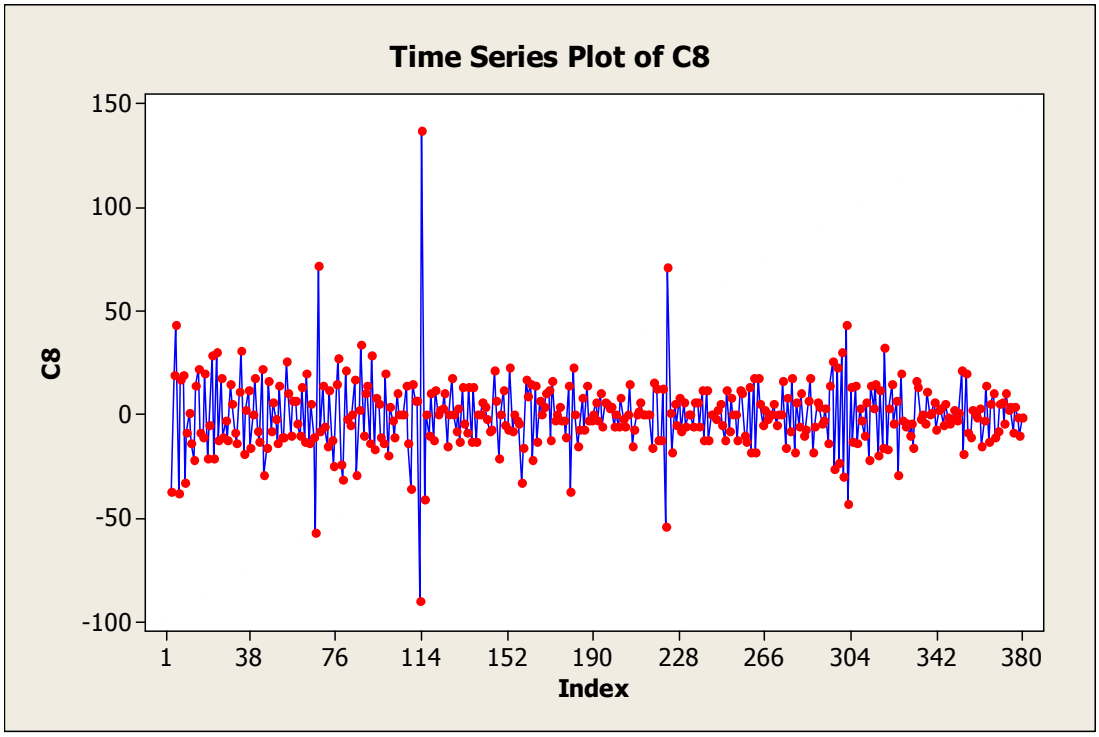


Figure 9: Stationary Data Set

Modeling

In this phase of the analysis, the aim is to find the appropriate model for the data set that complies with the stationary hypothesis. For this purpose, the autocorrelation function and partial autocorrelation function of the series are used. SAC (sample autocorrelation function) and SPAC (sample partial autocorrelation function) functions prove to be useful for finding the appropriate model and to define the time series.

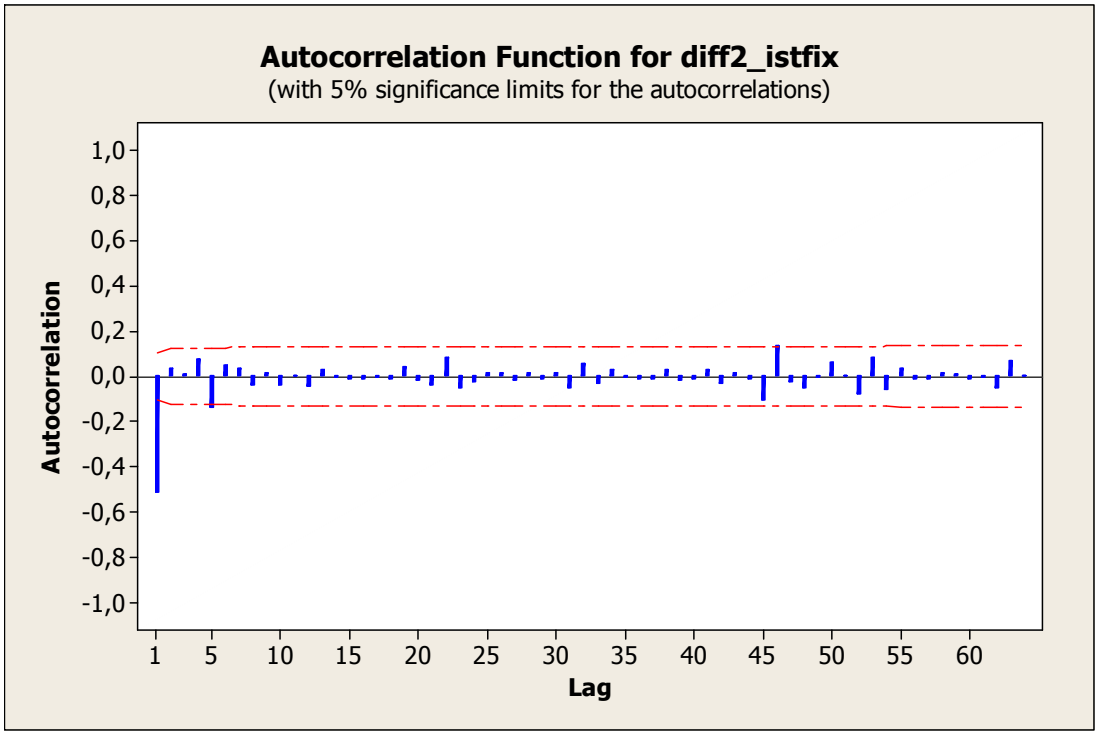


Figure 10: Autocorrelation Graph for the Stationary Series

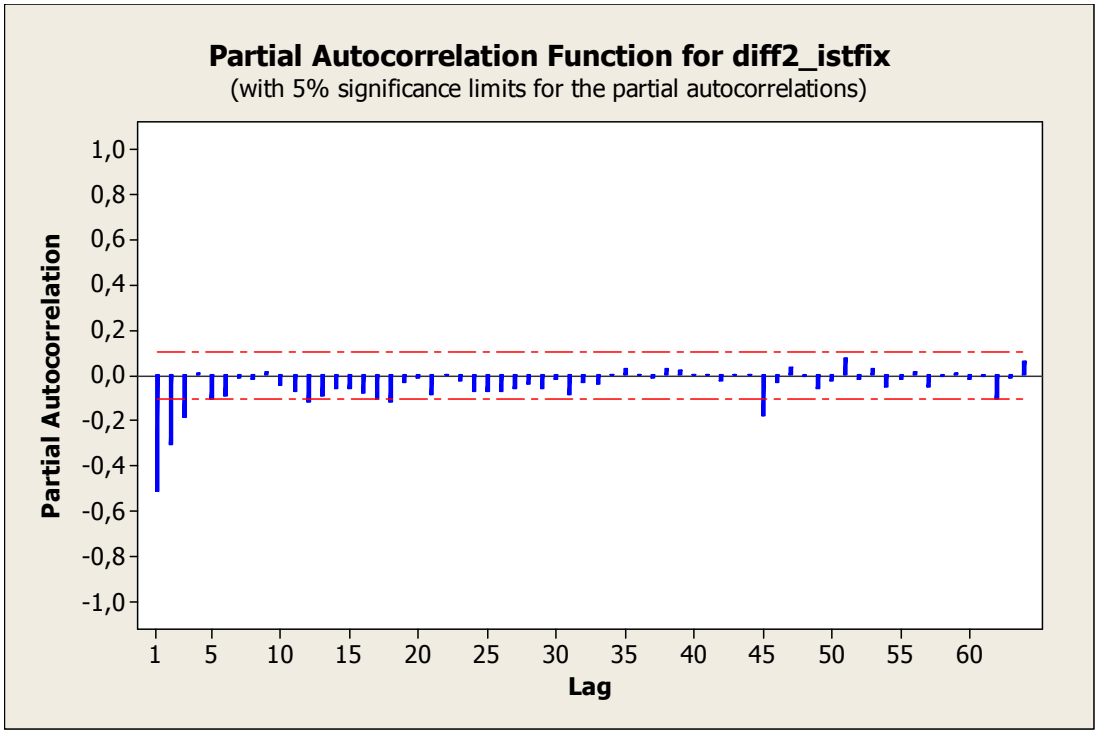


Figure 11: Partial Autocorrelation Graph for the Stationary Series

After making the time series data set stationary, it is decided which model should be used by the help of SAC and SPAC functions.

In this decision point, Box-Jenkins model is specified by the behaviours of SAC and SPAC functions. It is observed that the SAC graph is cut off (approached zero fast) after the first lag and the SPAC graph approached zero after the third lag. In light of this information, the model is chosen as ARIMA(3,2,1).

Evaluation of the Model

A standart ARIMA(p,d,q) model can be described as below:

$$z_t = \delta + \phi_1 z_{t-1} + \phi_2 z_{t-2} + \ldots + \phi_p z_{t-p} + a_t - \theta_1 a_{t-1} - \ldots - \theta_q a_{t-q}$$

Let Z_t be a series with the regular difference set as 2, the model appropriate for the time series can be shown as below:

$$z_t = \delta + \phi_1 z_{t-1} + \phi_2 z_{t-2} + \phi_p z_{t-3} + a_t - \theta_1 a_{t-1}$$

First the model parameters' significance will be tested and the decision to whether the constant term (δ) would be included in the model or not will be made. Model parameters and the hypothesis for the constant term can be stated as below:

$H_0 : \theta_1 = 0$ $\quad$ $H_0 : \phi_i = 0$ $\quad$ $H_0 : \delta = 0$

$H_1 : \theta_1 \neq 0$ $\quad$ $H_1 : \phi_i \neq 0$ $\quad$ $H_1 : \delta \neq 0$

Type	**Coef**	**SE Coef**	**T**	**P**
AR 1	-0,7318	0,0507	-14,43	0,000
AR 2	-0,4365	0,0591	-7,38	0,000
AR 3	-0,1853	0,0507	-3,65	0,000
MA 1	-0,2234	0,2623	-0,85	0,395
Constant	-0,0938	0,8780	-0,11	0,915

As seen above, the constant term and the MA(1) term are deemed insignificant and thus they were left out from the model. The rest of the model parameters were found highly significant.

The results and hypothesis for the model sufficiency analysis are as below. In order for the model to be deemed sufficient, the model should prove sufficient for each and every lag in the below table.

H_0 : The model is significant.

H_1 : The model is insignificant.

Modified Box-Pierce (Ljung-Box) Chi-Square statistic:

Lag	12	24	36	48
Chi-Square	18,6	25,9	30,8	47,3
DF	7	19	31	43
P-Value	**0,074**	**0,211**	**0,581**	**0,378**

According to the results of Minitab Application; the hypothesis formed for the sufficiency of the model was not denied for any of the lags, thus proving the model sufficient.

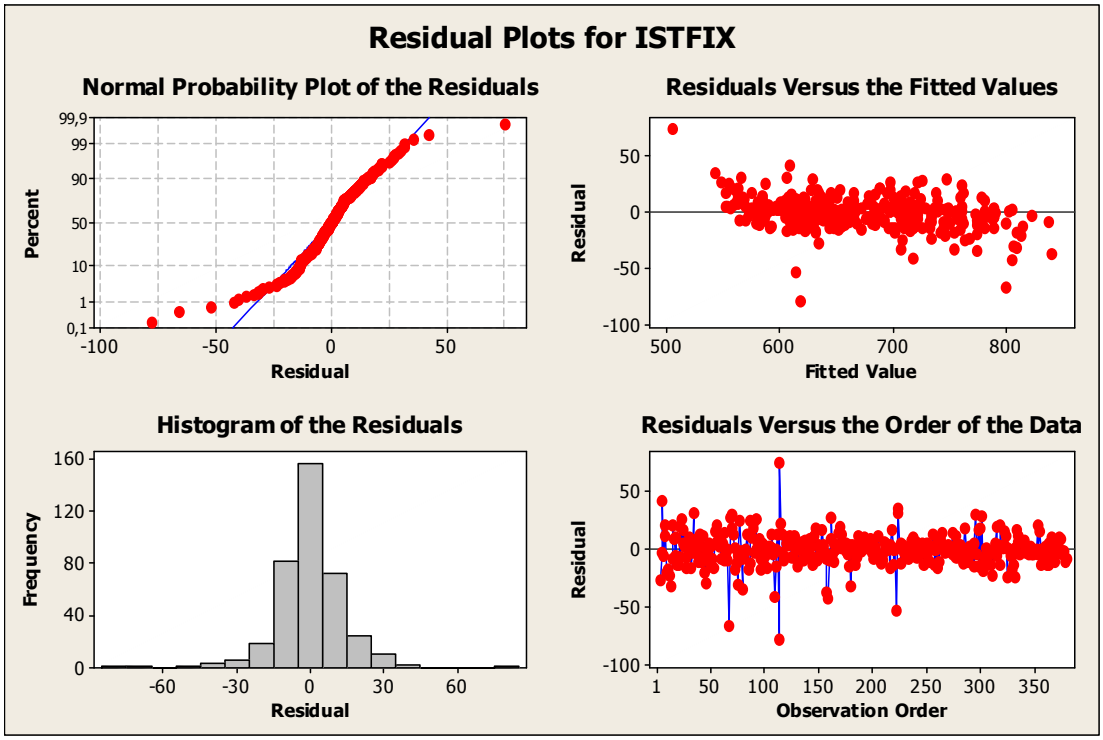


Figure 12: Residual Plots for ISTFIX Data Set

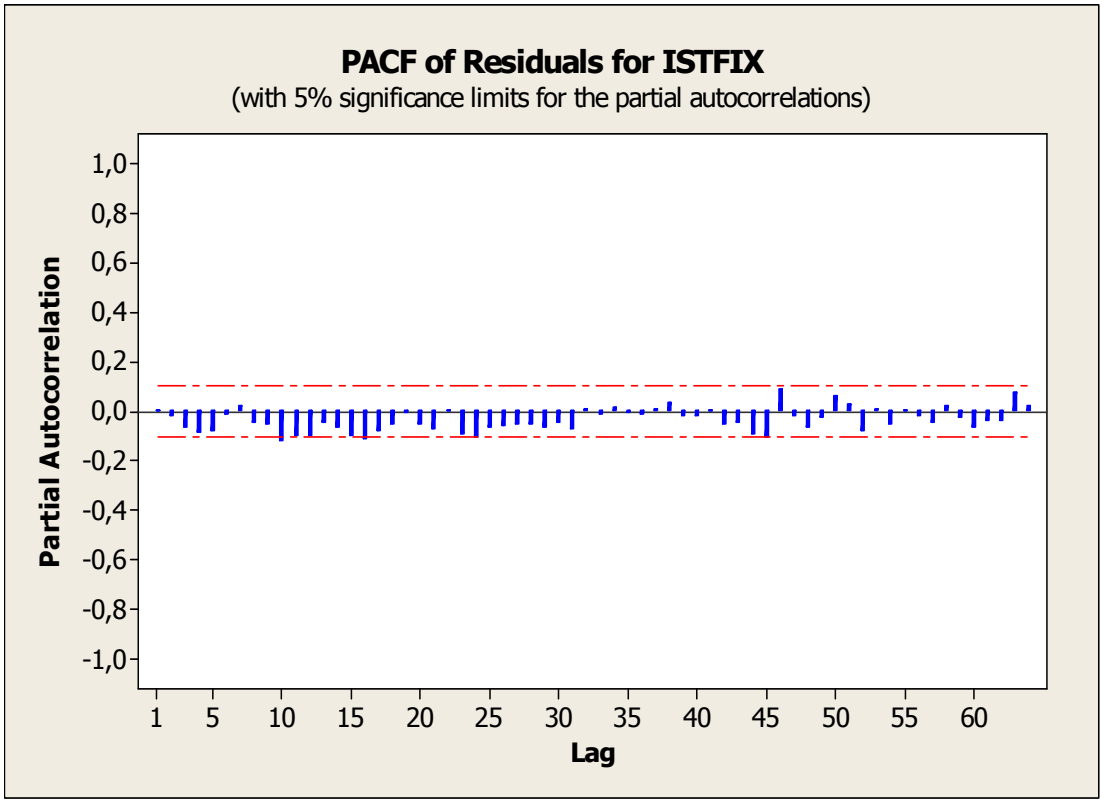


Figure 13: Partial Autocorrelation Function of Residuals for ISTFIX Data Set

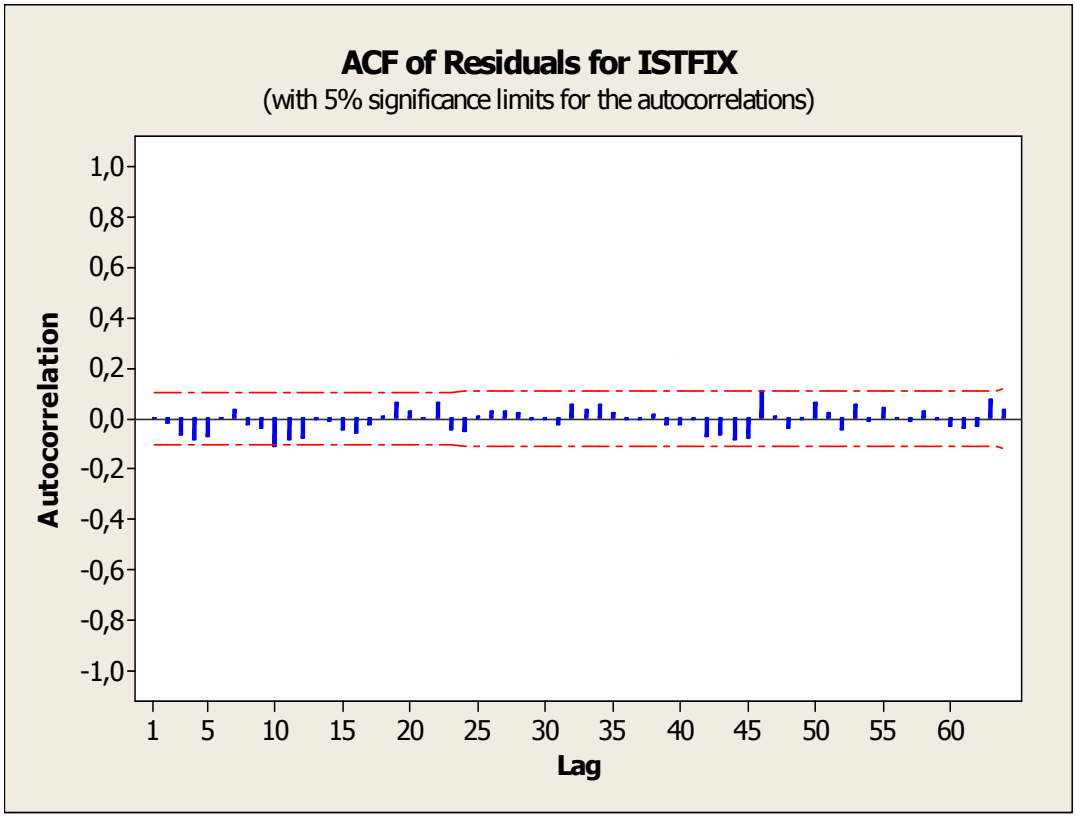


Figure 14: Autocorrelation Function of Residuals for ISTFIX Data Set

It is shown that the model is sufficient according to the Ljung-Box statistics. In addition to this, the random error term hypotheses should also be met. The graph above shows the hypotheses of the errors are met.

Forecasting

The forecasting of the series was done by the use of the parameters and past values of the series. Suggested model forecasted these data with a maximum of 2.3% error. The following entries, of which each one representing a week, were forecasted with a maximum of 5% error and shown in the table as follows:

Table 31: Forecasting Results for Istfix Data Set

Period	Lower	Forecast	Upper	Actual	%Error
23.03.2015	587,72	**615,07**	642,42	**624,00**	1.4
30.03.2015	568,70	**613,05**	657,40	**621,00**	1.3
06.04.2015	549,03	**612,44**	675,85	**622,00**	1.6
13.04.2015	525,38	**611,10**	696,83	**622,00**	1.8
20.04.2015	497,68	**609,31**	720,94	**612,00**	0.5
27.04.2015	469,36	**607,93**	746,49	**601,00**	1.2
04.05.2015	438,85	**606,51**	774,17	**599,00**	1.2
11.05.2015	406,23	**604,91**	803,58	**599,00**	1
18.05.2015	371,87	**603,30**	834,74	**589,00**	2.3
25.05.2015	336,01	**601,72**	867,43	**589,00**	2
01.06.2015	298,47	**600,07**	901,68	**589,00**	1.8
08.06.2015	259,40	**598,38**	937,36	**597,00**	0.1
15.06.2015	218,89	**596,67**	974,45	**588,00**	1.3
22.06.2015	176,97	**594,93**	1012,88	**584,00**	1.7
29.06.2015	133,67	**593,14**	1052,62	**584,00**	1.5
06.07.2015	106,00	**592,64**	1079,29		

Modeling Of The Series According To Tonnage

Figure 15 shows the general outlook of the series.

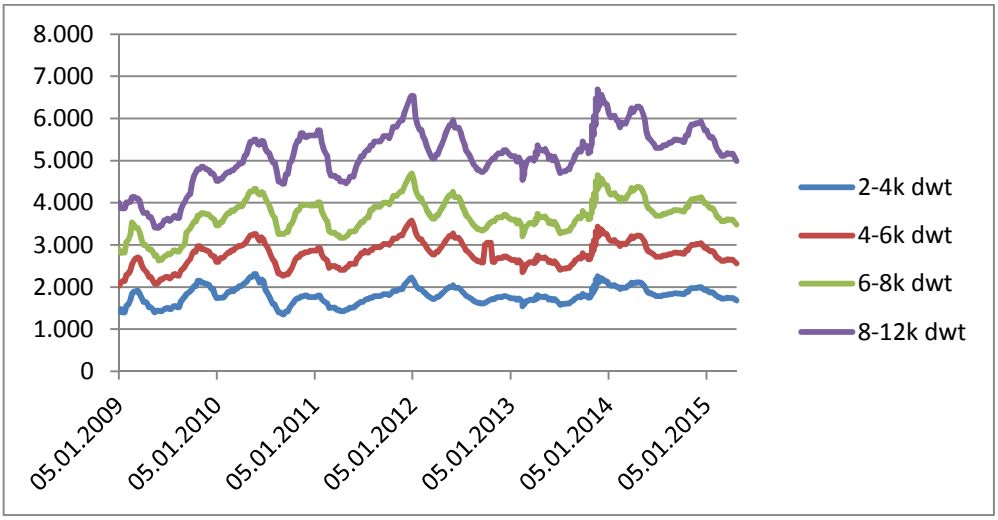


Figure 15: January 5th 2009 – April 27th 2015 Time Series Graph

As it is the case for the first set of data which is index points for ISTFIX, it is the same for the following data, when looked at the graph listed by the time index, it can be seen that there are no specific seasonality or trend. The fact that there are no widening or narrowing in the course of the series shows that, there are no state of heterogeneity of variance.

In order to make the modeling work, the data should show a stable distribution over a stable average. The analysis of the original data set shows that the data is not stationary. To achieve this stationary data, regular difference method had been used as it was used in the first model for the ISTFIX data set.

2000-4000 Deadweight Tonnage

Original data set for 2000-4000 dwt sized vessels does not show a stationary nature, tables below show the autocorrelation and partial autocorrelation functions for this data set.

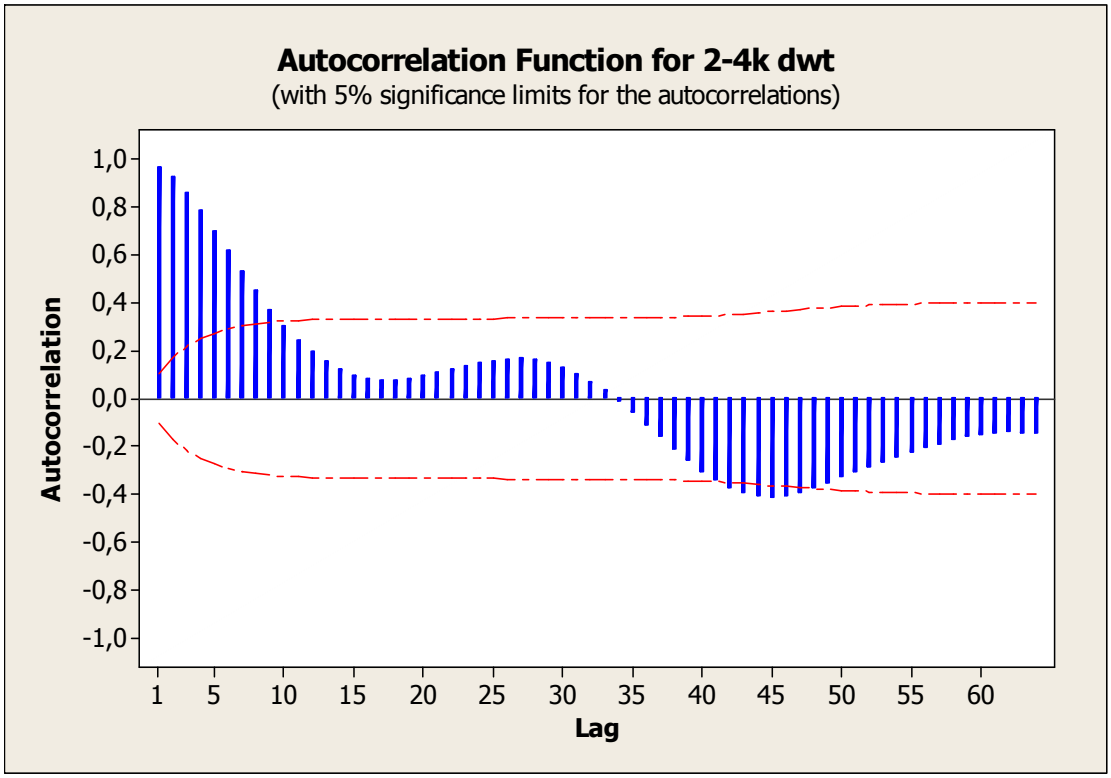


Figure 16: Autocorrelation Graph for the Original 2-4k Dwt Data Set

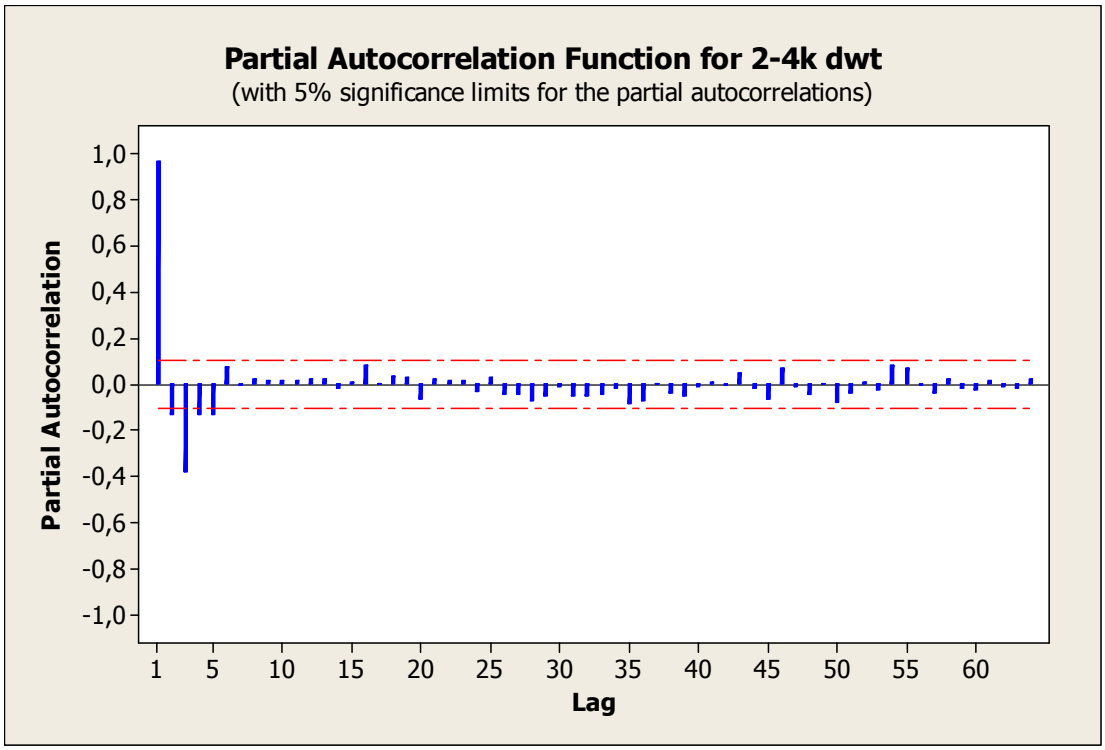


Figure 17: Partial Autocorrelation Graph for the Original 2-4k Dwt Data

When the autocorrelation and partial autocorrelation graph for the original data is analyzed, the fact that the lag between different points of time, approaching zero slowly shows that the data set is not stationary.

In order to make these data set stationary, regular difference method was used. After this process, series appeared to have a stable distribution over a stable average and had achieved stationary status as seen on Figure 18.

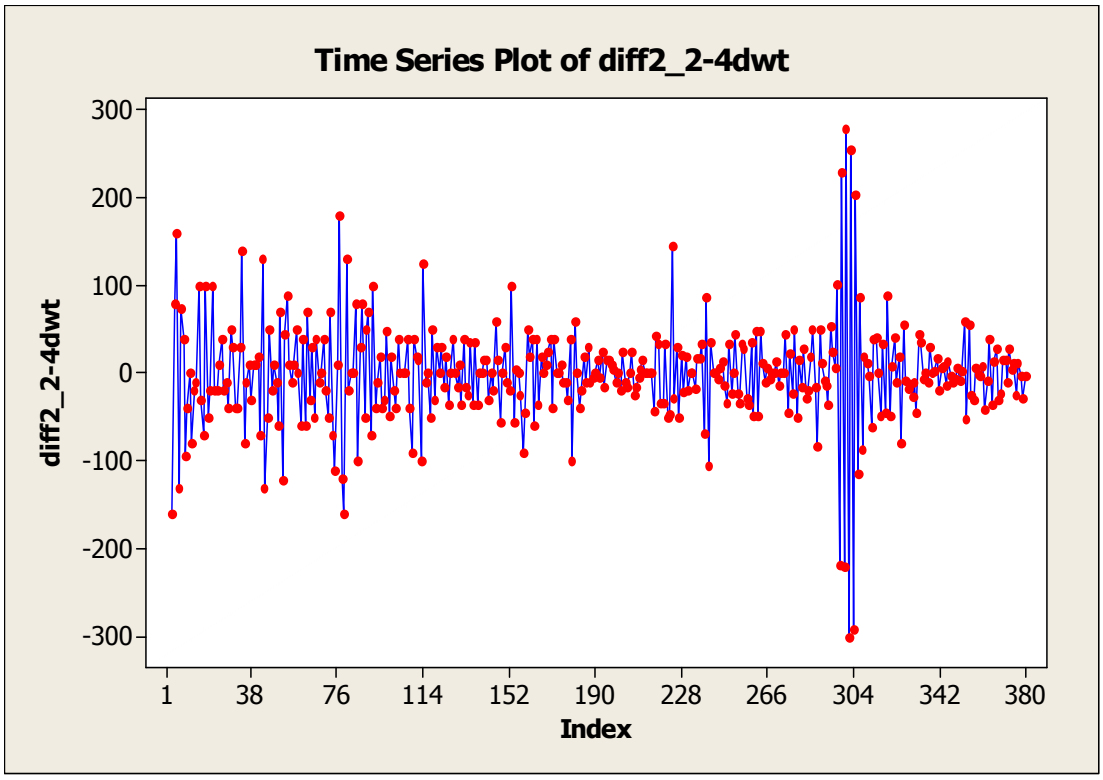


Figure 18: Stationary Data Set for 2-4k Dwt

Modeling

In this phase of the analysis, the aim is to find the appropriate model for the data set that complies with the stationary hypothesis. For this purpose, the autocorrelation function and partial autocorrelation function of the series are used for determining the appropriate model.

The behavior of SAC (sample autocorrelation function) and SPAC (sample partial autocorrelation function) functions prove Box-Jenkins model to be the appropriate model and to define the time series. The appropriate model for the freight values is as shown below.

ARIMA (3,2,1)

Let Z_t be a series with the regular difference set as 2, the model appropriate for the time series can be shown as below:

$$z_t = \phi_1 z_{t-1} + \phi_2 z_{t-2} + \phi_p z_{t-3} + a_t - \theta_1 a_{t-1}$$

Final Estimates of parameters:

Type	**Coef**	**SE Coef**	**T**	**P**
AR 1	-1,0974	0,1505	-7,29	0,000
AR 2	-0,6386	0,1205	-5,30	0,000
AR 3	-0,3419	0,0515	-6,63	0,000
MA 1	-0,3024	0,1592	-1,90	0,038

The results and hypothesis for the model sufficiency analysis are as below. In order for the model to be deemed sufficient, the model should prove sufficient for each and every lag in the below table.

H_0 : The model is significant.

H_1 : The model is insignificant.

Modified Box-Pierce (Ljung-Box) Chi-Square statistic:

Lag	12	24	36	48
Chi-Square	15,3	21,5	33,2	48,2
DF	8	20	32	44
P-Value	**0,054**	**0,369**	**0,409**	**0,308**

According to the results of Minitab Application; the hypothesis formed for the sufficiency of the model was not denied for any of the lags, thus proving the model sufficient.

It is shown that the model is sufficient according to the Ljung-Box statistics. In addition to this, the random error term hypotheses should also be met. The graph below shows the hypotheses of the errors are met.

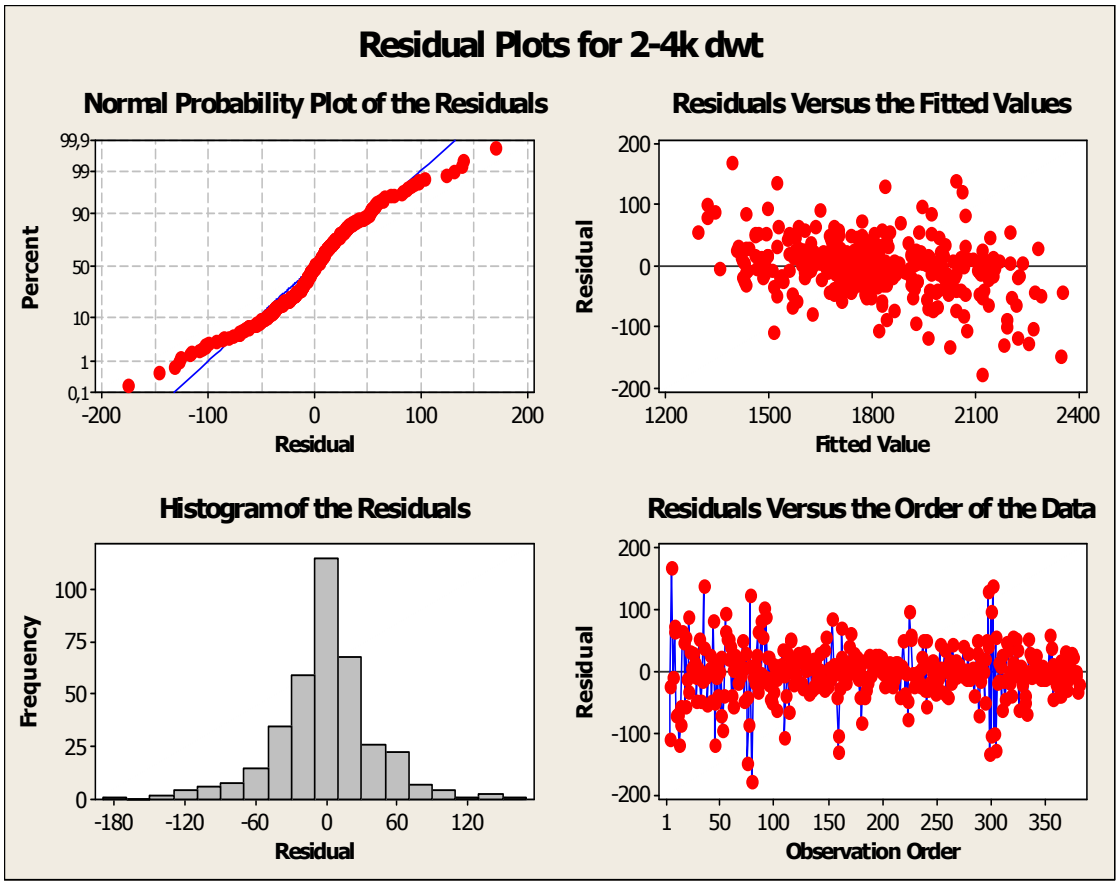


Figure 19: Residual Plots for 2-4k Dwt Data Set

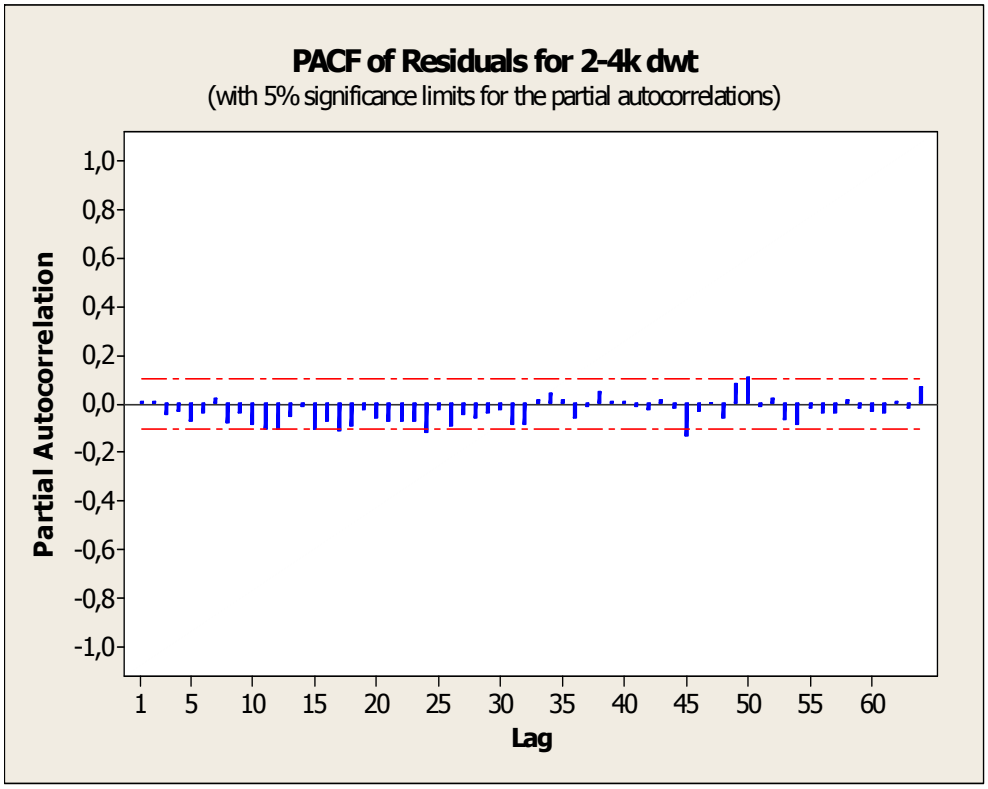


Figure 20: Partial Autocorrelation Function of Residuals of 2-4k Dwt Data

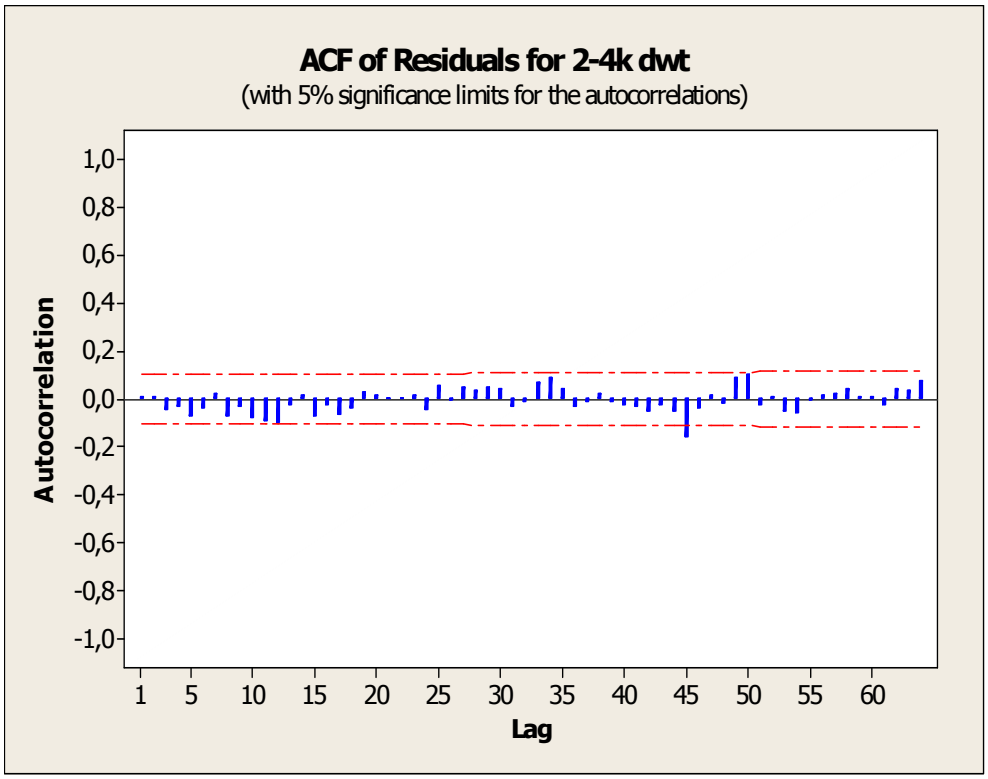


Figure 21: Autocorrelation Function of Residuals of 2-4k Dwt Data

Forecasting

The forecasting of the series was done by the use of the parameters and past values of the series. Suggested model forecasted these data with a maximum of 2.6% error. The following entries, of which each one representing a week, were forecasted with a maximum of 5% error and shown in the table as follows:

Table 32: Forecasting Results for 2000-4000 DWT Data Set

Period	**Lower**	**Forecast**	**Upper**	**Actual**	**%Error**
23.03.2015	1636,38	**1721,01**	1805,63	**1745,00**	1.4
30.03.2015	1581,90	**1714,41**	1846,92	**1737,00**	1.3
06.04.2015	1521,21	**1713,33**	1905,45	**1740,00**	1.6
13.04.2015	1454,46	**1710,04**	1965,63	**1740,00**	1.7
20.04.2015	1370,36	**1705,52**	2040,67	**1712,00**	0.4
27.04.2015	1288,14	**1701,87**	2115,60	**1681,00**	1.2
04.05.2015	1197,19	**1698,81**	2200,43	**1675,00**	1.4
11.05.2015	1102,20	**1694,97**	2287,74	**1675,00**	1.1
18.05.2015	1000,01	**1691,31**	2382,60	**1647,00**	2.6
25.05.2015	895,22	**1687,75**	2480,27	**1647,00**	2.3
01.06.2015	784,30	**1684,23**	2584,15	**1647,00**	2.1
08.06.2015	669,85	**1680,54**	2691,22	**1670,00**	0.6
15.06.2015	550,42	**1676,97**	2803,52	**1645,00**	1.8
22.06.2015	427,60	**1673,37**	2919,13	**1633,00**	2.4
29.06.2015	300,23	**1669,78**	3039,34	**1633,00**	2.1
06.07.2015	169,44	**1666,16**	3162,87		

4000-6000 Deadweight Tonnage

The same procedure applied for the forecesting of the previous series has been repeated here and in order to make these data set stationary, regular difference method was used. After this process, series appeared to have a stable distribution over a stable average and had achieved stationary status as seen on Figure 22.

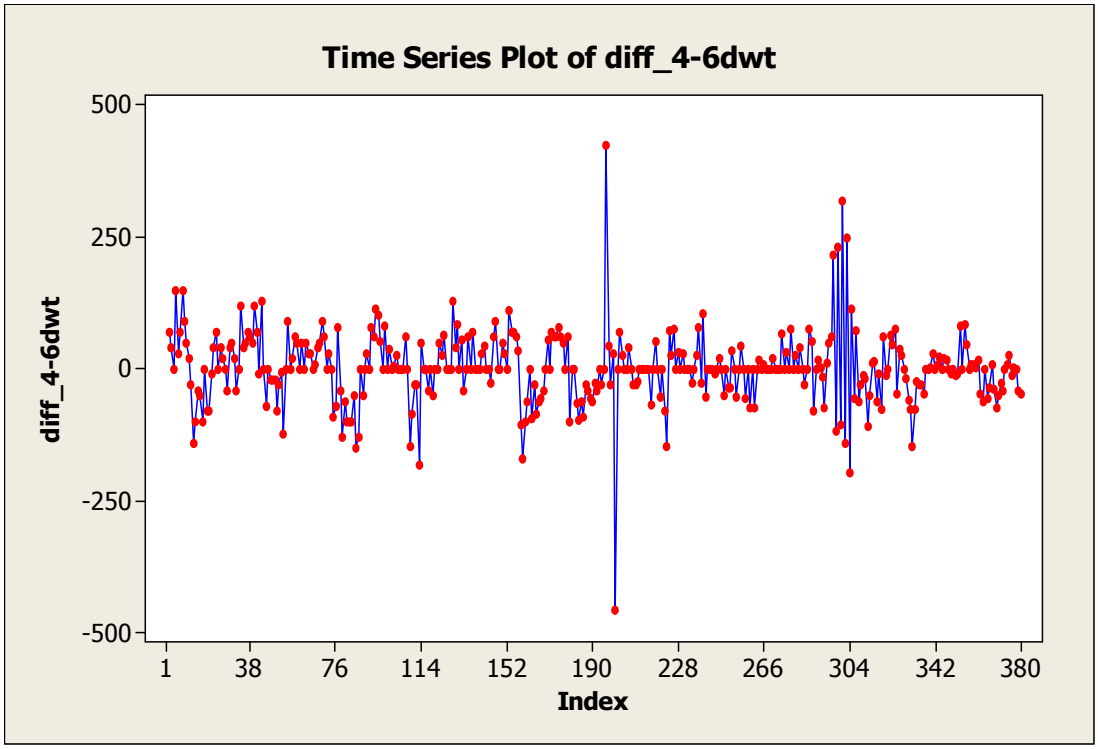


Figure 22: Stationary Data Set for 4-6 Dwt Data

Modeling

The behavior of SAC (sample autocorrelation function) and SPAC (sample partial autocorrelation function) functions prove Box-Jenkins model to be the appropriate model and to define the time series. The appropriate model for the freight values is as shown below.

ARIMA (2,1,0)

Let Z_t be a series with the regular difference set as 2, the model appropriate for the time series can be shown as below:

$$z_t = \phi_2 z_{t-2} + a_t$$

Final Estimates of parameters:

Type	**Coef**	**SE Coef**	**T**	**P**
AR 1	-0,0667	0,0487	-1,37	0,171
AR 2	-0,3281	0,0487	-6,74	0,000

AR 1 parameter proves to be insignificant and thus excluded from the model.

The results and hypothesis for the model sufficiency analysis are as below. In order for the model to be deemed sufficient, the model should prove sufficient for each and every lag in the below table.

H_0 : The model is significant.
H_1 : The model is insignificant.

Modified Box-Pierce (Ljung-Box) Chi-Square statistic:

Lag	12	24	36	48
Chi-Square	15,1	25,9	37,0	52,4
DF	10	22	34	46
P-Value	**0,129**	**0,255**	**0,334**	**0,240**

According to the results of Minitab Application; the hypothesis formed for the sufficiency of the model was not denied for any of the lags, thus proving the model sufficient.

It is shown that the model is sufficient according to the Ljung-Box statistics. In addition to this, the random error term hypotheses should also be met. The graph below shows the hypotheses of the errors are met.

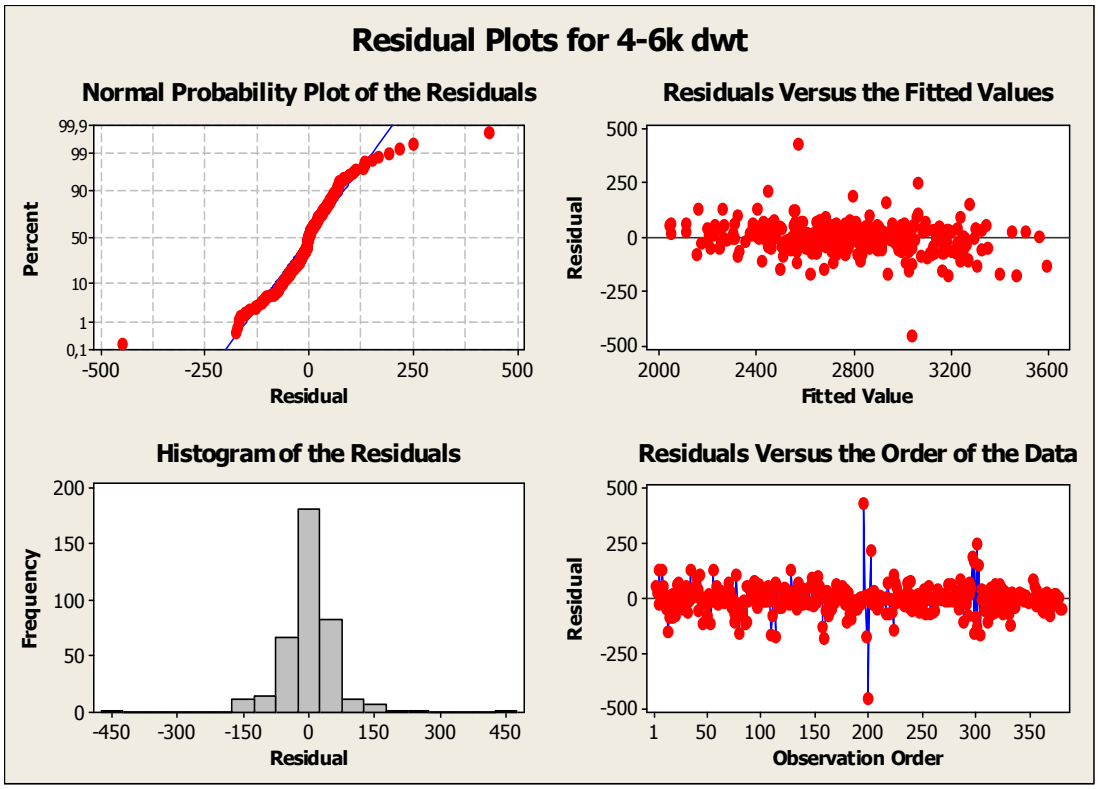


Figure 23: Residual Plots for 4-6k dwt Data Set

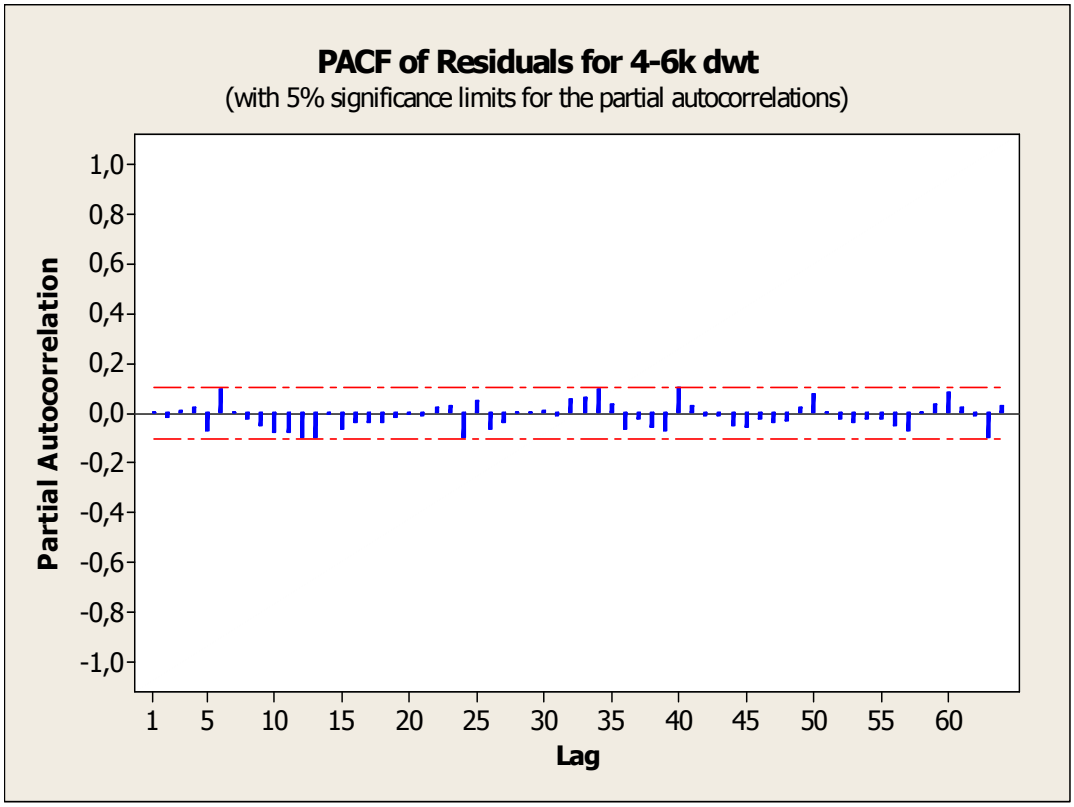


Figure 24: Partial Autocorrelation Function of Residuals for 4-6k Dwt Data

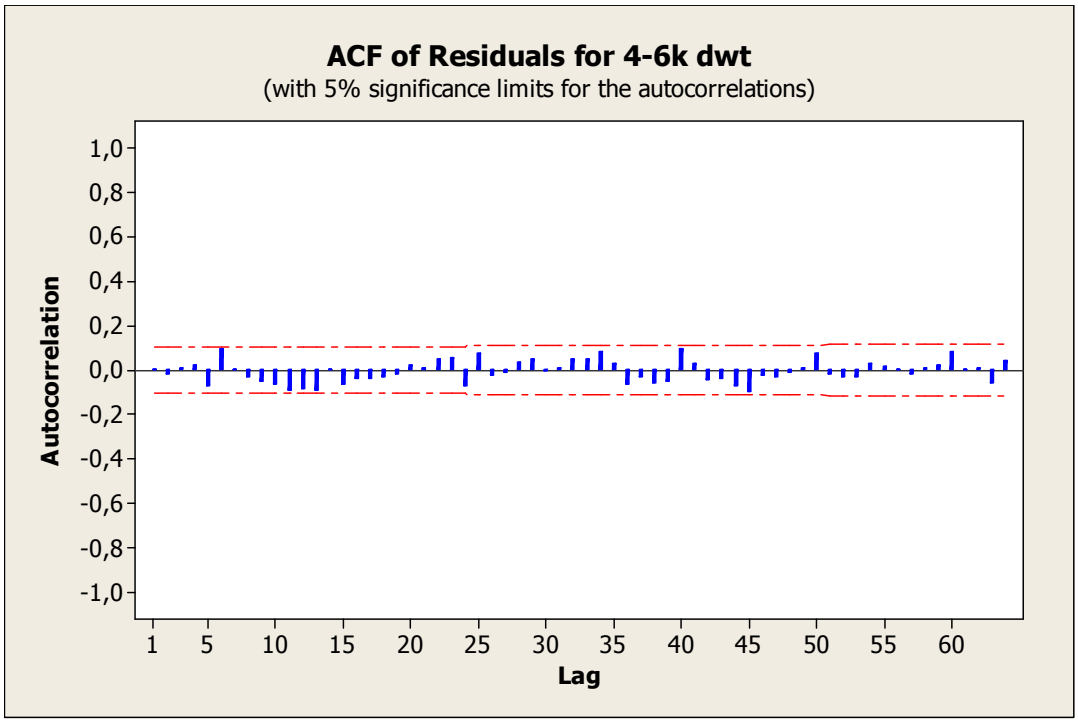


Figure 25: Autocorrelation Function of Residuals for 4-6k Dwt Data

Forecasting

The forecasting of the series was done by the use of the parameters and past values of the series. Suggested model forecasted these data with a maximum of 5.9% error. The following entries, of which each one representing a week, were forecasted with a maximum of 5.9% error and shown in the table as follows:

Table 33: Forecasting Results for 4000-6000 DWT Data Set

Period	**Lower**	**Forecast**	**Upper**	**Actual**	**%Error**
23.03.2015	2504,06	**2631,53**	2759,00	**2657,00**	1
30.03.2015	2447,81	**2634,19**	2820,58	**2644,00**	0.4
06.04.2015	2376,57	**2634,55**	2892,52	**2648,00**	0.5
13.04.2015	2318,58	**2635,44**	2952,30	**2648,00**	0.5
20.04.2015	2261,84	**2635,62**	3009,40	**2606,00**	1.1
27.04.2015	2211,50	**2635,92**	3060,35	**2559,00**	1.4
04.05.2015	2164,26	**2636,00**	3107,75	**2551,00**	3.2
11.05.2015	2120,87	**2636,11**	3151,34	**2551,00**	3.2
18.05.2015	2080,18	**2636,14**	3192,10	**2508,00**	4.8
25.05.2015	2042,10	**2636,18**	3230,25	**2508,00**	4.8
01.06.2015	2006,10	**2636,19**	3266,28	**2508,00**	4.8
08.06.2015	1971,99	**2636,20**	3300,42	**2542,00**	3.5
15.06.2015	1939,47	**2638,21**	3332,95	**2504,00**	5
22.06.2015	1908,38	**2640,21**	3364,04	**2487,00**	5.7
29.06.2015	1878,55	**2643,22**	3393,88	**2487,00**	5.9
06.07.2015	1849,83	**2645,22**	3422,60		

6000-8000 Deadweight Tonnage

The same procedure applied for the forecesting of the previous series has been repeated here and in order to make these data set stationary, regular difference method was used. After this process, series appeared to have a stable distribution over a stable average and had achieved stationary status as seen on Figure 26.

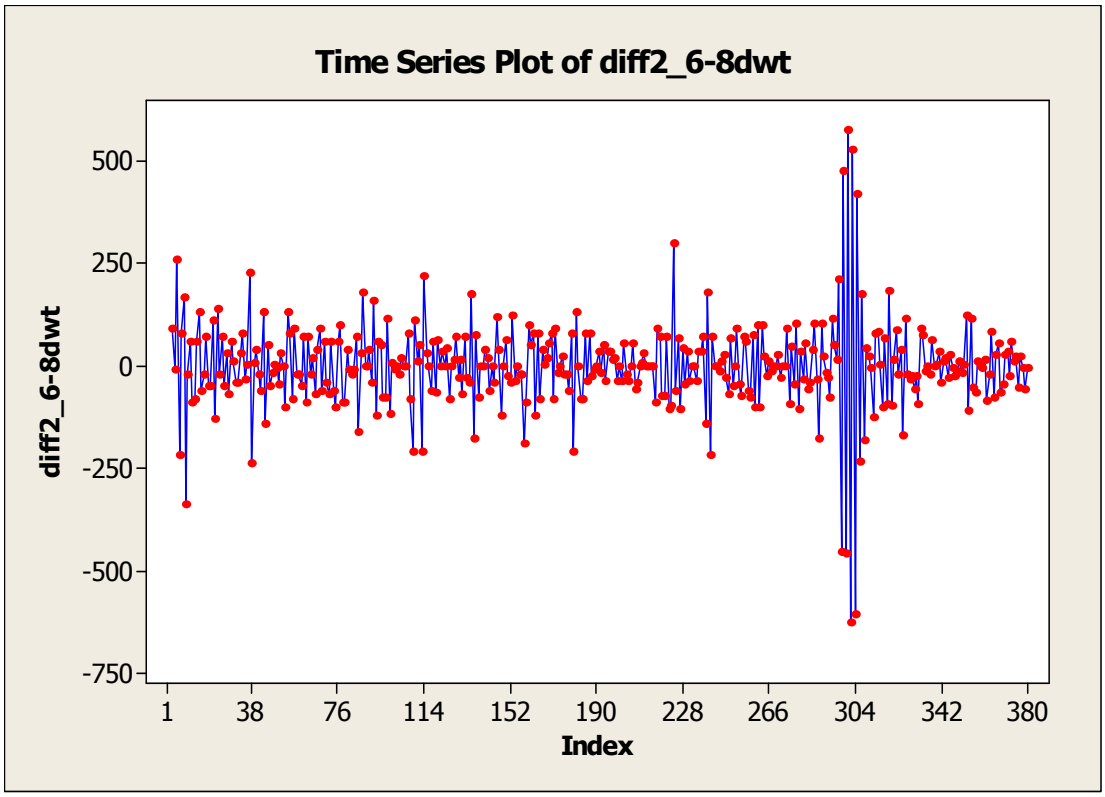


Figure 26: Time Series Plot of 6-8k Dwt with Difference Set as 2

Modeling

The behavior of SAC (sample autocorrelation function) and SPAC (sample partial autocorrelation function) functions prove Box-Jenkins model to be the appropriate model and to define the time series. The appropriate model for the freight values is as shown below.

ARIMA (3,2,0)

Let Z_t be a series with the regular difference set as 2, the model appropriate for the time series can be shown as below:

$$z_t = \phi_1 z_{t-1} + \phi_2 z_{t-2} + \phi_3 z_{t-3} + a_t$$

Final Estimates of parameters:

Type	**Coef**	**SE Coef**	**T**	**P**
AR 1	-0,8286	0,0499	-16,61	0,000
AR 2	-0,3281	0,0487	-6,74	0,000
AR 3	-0,2565	0,0499	-5,14	0,000

The results and hypothesis for the model sufficiency analysis are as below. In order for the model to be deemed sufficient, the model should prove sufficient for each and every lag in the below table.

H_0 : The model is significant.

H_1 : The model is insignificant.

Modified Box-Pierce (Ljung-Box) Chi-Square statistic:

Lag	12	24	36	48
Chi-Square	16,9	35,2	43,8	59,7
DF	9	21	33	45
P-Value	**0,050**	**0,087**	**0,099**	**0,071**

According to the results of Minitab Application; the hypothesis formed for the sufficiency of the model was not denied for any of the lags, thus proving the model sufficient.

It is shown that the model is sufficient according to the Ljung-Box statistics. In addition to this, the random error term hypotheses should also be met. The graph below shows the hypotheses of the errors are met.

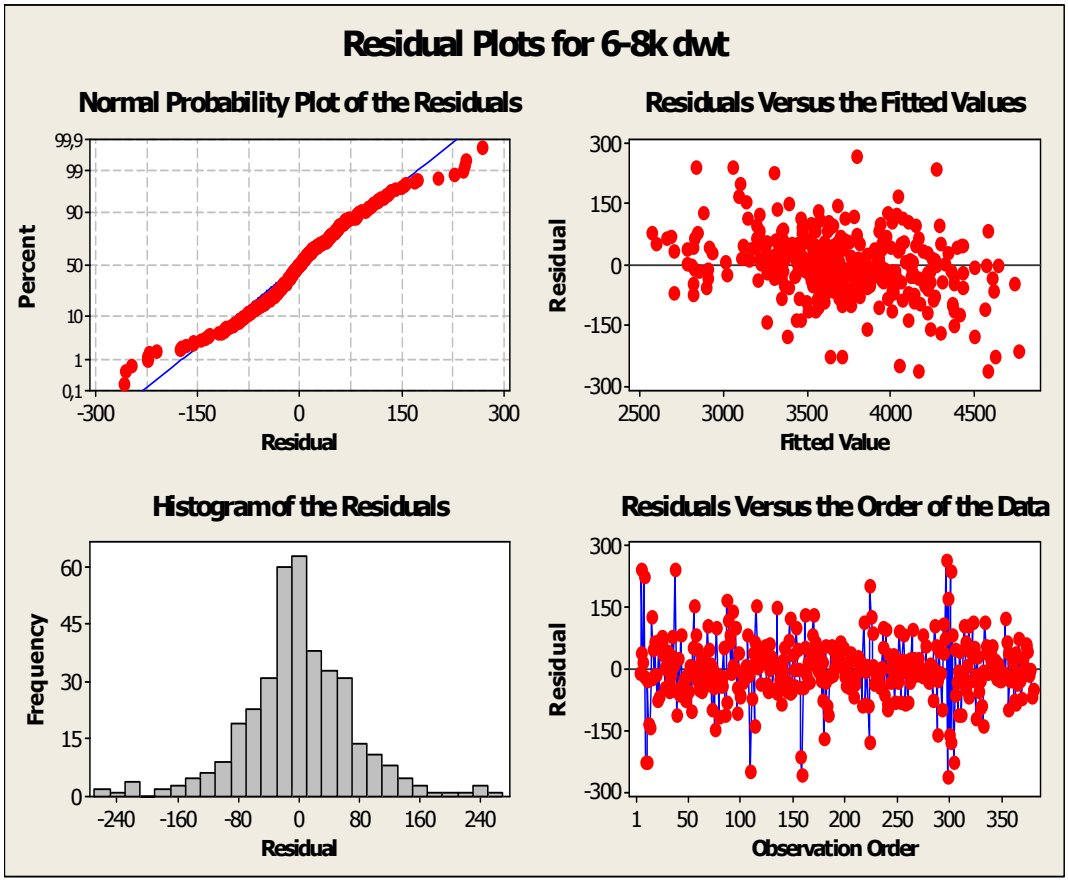


Figure 27: Residual Plots for 6-8k Dwt Data Set

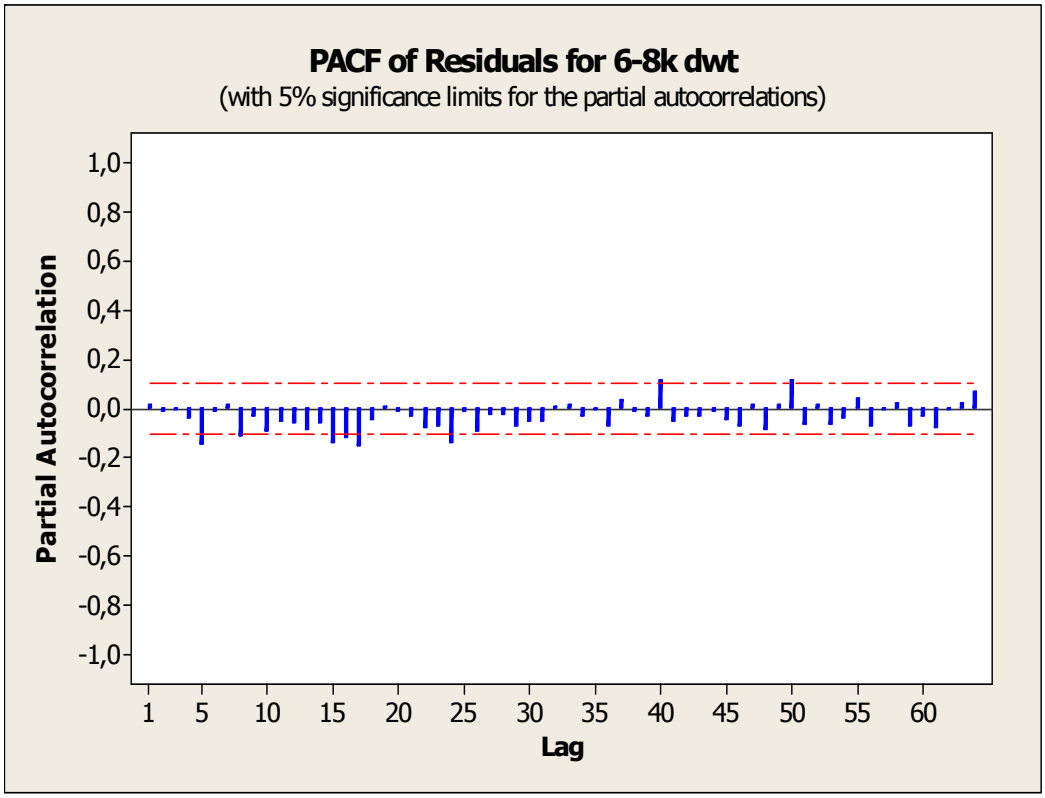


Figure 28: Partial Autocorrelation Function of Residuals for 6-8 Dwt Data

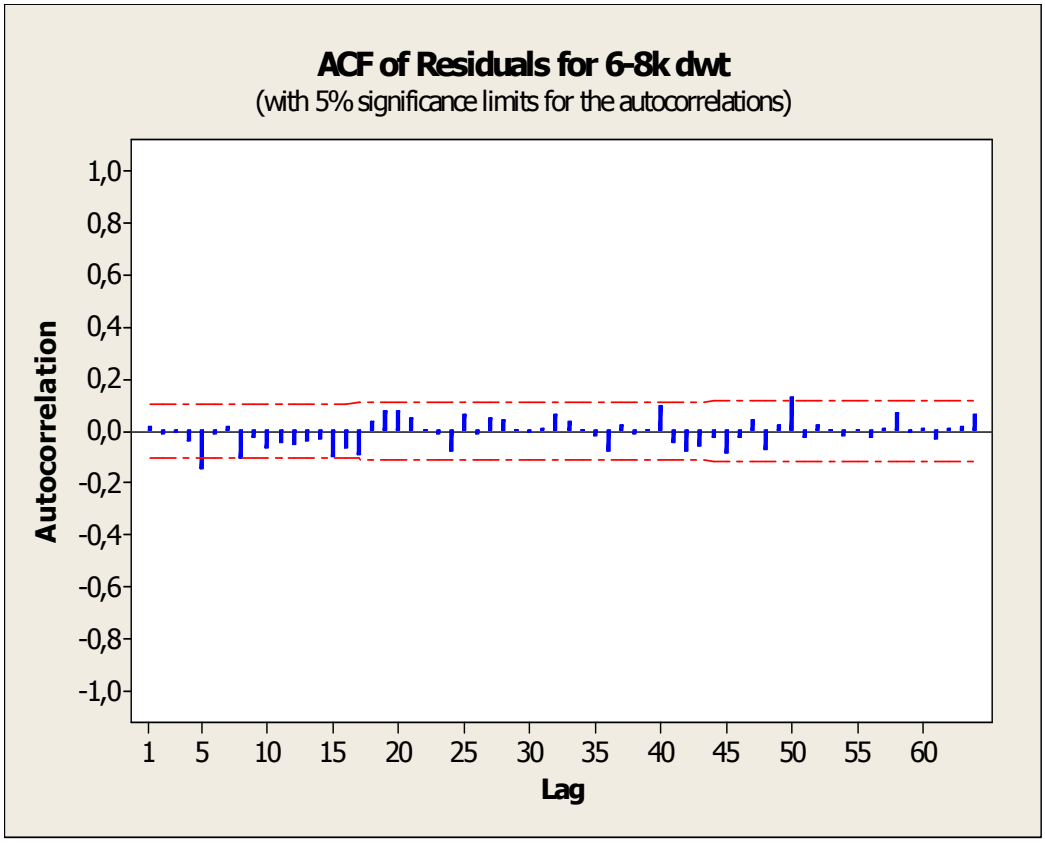


Figure 29: Autocorrelation Function of Residuals for 6-8k Dwt Data

Forecasting

The forecasting of the series was done by the use of the parameters and past values of the series. Suggested model forecasted these data with a maximum of 2% error. The following entries, of which each one representing a week, were forecasted with a maximum of 5% error and shown in the table as follows:

Table 34: Forecasting Results for 6000-8000 DWT Data Set

Period	**Lower**	**Forecast**	**Upper**	**Actual**	**%Error**
23.03.2015	3416,29	**3563,72**	3711,16	**3609,00**	1.3
30.03.2015	3325,79	**3552,87**	3779,95	**3592,00**	1.1
06.04.2015	3208,35	**3546,31**	3884,27	**3598,00**	1.4
13.04.2015	3098,49	**3542,03**	3985,56	**3598,00**	1.6
20.04.2015	2955,53	**3534,32**	4113,11	**3540,00**	0.1
27.04.2015	2814,22	**3527,60**	4240,97	**3476,00**	1.5
04.05.2015	2655,44	**3520,61**	4385,78	**3465,00**	1.5
11.05.2015	2494,43	**3514,39**	4534,35	**3465,00**	1.4
18.05.2015	2318,92	**3507,37**	4695,83	**3407,00**	2.8
25.05.2015	2139,37	**3500,83**	4862,29	**3407,00**	2.6
01.06.2015	1948,87	**3493,96**	5039,05	**3407,00**	2.4
08.06.2015	1753,38	**3487,41**	5221,44	**3453,00**	0.9
15.06.2015	1548,64	**3480,58**	5412,52	**3401,00**	2.2
22.06.2015	1338,49	**3473,96**	5609,43	**3378,00**	2.7
29.06.2015	1120,39	**3467,18**	5813,96	**3378,00**	2.5
06.07.2015	896,73	**3460,53**	6024,32		

8000-12000 Deadweight Tonnage

The same procedure applied for the forecesting of the previous series has been repeated here and in order to make these data set stationary, regular difference method was used. After this process, series appeared to have a stable distribution over a stable average and had achieved stationary status as seen on Figure 30.

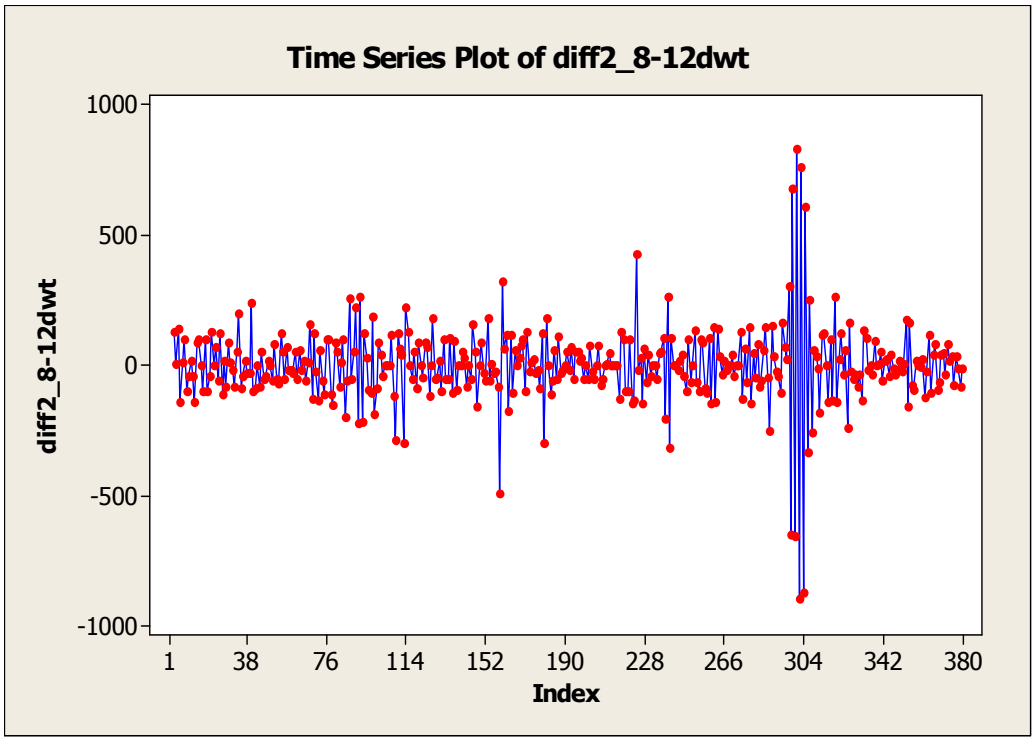


Figure 30: Time Series Plot of 8-12k Dwt with Difference Set as 2

Modeling

The behavior of SAC (sample autocorrelation function) and SPAC (sample partial autocorrelation function) functions prove Box-Jenkins model to be the appropriate model and to define the time series. The appropriate model for the freight values is as shown below.

ARIMA (3,2,0)

Let Z_t be a series with the regular difference set as 2, the model appropriate for the time series can be shown as below:

$$z_t = \phi_1 z_{t-1} + \phi_2 z_{t-2} + \phi_3 z_{t-3} + a_t$$

Final Estimates of parameters:

Type	**Coef**	**SE Coef**	**T**	**P**
AR 1	-0,8221	0,0492	-16,70	0,000
AR 2	-0,3457	0,0626	-5,53	0,000
AR 3	-0,3014	0,0493	-6,12	0,000

The results and hypothesis for the model sufficiency analysis are as below. In order for the model to be deemed sufficient, the model should prove sufficient for each and every lag in the below table.

H_0 : The model is significant.

H_1 : The model is insignificant.

Modified Box-Pierce (Ljung-Box) Chi-Square statistic:

Lag	12	24	36	48
Chi-Square	15,6	27,8	38,8	51,6
DF	9	21	33	45
P-Value	**0,075**	**0,147**	**0,225**	**0,232**

According to the results of Minitab Application; the hypothesis formed for the sufficiency of the model was not denied for any of the lags, thus proving the model sufficient.

It is shown that the model is sufficient according to the Ljung-Box statistics. In addition to this, the random error term hypotheses should also be met. The graph below shows the hypotheses of the errors are met.

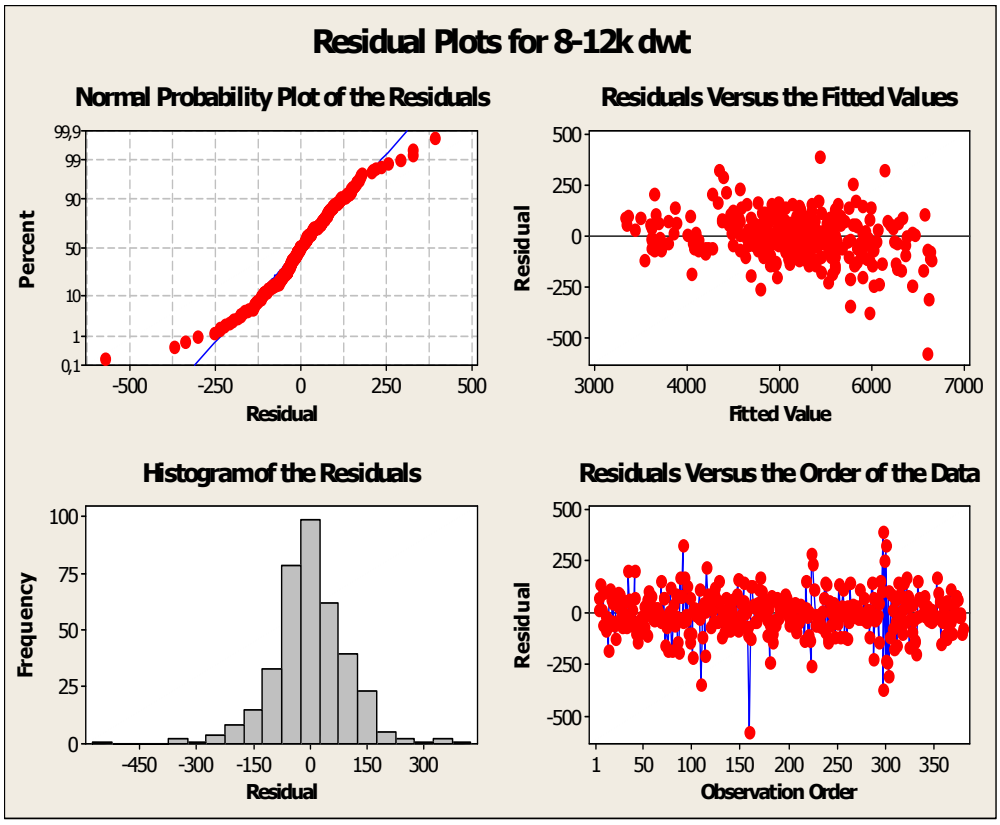


Figure 31: Residual Plots for 8-12k Dwt Data

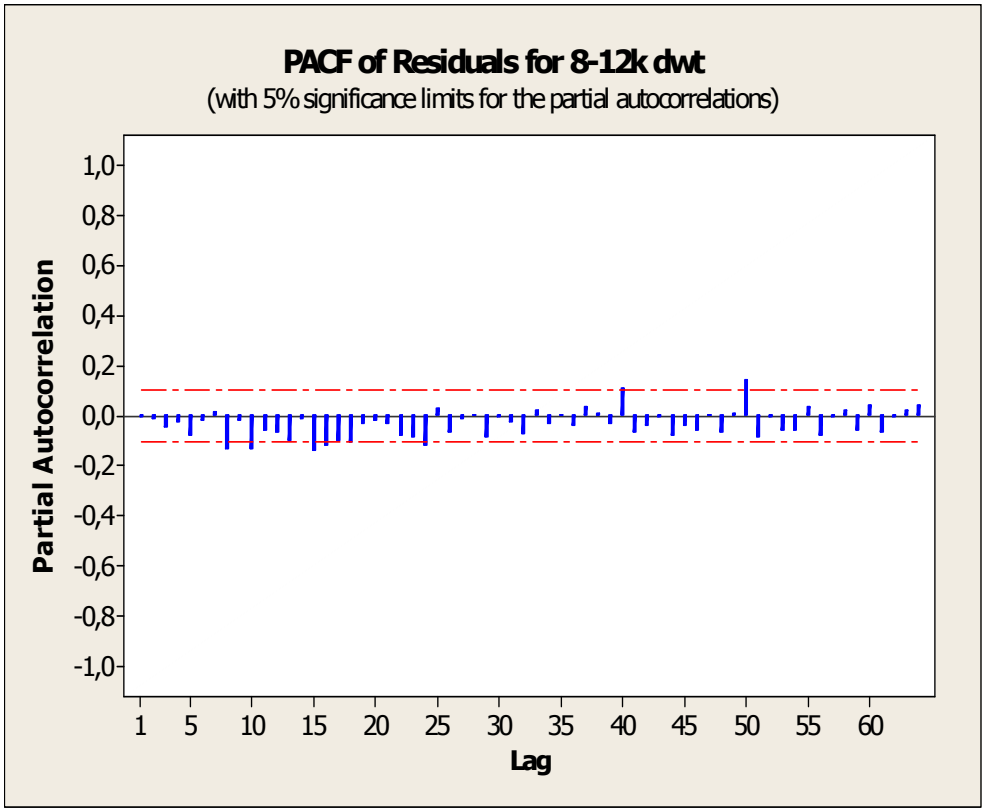


Figure 32: Partial Autocorrelation Function of Residuals for 8-12k Dwt Data

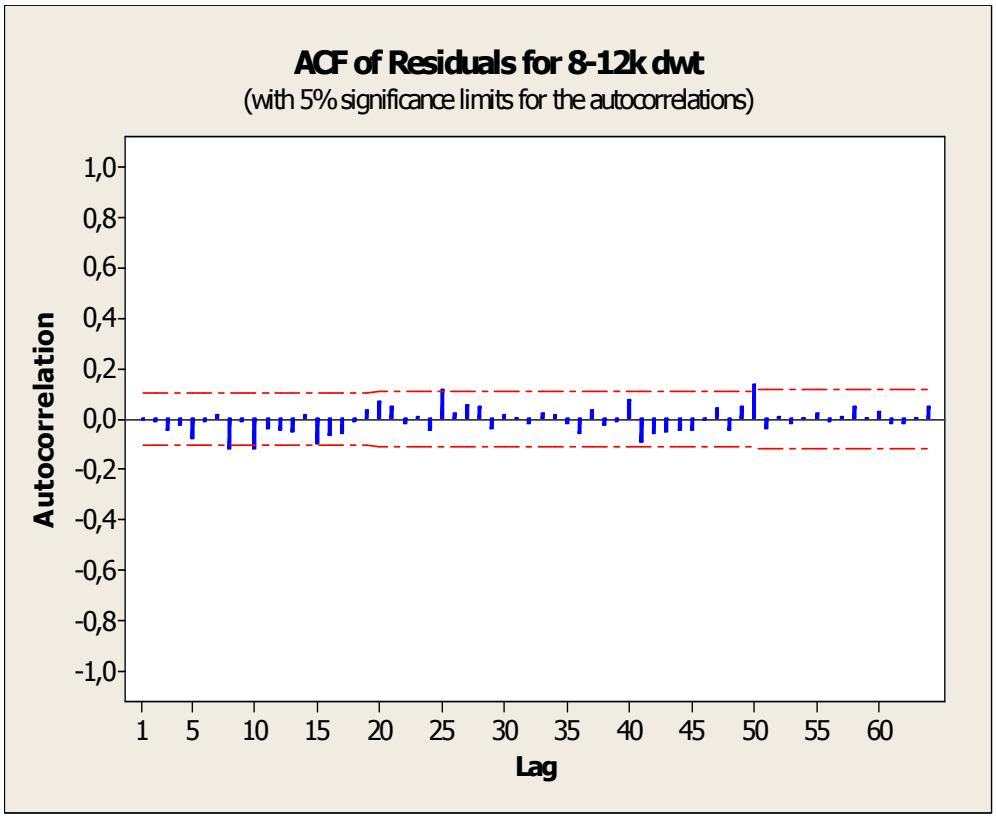


Figure 33: Autocorrelation Function of Residuals for 8-12k Dwt Data

Forecasting

The forecasting of the series was done by the use of the parameters and past values of the series. Suggested model forecasted these data with a maximum of 2.5% error. The following entries, of which each one representing a week, were forecasted with a maximum of 5% error and shown in the table as follows:

Table 35: Forecasting Results for 8000-12000 DWT Data Set

Period	**Lower**	**Forecast**	**Upper**	**Actual**	**%Error**
23.03.2015	4914,83	**5114,10**	5313,38	**5180,00**	1.3
30.03.2015	4785,98	**5093,88**	5401,78	**5155,00**	1.2
06.04.2015	4627,70	**5083,42**	5539,14	**5164,00**	1.6
13.04.2015	4482,88	**5076,04**	5669,20	**5164,00**	1.7
20.04.2015	4289,98	**5064,06**	5838,13	**5081,00**	0.3
27.04.2015	4099,80	**5051,85**	6003,90	**4989,00**	1.2
04.05.2015	3886,08	**5040,49**	6194,90	**4973,00**	1.3
11.05.2015	3671,51	**5029,90**	6388,29	**4973,00**	1.1
18.05.2015	3435,80	**5018,45**	6601,10	**4890,00**	2.5
25.05.2015	3195,95	**5007,18**	6818,42	**4890,00**	2.3
01.06.2015	2940,56	**4995,83**	7051,10	**4890,00**	2.1
08.06.2015	2679,77	**4984,75**	7289,73	**4956,00**	0.5
15.06.2015	2405,71	**4973,42**	7541,13	**4881,00**	1.8
22.06.2015	2125,33	**4962,22**	7799,12	**4848,00**	2.3
29.06.2015	1833,73	**4950,92**	8068,12	**4848,00**	2
06.07.2015	1535,44	**4939,74**	8344,03		

CONCLUSION

In this study, fourteen shipbrokers have been interviewed, in order to determine, what the experts of the dry bulk shipping sector specify the factors that has an effect on the freight rates formed in the market and how they shape their fixtures, if shipbrokers use freight indices as an informative and proactive tool, if they do so, to what extent the shipbrokers benefit from the information made available by the publishers of the said indices, and whether the experts benefit from the freight forecasts, and to what extent.

Another aim of this study is to carry out a forecast for the Istanbul Freight Index using time series method and provide a useful tool for the players involved in the coaster shipping sector. For this aim, five indices published by Istanbul Freight Index have been analyzed and forecasted, which include ISTFIX, the main composite index, and four tonnage based indices (2000-4000 DWT, 4000-6000 DWT, 6000-8000 DWT and 8000-12000 DWT).

The answers of the participants show great similarities to the literature regarding factors affecting freight rates, in which more than half of the participants, nine of them to be exact, stated the global trade volume is by far the most important factor regarding the fluctuations of the freight rates, since the seaborne trade depends on the raw materials and manufactured goods being traded, it is only natural that this factor comes on top. Secondly oil prices were mentioned by eight of the participants, most of them stating oil related cost account for 20 to 25 % of the freight rate to be set. The third factor was named by half of the participants, which is ship supply and ship demand in the market, this factor is used to explain the forming of the freight by maritime economists such as Stopford and McConville, the equilibrium point of ship supply and demand is where the right amount of freight is formed. Six of the participants listed port and canal fees as a major impact on freight, said participants stated unanimously that said fees account for 15 to 20% of the total freight. Wars, acts of piracy and political factors accounted for five of the answers, all of which restricts or adds to the cost of trading in a particular region. Cargo quantity and type was another answer which was given by five of the participants as, the type of the cargo, depending on its stowage factor, determines how much of that said cargo can

be loaded on a specific vessel, and that quantity determines how much time the vessel will be spending on loading and discharging operations. In addition, hazardous cargo and cargo that requires extra care (hatch cleaning, lashing, securing) would inadmissibly create extra costs. Running costs, which represents a fixed cost for operating a vessel, proves to be a controversy among experts, with just four of the participants listing it as a factor which has an impact on freight rates. Seasonality of the goods carried such as vegetables and fruits and their effect on freight fluctuation depending on season was voiced by four of the participants. Port's specifications such as availability, loading and discharging capacity, draft, and price was the last factor that was stated by four of the experts. Voyage time, and in result, voyage cost, regional factors such as the trade volume of the region, weather restrictions of the said region and loading/discharging rates of the called ports all voiced by three of the participants each affecting the time spent and thus the costs arise from increased consumption of oil and/or port fees. Competition was interestingly one of the least popular answers which was only stated by one participant. The main reason behind the lack of consideration for competition is the current state of the dry bulk market, which hit a record low, going below the rates in 1986. In a market where the most of the shipowners faced with the decision to whether lay up their vessel or work to cut their losses it is hard to talk about competition. The other factor stated only once was newbuilding of vessels. The same conditions apply for this factor as well, since the last crisis, newbuilding orders plummeted, and without a optimistic future ahead, a change is not expected.

Answers given to the second question regarding the effect of oil prices on freight rates coincided with the number of time this factor was voiced in the first. Participants were in a unanimous agreement regarding oil prices as a major impact on freight. However, the extent of the impact was not stated the same by all participants. While one participant named oil and oil related costs for the emerging of low consumption vessels, two others stated in a market with low demand such as today's, even if the oil prices went up, this effect can not be mirrored in freight rates.

Port calls and in result port fees are musts in a voyage but their effect on the freight rates are not to be overlooked, with six of the participants naming port fees, along with canal fees, among the major impacts on freight rates. Experts noting some

European (mostly English) ports could raise the cost of a voyage abnormally and should be accounted for in the freight calculation accordingly. Also the Suez Canal was mentioned by most of the experts as one of the most expensive component of a freight calculation when preferred. The reason behind the costly manner of the Suez Canal is that the alternative is time consuming, also not very cheap and sometimes include the risk of piracy.

Running costs was a hard factor to label, while eight of the experts said this factor directly affect freight rates, rest of the participants can be grouped in twos, one group addressing its importance as a competitive tool, other one noting an ideal market should be present to count running costs as a major factor, those participants noted in today's market, running costs have little to none effect. The last group consists of participants who claim the running costs, being a constant cost, is affectless regarding freight rates.

Participants were asked whether they used freight indices or not, eight of the experts stated they regularly use freight indices, while three of them noted they just do so to keep updated. Rest of the participants stated they do not use freight indices at all.

For a follow-up, their choice of index was asked to the participants. The Baltic Exchange had a major dominance among the answers with eleven experts stating they use this index, ten of the experts who use Baltic Exchange do so exclusively. The one expert also uses Istanbul Freight Index. This index also has an exclusive user among the participants. The reason behind the vast majority of Baltic Exchange lies in its being global, highly respected and well proven over the years. When asked why they do not prefer ISTFIX, majority of the participants stated the day-to-day nature of the coaster shipping, and that they prefer to receive their information from their colleagues, this problem might be caused by the pay-to-subscribe method applied by the Istanbul Freight Index. While Baltic Exchange also has the same method of subscription, it covers a vast amount of routes and vessel sizes whereas ISTFIX's coverage is regional and on a smaller tonnage basis, therefore, can easily be substituted in the same way ISTFIX gathers their information, by experienced shipbrokers sharing their knowledge and comments.

The most used aspects of freight indices was found to be the index numbers with being eight of the participants answer, and time charter rates provided by those indices, which was mentioned by seven of the participants. Market reports published by freight indices was stated four times, daily fixture reports and sale & purchase reports follow with three and two times in that order.

To elaborate on the usage of market reports, participants were asked if they use market reports other than the ones published by Baltic Exchange and Istanbul Freight Index. The most used market reports among the participants were the ones published by prestigious broker houses worldwide such as Clarksons, Fearnleys, SSY and Maersk. The runner-up was BMTI (Brokers Market & Trend Information) with two of the participants stating they use their reports. Trade winds, Platou, Rufco and Nitro Shipping were eached named by one participant. Four participants stated they only use market reports published by Baltic Exchange and/or Istanbul Freight Index, whereas one participant stated he does not use market reports at all.

In the next step participants were asked what aspects of the market reports do they benefit and the results were homogeneous. Freight levels, Sale and purchase numbers, traded cargo types and comments on those cargo, demolition reports, global and regional trade trends were all named by three participants, newbuilding orders was the second most popular answer, given by two participants. only one expert uses market reports to check for oil prices and forecasts, also the same goes for market outlook and forecasts.

To tie the two parts of the study together, a series of freight forecasting related questions were asked to the participants. First of them being "Does your company carry out freight forecasting, if not do you use the ones published?" Nine of the participants noted they benefit from freight forecasts and seven of them carry out the forecasts themselves. Five of the experts noted they do not use forecasts claiming the instability of today's economy prevents them from forecasting in a healthy manner.

Participants were then asked whether their forecasts match the actual market figures. participants answer were confident, stating it always matches with the actual figures, three of the participants were more modest stating their figures usually match

the ones in the actual market. Two of the experts claimed their forecasted figures sometimes match the actual market figures.

Lastly the participants were asked to voice their thoughts on a forecasts trustworthiness, depending on its extent. Four participants stated a forecast can go on a maximum of 2 to 3 months without being compromised. Two participants set this date to a maximum of one month, whereas one participant claimed a forecast can go on to a maximum of 3 to 6 months without losing its trustworthiness.

In the forecasting of Istanbul Freight Index data, using figures and rates starting from 05.01.2009, the time series method have been used, the modeling was done by Box-Jenkins method an exponential smoothing method was also applied. All five indices published by Istanbul Freight Index have been forecasted, which includes the main ISTFIX index and tonnage based indices (2000-4000 DWT, 4000-6000 DWT, 6000-8000 DWT and 8000-12000 DWT).

The forecasts made, covered 16 weeks, before the lower and upper reliability limits reached unmeaningful numbers. This period of time matches the answers given by the participants of the interviews made for the trustworthy forecasts.

The forecast of the ISTFIX index was succesfully done with the maximum error of 2.3%. The model forecasted this index with the lowest error margin as it is composed from the rest. The downwards trend was dominant in the actual figures as it was forecasted.

The forecast of the 2000-4000 DWT index was succesfully done with the maximum error of 2.6%. The downwards trend was dominant in the actual figures as it was forecasted.

The forecast of the 4000-6000 DWT DWT index proved troublesome while the forecasts passed the aimed 5% error limit twice with 5.7% and 5.9%, both these errors took place in the last two weeks of the forecast. The reason behind this misreading lies in the sudden and unexpected plummet of the rates in this tonnage of vessels when compared with the recent upwards trend.

The forecast of 6000-8000 DWT index was succesfully done with the maximum error of 2.8%. The downwards trend was dominant in the actual figures as it was forecasted.

The forecast of 8000-12000 DWT index was succesfully done with the maximum error of 2.5%. The downwards trend was dominant in the actual figures as it was forecasted.

In the end the forecasting of Istanbul Freight Index time series by using Box-Jenkins model proved to be succesful in the short term. As the participants stated the most reliable period of time for forecasting freight rates found to be 2-3 months. The only two times the model achieved an error rate above 5% came in the 14th and 15th weeks of the forecasting of the regarding time series.

Even though this model proves its significance in analyzing the trends of the freight rates, the fact that the model only takes into consideration the past readings of the data forecasted and not the factors affecting them should not be ignored. The factors affecting freight rates which were determined by the literature review and the interviews made, must be considered in supplementing what the forecast results indicate.

Further research on the matter could be carried out in order to account for the effect on the factors this study found relevant for the freight rates for dry bulk shipping whilst conducting a forecast. The relationship between freight index data and factors such as ship supply and demand, global economic indicators and oil prices could be investigated.

REFERENCES

Akalın, S. (1977). İşletme İstatistiği. İzmir: Ege Üniversitesi Matbaası.

Akgül, I. (1994). *Zaman Serileri Analizi Ve Öngörü Modelleri*. Öneri Dergisi. 1.1, 52-69.

Alizedh, A.H., Talley, W.K. (2011). Microeconomic Determinants of Dry Bulk Shipping Freight Rates and Contract Times, *Transportation,* 38: 561-579.

Alizedh, A.H., Talley, W.K. (2011). Vessel and Voyage Determinants of Tanker Freight Rates and Contract Times, *Transport Policy*, 18: 665-675.

Batchelor, R., Alizadeh, A., Visvikis, I. (2007). Forecasting Spot and Forward Prices in the International Freight Market. *International Journal Of Forecasting,* 23: 101-114.

Berg, B.L. (2000). Qualitative Research Methods for the Social Sciences, California: Allyn and Bacon

Blythe, J. (2005). Essentials of Marketing, Third Edition. London: Prentice Hall.

Bolton, P. (2007). Statistical Literacy Guide. London: House of Commons Library.

Bovee, C.L., Thill, J.V., Mescon, M.H. (2007). Excellence In Business, Third Edition. New Jersey: Prentice Hall.

Branch, A.E. (2007). Elements of Shipping, Eighth Edition. London and New York: Routledge.

Bryman, A. (1989). Research Methods and Organization Studies, London and New York: Routledge

Buell, V.P. (1986). Hanbook of Modern Marketing, Second Edition. New York: McGraw-Hill.

Bulut, E. (2014). Modeling Seasonality Using the Fuzzy İntegrated Logical Forecasting (FILF) approach, *Expert Systems with Applications,* 41: 1806-1812.

Chang, C., Hsieh, C., Lin, Y. (2012). A Predictive Model of the Freight Rate of the International Market in Capesize Dry Bulk Carriers, *Applied Economics Letters*, 19(4): 313-317.

Cooke, J., Young, T. and Taylor, A. (2007). Voyage Charters, Third Edition. London: Informa.

Çetin, I.B. (2010). Unpublished Lecture Notes. Izmir: Dokuz Eylül Universitesi.

Davis, K. (1961). Marketing Management. New York: The Ronald Press Company.

De Oliveira, G. F. (2014). Determinants of European Freight Rates: The Role of Market Power and Trade Imbalance, *Transportation Research Part E,* 62: 23-33.

Dibb, S., Simkin, L., Pride, W.M. and Ferrell, O.C. (1994). Marketing Concepts and Strategies, Second European edition. London and Boston: Houghton Mifflin.

Duru, O. (2010). A Fuzzy Integrated Logical Forecasting Model for Dry Bulk Shipping Index Forecasting: An Improved Fuzzy Time Series Approach, *Expert Systems with Applications,* 37: 5372-5380.

Duru, o. (2012). A Multivariate Model of Fuzzy Integrated Logical Forecasting Method (M-FILF) and Multiplicative Time Series Clustering: A Model of Time-Varying Volatility for Dry Cargo Freight Market, *Expert Systems with Applications,* 39: 4135-4142.

Duru, O., Bulut, E., Yoshida, S. (2010). Bivariate Long Term Fuzzy Time Series Forecasting of Dry Cargo Freight Rates, *The Asian Journal of Shipping,* 26(2): 205-223.

Duru, O., Bulut, E., Yoshida, S. (2012). A Fuzzy Extended DELPHI Method for Adjustment of Statistical Time Series Prediction: An Empirical Study on Dry Bulk Freight Market Case, *Expert Systems with Applications,* 39: 840-848 .

Duru, O., Yoshida, S. (2009). Judgmental Forecasting in the Dry Bulk Shipping Business: Statistical vs. Judgmental Approach, *The Asian Journal of Shipping,* 25(2): 189-217.

Ennew, C. and Waite, N. (2007). Financial Services Marketing. London: Routledge.

Frank, R.H. (2007). Microeconomics and Behavior. New York: McGraw-Hill.

Gorton, L., Ihre, R. and Sandevarn, A. (2007). Shipbroking and Chartering. London: Lloyd's of London Press.

Güler, M.F. (1990). *ARIMA Modelleriyle Gelecek Tahmini Ve THY Yolcu Sayıları Üzerine Bir Deneme*. (Unpublished Doctoral Dissertation). İstanbul: İstanbul Üniversitesi İktisat Fakültesi.

Hinterhuber, A. (2008). Customer value-based pricing strategies: why companies resist. *Journal Of Business Strategy* 29(4): 41.

Hollensen, S. (2010). Global Marketing – A Decision-oriented Approach 5th Edition. London: Prentice Hall.

Horasan, E.B. (2011). *Box-Jenkins Modeli ile Bağımsız Denetim Uygulaması.* (Unpublished Master Dissertation). İstanbul: Marmara University Graduate School of Social Science.

Indounas, K. (2006). "Making Effective Pricing Decisions", Business Horizons, 49(5): 415-424.

Institute of Chartered Shipbrokers (2011). Dry Cargo Chartering. London: Witherby.

International Monetary Fund (2010). Export and Import Price Index Manual Theory and Practice.

Istanbul Freight Index. "About Us", http://en.istfix.com/Content.php?ContentID=145 (21.05.2015)

Jorgensen, P.L. and De Giovanni, D. (2010). Time Charters with Purchase Options in Shipping: Valuation and Risk Management. Applied Mathematical Finance, 17(5): 399-430.

Kotler, P. and Armstrong, G. (2011). Principles of Marketing. New Jersey: Prentice Hall.

Kvanli, A.H., Pavur, R.J. and Guynes, C.H. (2000). Introduction to Business Statistics, Fifth Edition. South-Western.

Landsburg, S.E. (2007). Price Theory and Applications, Seventh Edition. Thomson South-Western.

Lewis, K. and Housden, M. (1998). An Introduction To Global Marketing. London: Kogan Page.

Lun, Y.H.V., Lai, K.H, Cheng, T.C.E. (2010). Shipping and Logistics Management. London: Springer.

McConville, J. (1999). Economics of Maritime Transport. London: Witherby & Co.

Mihailov, A., Rumler, F., Scharler, J., (2011). Inflation dynamics in the new EU member states: how relevant are external factors? *Review of International Economics* 19(1): 65–76.

Mocatta, A.A., Mustill, M.J., and Boyd, S.C. (1974). Scrutton on Charterparties and Bills of Lading. London: ICS.

Mucuk, İ. (2010). Pazarlama İlkeleri. Türkmen, İstanbul.

Neuman, W.L. (2006). Social Research Methods: Qualitative and Quantitative Approaches, 6th Edition. Wisconsin: Pearson

Newbold, P., Carlson, W.L. and Thorne, B.M. (2007). Statistics for Business and Economics, Sicth Edition. New York: Prentice Hall.

OECD (2005). Methodological Guide For Developing Producer Price Indices For Services.

Ozer, T. and Çetin, I.T. (2012). A Study on The Charter Type Choice of Turkish General Cargo And Drybulk Shipowners. *Asian Journal of Shipping and Logistics,* 28(2): 203-226.

Schultze, C.L. (2003). The Consumer Price Index: Conceptual Issues and Practical Suggestions",Journal of Economic Perspectives, 17(1): 3-22.

Skouras, T., Avlonitis, G.J., Indounas, K.A., (2005). "Economics and Marketing on Pricing: How and Why Do They Differ?", *Journal of Product and Brand Management*, 14(6): 362-374.

Slack, B., Gouvernal, E. (2011). Container Freight Rates and the Role of Surcharge, *Journal of Transport Geography*, 19: 1482- 1489.

Sommers, M.S., Barnes, J.G., Stanton, W.J., Etzel, M.J., Walker, B.J. (1992). Fundamentals of Marketing, Sixth Edition. Vancouver: McGraw-Hill.

Stone, M.A., Desmond, J. (2007). Fundamentals of Marketing. New York: Routledge.

Stopford, M. (1997). Maritime Economics, Second Edition. London: Routledge.

Şimşek, N. (1998). Fiyatlarının Konjonktürel Davranışına İlişkin Bir Araştırma, 1963-1995 Türkiye Örneği, Unpublished Masters Thesis, İzmir: Dokuz Eylül Üniversitesi, Sosyal Bilimler Enstitüsü.

The Baltic Exchange (2015). Guide to Market Benchmarks.

The Baltic Exchange. "About Us", http://www.balticexchange.com/market-information/methodology.shtml, (11.11.2014)

The United States Bureau of Labor Statistics. (2007). Bureau of Labor Statistics Handbook of Methods Chapter 17: The Consumer Price Index.

Tiwari, A.K., Mutascu, M. and Andries, A.M. (2013). Decomposing Time-Frequency Relationship Between Producer Price and Consumer Price Indices in Romania through Wavelet Analysis. *Economic Modelling,* 31(1): 151-159.

Türkbal, A. (1981). *Bilimsel Araştırma Metodları Ve Uygulamalı İstatistik*. Erzurum: Atatürk Üniversitesi Yayınları.

Veenstra, A.W., Franses, P.H. (1997). A Co-Integration Approach to Forecasting Freight Rates in the Dry Bulk Shipping Sector, *Transportation Research Part A: Policy and Practice,* 31(6): 447-458.

Weieres, R.M. (2008). Introduction to Business Statistics, Sixth Edition. Thomson South-Western.

Wilmshurt, J., Mackay, A. (2002). Fundamentals of Marketing, Forth Edition. London: Butterworth Heinemann.

Woods, P.J. (2000). Tanker Chartering. London: Witherby.

Yalta, A.T. (2011). Zaman Serileri Ekonometrisine Giriş Box-Jenkins Yöntemi Published Lecture Notes. Ankara: TOBB Ekonomi ve Teknoloji Üniversitesi.

Yang, Z., Jin, L., Wang, M. (2011). Forecasting Baltic Panamax Index with Support Vector Machine, *Journal Of Transportation Systems Engineering And Information Technology,* 11(3): 50-57.

Zikmund, W.G., d'Amico, M. (2001). Effective Marketing, Third Edition. South-Western

APPENDICES

Appendix 1: Interview Form

Egemen ERTÜRK

Dokuz Eylül Üniversitesi

Sosyal Bilimler Enstitüsü

Denizcilik İşletmeleri Yönetimi Anabilim Dalı

Denizcilik İşletmeleri Yönetimi Yüksek Lisans Programı (İngilizce)

Tel: 0 543 574 46 42

E-mail: egemen.erturk@deu.edu.tr

Sayın Yetkili,

Bu çalışmanın amacı, Türkiye'deki dökme yük taşımacılığı navlunlarının etkilendiği kalemleri ve bu kalemlerin ağırlığını tespit ederek navlunların gelecekte nasıl dalgalanmalar gösterebileceğini zaman serisi modeliyle tahminlemektir. İki aşamada yürütülecek olan araştırmanın ilk aşamasını, örneklemi oluşturan broker ve dökme yük armatörlerinin navlunları etkileyen faktörler ile ilgili cevaplayanın yorumuna dayalı soru formu oluşturmaktadır. Bu aşamadaki bulgulardan yola çıkılarak araştırmanın ikinci aşaması hazırlanacaktır. Araştırma sürecinde elde edilen tüm bilgiler istatistik amaçlı kullanılacak olup, firmaların adları ve özel bilgileri **kesinlikle açıklanmayacaktır.** Çalışma tamamlandığında isteğiniz doğrultusunda sonuçların bir kopyasına bizden ulaşabilirsiniz. Yardımlarınız için şimdiden teşekkür eder ve işlerinizde başarılar dileriz.

Saygılarımla,

Egemen Ertürk

Bu çalışma Doç.Dr. İsmail Bilge ÇETİN'in danışmanlığında gerçekleştirilmektedir.

Tel: 0 232 301 88 21

E-Posta: ismail.cetin@deu.edu.tr

SORULAR

1. Yaptığınız kira sözleşmelerinde size göre navlunu etkileyen faktörler nelerdir? (Önem sıralamasını göz önünde bulundurarak belirtiniz)

2. Yakıt fiyatları navlununuzu etkiler mi, ne ölçüde etkiler?

3. Liman masrafları, kanal-boğaz ücretleri navlununuzu etkiler mi, ne ölçüde etkiler?

4. Running Costlar (Manning, stores, consumables, provision, repair and maintenance, surveys,inspections, certificates, classification, insurance, drydocking) navlununuzu etkiler mi, ne ölçüde etkiler?

5. Navlun endekslerini kullanıyor musunuz?

6. Hangi navlun endekslerini kullanıyorsunuz? (ISTFIX – Baltic Dry Index, diğer)

7. ISTFIX ve Baltic Exchange'in yayınladığı hangi verileri kullanıyorsunuz ? (Endeks değerleri, Navlun oranları, Piyasa raporu, Gemi alım-satım raporu)

8. ISTFIX ve Baltic Exchange'in dışında hangi piyasa raporlarını (market report) kullanıyorsunuz?

9. Kullandığınız piyasa raporlarının hangi özellikleri kullanıyorsunuz?

10. İşletme olarak navlun tahminlemesi yapıyor musunuz? Yapmıyorsanız yayınlanan navlun tahminlerinden yararlanıyor musunuz?

11. Yararlandığınız navlun tahminlemeleri gerçekleşen piyasa değerleriyle örtüşüyor mu ?

12. Kaç aylık tahminlemeler gerçek piyasa değerleriyle örtüşmektedir ?

PROFİL BİLGİLERİ

(Aşağıdaki sorular istatistiksel amaçlı kullanılacak ve kesinlikle gizli tutulacaktır.)

Profil Bilgileri:

Ad Soyad

Göreviniz:

Tecrübe süreniz:

Yaşınız:

Eğitim durumunuz: ( ) Lise ( ) Lisans ( ) Yüksek Lisans ( ) Doktora

Şirket Bilgileri:

Şirket Adı:

Kuruluş yılı:

Bulunduğu şehir :

Yaklaşık personel sayısı:

Çalışmanın sonuçlarını tarafınıza iletmemizi ister misiniz? ( ) EVET ( ) HAYIR

Katılımınız için Teşekkür ederiz.

Appendix 2: The Baltic Exchange Full Route Descriptions

Baltic Exchange Capesize 2014 Index (BCI)

The Baltic capesize 2014 vessel is based on the following description:

180,000mt dwt on 18.2m SSW draft

Max age 10 yrs

LOA 290m, beam 45m, TPC 121

198,000cbm grain

14 knots laden/15 knots ballast on 62mt fuel oil (380cst), no diesel at sea

When considering the prevailing timecharter market rate for the Baltic capesize vessel, panellists should assume that, if steaming at 12 knots laden or 13 knots ballast, the vessel will consume 43mt fuel oil (380cst), no diesel at sea.

Routes

C2

Tubarao to Rotterdam. 160,000lt iron ore, 10% more or less in owner's option, free in and out. Laydays/cancelling 20/35 days from index date. 6 days, Sundays + holidays included all purposes. 6 hrs turn time at loading port, 6 hrs turn time at discharge port, 0.5% in lieu of weighing. Freight based on long tons. Age max 18 yrs. 3.75% total commission.

C3

Tubarao to Qingdao. 160,000mt or 170,000mt iron ore, 10% more or less in owner's option, free in and out. Laydays/cancelling 20/35 days from index date. Scale load/30,000mt Sundays + holidays included discharge. 6 hrs turn time at loading port, 24 hrs turn time at discharge port. Age max 18 yrs. 3.75% total commission.

C4

Richards Bay to Rotterdam. 150,000mt coal, 10% more or less in owner's option, free in and out, trimmed. Laydays/cancelling 25/40 days from index date. Scale

load/25,000mt Sundays + holidays included discharge. 18 hrs turn time at loading port, 12 hrs turn time at discharge port. Age max 15 yrs. 3.75% total commission.

C5

West Australia to Qingdao. 160,000mt or 170,000mt iron ore, 10% more or less in owner's option, free in and out. Laydays/cancelling 10/20 days from index date. Scale load/30,000mt Sundays + holidays included discharge. 6 hrs turn time at loading port, 24 hrs turn time at discharge port. Age max 18 yrs. 3.75% total commission.

C7

Bolivar to Rotterdam. 150,000mt coal, 10% more or less in owner's option, free in and out, trimmed. Laydays/cancelling 20/35 days from index date. 50,000mt Sundays + holidays included load, 25,000mt Sundays + holidays included discharge. 12 hrs turn time at loading port, 12 hrs turn time at discharge port. Age max 15 yrs. 3.75% total commission.

C8_14

Delivery Gibraltar-Hamburg range, laydays/cancelling 3/10 days from index date, transatlantic round voyage, redelivery Gibraltar-Hamburg range, duration 30-45 days. Basis the Baltic capesize 2014 vessel. 5% total commission.

C9_14

Delivery Amsterdam-Rotterdam-Antwerp range or passing Passero, laydays/cancelling 3/10 days from index date, redelivery China-Japan range, duration about 65 days. Basis the Baltic capesize 2014 vessel. 5% total commission.

C10_14

Delivery China-Japan range, laydays/cancelling 3/10 days from index date, redelivery China-Japan range, duration 30-40 days. Basis the Baltic capesize 2014 vessel. 5% total commission.

C14

Delivery Qingdao spot or retroactive up to a maximum 15 days after sailing from Qingdao, round voyage via Brazil, redelivery China-Japan range, duration 80-90 days. Basis the Baltic capesize 2014 vessel. 5% total commission.

C15

Richards Bay to Fangcheng. 160,000mt coal, 10% more or less in owner's option,

free in and out, trimmed, scale load / 30,000mt Sundays + holidays included discharge. 18 hrs turn time at loading port, 24 hrs turn time at discharge port. Laydays/cancelling 25/35 days from index date. Age max 15 yrs. 5% total commission.

C16

Delivery North China-South Japan range, 3-10 days from index date for a trip via Australia or Indonesia or US west coast or South Africa or Brazil, redelivery UK-Cont-Med within Skaw-Passero range, duration to be adjusted to 65 days. Basis the Baltic capesize 2014 vessel. 5% total commission.

C17 Saldanha Bay to Qingdao. 170,000mt iron ore 10% more or less in owner's option, free in and out trimmed. Laydays/cancelling 20/30 days from index date. 90,000 Sundays + holidays included load / 30,000 Sundays + holidays included discharge. 18 hrs turntime at loading port, 24 hrs turntime at discharge port. Max age 18 yrs. 5 % total commission. (This route does not contribute to the BCI.)

Baltic Exchange Panamax Index (BPI)

The Baltic panamax vessel is based on the following description:

• 74,000mt dwt on 13.95m SSW draft

• Max age 12 yrs

• LOA 225m, beam 32.2m

• 89,000cbm grain

• 14 knots on 32mt fuel oil (380cst) laden/28mt fuel oil (380cst) ballast, no diesel at sea.

Routes

P1A_03

Delivery Skaw-Gibraltar range, loading 15-20 days from index date, transatlantic round voyage, including east coast South America, redelivery Skaw-Gibraltar range, duration 45-60 days. Basis the Baltic panamax vessel. Cargo basis grain, ore, coal or similar bulk harmless cargo. 3.75% total commission.

P2A _03

Delivery Skaw-Gibraltar range, loading 15-20 days from index date, for a trip via east coast South America, US Gulf or US east coast to Asia, redelivery Taiwan-

Japan range, duration 60-65 days. Basis the Baltic panamax vessel. Cargo basis grain, ore, coal or similar bulk harmless cargo. 3.75% total commission.

P3A _03

Delivery Japan-South Korea range, loading 15-20 days from index date, transpacific round voyage, either via Australia or Pacific (not including short rounds such as Vostochny to Japan), redelivery Japan-South Korea range, duration 35-50 days. Basis the Baltic panamax vessel. Cargo basis grain, ore, coal or similar bulk harmless cargo. 3.75% total commission.

P4 _03

Delivery Japan-South Korea range, loading 15-20 days from index date, for a trip via US west coast- British Columbia range or Australia, redelivery Skaw-Passero range, duration 50-60 days. Basis the Baltic panamax vessel. Cargo basis grain, petroleum coke, coal or similar bulk harmless cargo. 3.75% total commission..

Baltic Exchange Supramax Index (BSI)

The Baltic supramax vessel is based on a standard "Tess 52" type vessel of the following description:

• 52,454mt dwt on 12.02m SSW draft

• Max age 15 yrs

• LOA 189.99m, beam 32.26m

• 67,756cbm grain, 65,600cbm bale

• 5 holds, 5 hatches

• 4 x 30mt cranes with 12cbm grabs

• 14 knots laden/14.5 knots ballast on 30mt fuel oil (380cst), no diesel at sea

Routes

S1A

Delivery Antwerp-Skaw range, laydays/cancelling 5/10 days from index date, redelivery Singapore-Japan range (including China), duration 60-65 days. Basis the

Baltic supramax vessel. 5% total commission.

S1B

Delivery passing Canakkale, laydays/cancelling 5/10 days from index date, redelivery Singapore-Japan range (including China), duration 50-55 days. Basis the Baltic supramax vessel. 5% total commission.

S2

Delivery South Korea-Japan range, laydays/cancelling 5/10 days from index date, for an Australian or transpacific round voyage, redelivery South Korea-Japan range, duration 35-40 days. Basis the Baltic supramax vessel. 5% total commission.

S3

Delivery South Korea-Japan range, laydays/cancelling 5/10 days from index date, redelivery Gibraltar-Skaw range, duration 60-65 days. Basis the Baltic supramax vessel. 5% total commission.

S4A

Delivery US Gulf, laydays/cancelling 5/10 days from index date, redelivery Skaw-Passero range, duration about 30 days. Basis the Baltic supramax vessel. 5% total commission.

S4B

Delivery Skaw-Passero range, laydays/cancelling 5/10 days from index date, redelivery US Gulf, duration about 30 days. Basis the Baltic supramax vessel. 5% total commission.

Baltic Exchange Handysize Index (BHSI)

The Baltic Exchange handysize vessel is based on the following vessel description:

• 28,000mt dwt on 9.78m SSW draft

• Max age 15 yrs

• LOA 169m, beam 27m

• 37,523cbm grain, 35,762cbm bale

• 5 holds, 5 hatches

• 4 x 30mt cranes

• 14 knots average laden/ballast on 22mt fuel oil (380cst), no diesel at sea

Routes

HS1

Delivery Skaw-Passero range, laydays/cancelling 5/10 days from index date, redelivery Recalada-Rio de Janeiro range, duration 35-45 days. Basis the Baltic handysize vessel. 5% total commission.

HS2

Delivery Skaw-Passero range, laydays/cancelling 5/10 days from index date, redelivery Boston-Galveston range. Duration 35-45 days. Basis the Baltic handysize vessel. 5% total commission.

HS3

Delivery Recalada-Rio de Janeiro range, laydays/cancelling 5/10 days from index date, redelivery Skaw-Passero range, duration 35-45 days. Basis the Baltic handysize vessel. 5% total commission.

HS4

Delivery US Gulf, laydays/cancelling 5/10 days from index date, for a trip via US Gulf or north coast South America, redelivery Skaw-Passero range, duration 35-45 days. Basis the Baltic handysize vessel. 5% total commission.

HS5

Delivery South East Asia, laydays/cancelling 5/10 days from index date, trip via Australia, redelivery Singapore–Japan range including China, duration 25-30 days. Basis the Baltic handysize vessel. 5% total commission.

HS6

Delivery South Korea-Japan range, laydays/cancelling 5/10 days from index date, trip via North Pacific, redelivery Singapore-Japan range including China, duration 40-45 days. Basis the Baltic handysize vessel. 5% total commission.