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Shipping asset pricing: a Rubinstein bargaining approach

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Shipping Asset Pricing: A Rubinstein Bargaining Approach.

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Declaration

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

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

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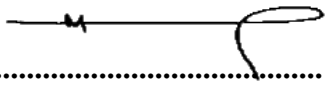
(Signature):  .....

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Abstract

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The shipping industry is usually secretive with less visibility to market information. Additionally, the products such as freight and assets traded in the shipping markets lack standardisation. Hence the trade between the buyers and sellers is conducted through continuous back-and-forth negotiation, via a physical broker. These three characteristics, (i) asymmetric information, (ii) non-standardised products, and (iii) involvement of physical brokers generates room for bargaining while trading shipping assets or services. This study utilises a simple dynamic bargaining game model by Rubinstein (1982) to (i) estimate the bargaining surplus, (ii) bargaining power, and (iii) the range of acceptable trade price for the buyer and the seller, at a per trade level, in the sales and purchase shipping market. In a way to achieve so, this study estimates the seller's minimum and buyer's maximum trading price and closely examinese minimum discount factor of the players for individual translation. Moreover, this research identified the factors that affect the bargaining power of the players in the S & P shipping market. For the purpose of the study monthly cross-sectional data has been collected from Clarkson's SIN between 2019 to 2022 for the three sizes of bulk carriers (Capesize, Panamax, and Handymax).

The result suggested that between the two players (buyer and seller), the minimum discount factor of the buyer is higher than the minimum discount factor of the seller throughout the study period. This implies that the buyer had more bargaining power compared to the seller throughout the study period. Further, this research examined the factors affecting the bargaining power of the players and argued that four broad categories highly affect the bargaining power of players in the S & P shipping market. Among them, the first one has considered market-related factors; the second and final categories are the product and the buyer (seller) characteristics, which affect the bargaining power of the players in the S & P shipping market.

KEYWORDS: Bargaining **s**urplus, discount factor, S&P Market, trading range.

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List of Abbreviations

AVG	Average
B2B	Business to Business
BM	Buyer's maximum
BSP	Buyer's surplus
DF	Discount factor
EPD	Earning per day
FPO	First Precise officer
GPA	Global human population
HSFO	High Sulfur fuel oil
ICT	Information and communication technology
LIBOR	London interbank Offered Rate
Min D. F	Minimum discount factor
NBP	New building price
OLS	Ordinary Least squares
OPD	Operational day in a year
PT	Today's vessel price
PV	Present Value
RL	Remaining life
S&P	Sale and Purchase
SHP	Shipping
SIN	Shipping Intelligence Network
SM	Seller's maximum
SSP	Sellers Surplus
SV	Scrap value
TP	Transaction price
TSP	Total surplus

USD	United States Dollar
VLCC	Very large crude oil carrier

Chapter 1: Introduction

Bargaining is not rocket science, but it is such a game where one may fail to gain the process due to depending on only simple intuition. However, searching the relevant information and understanding the overall situation might be helpful for better preparation for the bargaining game. Actually, the concept of bargaining is closely related to our daily life for collaborating for mutual benefit, getting a discounted price, or better terms and conditions of trade (Nash, 2016). In modern society, bargaining is a pervasive phenomenon, ranging from simple wage and trade negotiations to costly talk for arms control to haggling in the open market (Muthoo,1999). For making a better performance through suitable offers and counteroffers in the bargaining table, it is very important to learn the hidden strategies such as characteristics of the counterpart, proper timing for proposal, and searching the relevant information for gaining knowledge before starting the bargaining game (Shell, 2006). In general, for negotiating the price and terms of a contract for a tradeable product or service, the bargaining game may start between the sellers and buyers. During the bargaining situation, it is essential to attentively listen to the counterpart's claim and critically analyse what kind of signals he/ she uses to fulfil his/her requirements.

The bargaining concept is broadly used in the real estate and fine art market due to the uniqueness of the product (Phillips et al., 2016). Similarly, due to the illiquid nature of shipping assets (Ådland & Koekebakker, 2004), the concept of bargaining is widely used in the second-hand shipping market. However, bargaining is also visible in other markets where similar or identical products or services are sold. For instance, car market, insurance, mortgage, various business-to-business market, and personal loan (Phillips et al., 2016). Depending on the outcome of the bargaining process, the price of similar items in this market may change frequently. Overall, the final deal mostly depends on the buyer's willingness to pay, the seller's willingness to sell, and the bargaining power of the buyer and seller. In almost all the bargaining literature, one of the very common terms is frequently used, called bargaining power. In a bargaining game, both the players utilize this power to influence the price and terms and conditions of the contract in their own favour to gain more surplus from the trade (Martin, 1992). Actually, the bargaining surplus is the difference between the seller's

and buyer's asset valuation for a specific trade. So, the player who has higher bargaining power indicates that he/ she might receive the highest portion of surplus from the deal vis-a-vis the player with lower bargaining power. The terms of bargaining and negotiation are sometimes used and vice versa to refer to a communication process for reaching an agreement between two or more parties of their mutual interest. But there are some differences between these two terms. For instance, bargaining is a communication process where two parties are mainly focusing on the price of a specific commodity they wish to buy and sell, so it is not dealing with multiple issues. However, negotiation is related to a wide variety of issues and sub-issues for reaching an agreement before the final deal (Roberton, 2019). For a better understanding of the bargaining process, it is essential to be familiar with some standard terms that are widely used in the price bargaining game: the seller's minimum price, the buyer's maximum price, and the trading zone of a bargaining game (figure1).

According to the figure1, the seller's (buyer's) minimum (maximum) price is their internal price for willingness to sell (buy) a specific product or service (Song, 1995) in a specific period. Moreover, the trading zone or Deal zone is the price range between the seller's minimum price and the buyer's maximum price (Roberton, 2019). Further, the bargaining surplus is the outcome of the total bargaining game, which is determined by the characteristics of the players, the product, and market-related factors (Zhang et al., 2018).

Figure1: Trading zone and the buyers (sellers) maximum (minimum price)[1]

Multiple offers and counter offers are made in a bargaining situation. Firstly, an offer is made by player 1, then player 2 either rejects or accepts the offer. If player 2 accepts the offer, then the game ends, but if he/she rejects the offer and makes a counter offer then the game continues until they reach an agreement or the bargaining is terminated by the parties. Bargaining surplus is the outcome of the bargaining game. When they reach an agreement, the surplus is distributed between the parties as per their bargaining power. Like bilateral bargaining, multilateral bargaining is also common in many political or economic situations, where negotiation continues between a group of agents to split some surplus among the parties (Yildirim, 2007). For instance, two nations may involve in a negotiation process to resolve the disputed territory issue, fund distribution decisions across the states, and negotiate among parties for government formation.

In the shipping industry, almost all contracts are signed when two parties agree on an agreement through multiple negotiation processes. During the early 1990s, the liner shipping business was dominated by liner conferences. It is basically a self-regulated arrangement between the shipping lines, which fixes the rates in each trade.

[1] According to figure1, the buyer's (seller's) maximum(minimum) price is the individual internal price for willingness to buy (sell) a specific product. And trading zone is the range of the price between seller's minimum and buyer's maximum price.

According to this arrangement, there was no chance for negotiation between the carriers and the shippers, which caused enormous problems for the shipping business. The negotiation process became more convenient for the shippers and carriers after modifying the ocean shipping reform act (OSRA) in 1998 by the US government (Baboo & Thomchick, 2003). Replacing the conference system with OSRA has enabled the carriers to negotiate on various issues, including terms of the contract, price, trade lanes, and overall services, with the shippers. Thus, the shipping business became more flexibility. In the shipping industry four shipping markets (new building, sales & purchase, freight, and scrap) are highly correlated (Stopford, p-178). Hence like the freight market, all contracts of sales & purchase (S & P) market are also conducted through multiple negotiation processes. Further, there is no standard format for trading in the S & P shipping market (Kuester Simic & Prigge, 2016); and due to differences in technical specifications and unique characteristics, each ship is different from the others. This means that a vessel is heterogeneous by nature, and for these unique characteristics, there is no specific rule for determining the price of a ship in the S& P market (Stopford, 2008). Hence, the role of price bargaining can play a vital role in determining the price of a second-hand ship in the S & p shipping market.

1.1. Aims and objectives of the study

In the shipping industry, there are mainly four types of market, such as freight market, sale and purchase market, new building market, and demolition market (Stopford, 2008, p.175). Although the four markets are separate, they are highly correlated. (Lun et al., 2010, p. 33). Among the four markers, the new building market is related to the construction of new vessels as per the demand of the customers; the freight revenue is generated by the freight market, which is considered the main source of cash for the ship owners; the demolition market deals with the ship scrapping activities after the operational life of a vessel. However, the second-hand market is considered the sales and purchase market, where second-hand ships are traded between potential buyers and sellers through multiple bargaining processes (Stopford, 2008, p.198-199). Hence understanding the concept of bargaining might be helpful for the

participants for the successful completion of the deal in the S&P market. In contrast, if the participants failed to reach an agreement due to unsuccessful bargaining situations, in that case, no payoff is gained by any party. As such, the objective of this study is to study the role of bargaining and apply the price bargaining concept in the S & P market to estimate the shipping asset price and bargaining surplus for the individual transaction. In the S & P market, the parties who are involved in a trade are also shipowners, so transaction in this market does not affect the overall volume of cash (Stopford, 2008, p.178) and the actual fleet capacity of the shipping industry (Fan et al., 2021). However, the S & P activities are helpful in developing the fleet size of the individual shipping companies by acquiring vessels within a short time. In addition, the buyers also enjoy some benefits, such as less capital required to acquire a second-hand ship compared to new construction of the same size and specification. Further, it is also possible to have instant access to the market to meet the present demand instead of waiting around two years to construct a new vessel. As such, the sales and purchase (S&P) marker play an important role in the shipping industry; as thousands of second-hand vessels are bought and sold in this market every year (Ma 2020, P. 204) with an annual average price of over USD seventeen billion (Clarkson's SIN). However, the volume of sales in the S&P market dramatically increased last year; around 2,547 vessels of 148 million DWT were traded in the sale and purchase market, with an approximate value of over 49 billion USD in 2021. Among these, 972 bulk carriers with 65.5 million DWT, 510 containerships of 1.6 million TEUs, and 526 tankers with 58.4 million DWT were sold in the sale and purchase market (Clarkson's SIN). Considering all, this study critically analysed the individual trade to identify the relationship between the price of the vessel and the bargaining power of the players in the S & P shipping market.

As bargaining plays an important role in the completion of a trade in the S& P market, studying the role of bargaining can be helpful in strengthening the capacity of the S & P market and ensuring the sustainable growth of the modern shipping industry. However, there is a lack of research and no standard format for applying the bargaining concept in the S & P market. As such, both the buyers and sellers may face some difficulties in trading in this market, which also creates trade uncertainty between the players. Due to the high demand for the shipping service, the price of the

vessel increased in 2021, which was almost double in 2021 (Clarkson's SIN), and the shipowners who were interested in asset playing activities (buying low selling high) had taken advantage of this strong market. As shipping is a capital-intensive industry and a large volume of ships are trading in the S & P market through multiple negotiation processes, so better learning the bargaining concept might be helpful for the players to collaborate on their common benefits in different ways. Since most of the trades in this market involve physical interaction between two players (buyers and sellers), understanding the characteristics of the counterpart might also be helpful to gain more surplus from the trade. Due to the heterogeneous characteristic, lack of standardization, and asymmetric information in the second-hand shipping market, bargaining is widely used to determine the price of the second-hand ship (Stopford, 2008). Hence, this research also focused on examining the characteristics of the buyers and sellers by estimating the discount factor of the players. The player with more discount factor indicates more patience to finish the deal than the counterpart.

In the S & P market, the price of a ship and the players' bargaining power may vary according to the operational history, technical specification, size, speed of the vessel, the characteristics of the players, and the market. For instance, among others, if the vessel has any detention history, the buyer may consider that the vessel may have some lack of proper maintenance, safety-related, or any other technical issues. In that case, the bargaining power of the seller decreases in accordance with the previous history of the vessel and the reputation of the seller. Considering that, this paper also examined the factors that may affect the bargaining power of the players in the S & P shipping market. From a shipowner's perspective, it is impossible to generate huge revenue by operating a ship; however, the sale and purchase can be considered an important source of revenue in the shipping industry. So, it is to be argued that ship owners have two roles. One is operating the ship - making a profit through cargo transportation. The other - deciding to buy a vessel in a weak market and sell it in the peak market to make a huge profit (Stopford, 2009). As such many shipping companies in Japan and Europe not only focus on the transportation of freight but also focus on gaining maritime knowledge and information for better performance in the chartering, consulting, ship valuation, and sale and purchase of ships (Park et al.,

2018). Thus, understanding the price bargaining concept might be helpful for the successful trade and sustainable growth of the S&P shipping market.

The shipowner of the advanced shipping country, i.e., Greene, Singapore, Japan, and the United Kingdom, can benefit more from the S & P market compared to the other shipowner. It happens due to having updated knowledge, more experience, and more information than the other shipping companies worldwide. In the modern shipping industry, it is essential to remain competitive and ensure sustainable growth by acquiring modern vessels through the S & P activities with practising price bargaining models in this industry. Hence by understanding the overall bargaining process, the players may gain knowledge about the characteristics of the market, vessel-related factors, and the characteristics of the counterpart, which may be helpful for making a successful transaction.

Several studies have been conducted to analyze the factors that affect the price of the vessels (assets) and services in the shipping industry. For instance, Alizadeh and Nomikos, (2007), focused on developing strategies for trading vessels through S & P activities, Tvedt (1997); Kavussanos and Alizadeh (2002), studied the pricing of the ships for making investment decisions, and Fan & Luo (2013), analysed the investment decision by ship choice to expand the fleet capacity. It gives necessary information to the players for a better understanding of the overall characteristics of the shipping industry. However, there was no significant study to identify the factors that affect the bargaining ability of the buyers and sellers in the sale and purchase shipping market. Whereas, price bargaining is considered a crucial detriment of the second-hand shipping market.

Due to the lack of academic literature and the shortage of data on a per-trade basis, buyers and sellers are deprived of gaining knowledge about the picture (offers and counteroffers) of an individual trade. Keeping it in mind, this study analysed the individual trading range to gain knowledge on the buyer's maximum price willing to buy and the seller's minimum price willing to sell in a specific trade. It may help to determine the characteristics of the buyers and sellers for the individual trade. The bargaining model is widely used in the real estate market, automobile market, hospital health care literature (Brooks & Wong, 1997), insurance, labour market (Cahuc et al.,

2006), and tourist market. Since there are some common characteristics between the real estate and shipping market, this study has used the basic bargaining model to determine the surplus of the players in the S & P shipping market. It might be helpful for the players to determine the final trading price.

Considering the aforementioned in mind, this study is expected to analyze the role of bargaining in determining the individual trading range by examining the minimum discount factors and the bargaining surplus of the players. This might be helpful in establishing a perfect trading mechanism by implementing a price bargaining model in the sale and purchase shipping market. In addition, by starting a systematic analysis for operationalizing the bargaining concept in the sale and purchase shipping market, it is possible to determine the factors that affect the bargaining power of the buyer and seller in the S & P shipping market. For estimating the final trading price and splitting the bargaining surplus, this study highly focused on the bargaining power of the players by analyzing the reservation price (buyer's maximum and seller's minimum price) and minimum discount factor of the players. Further, this study aimed to motivate scholars and researchers to think about barging in a new way, in line with the application of the bargaining concept to determine the price of shipping assets in the S&P market.

1.2. Research questions

In accordance with the purpose of the study, this research mainly discussed the following questions:

- How to operationalize the price bargaining model to estimate the bargaining surplus in the sale and purchase (S & P) shipping market?
- What factors are affecting the bargaining power of the players in the S & P shipping market?

1.3. Contribution of the study

In the shipping literature, there has been long-term interest in pricing the shipping asset and identifying the factors affecting the asset and service prices for efficient decision-making. However, in order to better understand the pricing mechanism in the sale and purchase shipping market, it is essential to analyze the factors that influence the bargaining ability of the buyers and sellers. Because in the S & P market, almost all contracts are signed when two parties are agreed with an agreement through multiple negotiation processes. Hence the player who has more bargaining power can be able to gain more surplus than the other player (Wilhelmsson, 2008). Considering these, this study critically analysed the four major factors that highly affect the bargaining power of the players in the S & P market, such as the characteristics of the buyers (sellers), the market-related factors, and finally, product-related factors (Zhang et al.,2018). Since bargain power varies in accordance with the characteristics of players, hence, the knowledge gained from the study might be beneficial for the buyers and sellers for their better preparation in the bargaining process, which might be helpful for making a successful transaction in the S & P shipping market. In addition, by assuming the character of the market (bullish/bearish), the seller can be able to estimate his / her asking price, which is also considered the offer price. The higher asking price indicates the higher bargaining power of the seller due to the higher discounting factor and higher patience compared to the counterpart (Arnold, 1999).

Moreover, this study analysed both parties' reservation prices (sellers' minimum price willing to sell and buyers' maximum price willing to buy) for an individual trade, so the sellers and buyers could estimate their reservation price for a successful transaction in the S & P shipping market. Since the reservation price plays an important role in the successful completion of the transaction in the S & P market; hence if the sellers have a higher reservation than the buyer's maximum price, then there is no chance for trade due to the high expectation of the seller (Song, 1995). Thus, this study focuses on reservation prices in line with the characteristics of the players, market, and products that may be more interesting for the buyers and sellers for trading in the S & P shipping market. Although there is a lack of research for applying the bargaining model in the S & P shipping market, bargaining is still widely used in the sales and

purchase shipping market without any standard structure. As such, this study applied the basic bargaining model (Rubinstein's dynamic bargaining game model) to estimate bargaining surplus for the individual trade by analyzing the discount factor of the buyers and sellers; which may also inspire the researchers and the maritime market analysts to analyze the concept of bargaining in a new way in accordance with the sale and purchase shipping market.

Further, this study estimated the discount factor of the buyers and sellers, which can provide some interesting information about the characteristics of the buyers and the sellers. For instance, the higher discount factor indicates that the player has more patience compared to the counterpart (Knight, 2005), so he/she might achieve more surplus from the trade due to more bargaining power. The final outcome of a bargaining process is to reach an agreement between the parties; that means if the party is able to reach the agreement, the surplus may divide between themselves. Considering that, the study also focuses on how to divide the surplus between the parties after successfully completing the contract. This will also help to make the trade more convenient for the players in the S & P shipping market.

1. 4. Brief findings

In accordance with the aims and objectives of the study, this paper attempted to shed light on four important issues for better understanding and applying the price bargaining concept in the S&P shipping market. First of all, it focused on the estimation of the characteristics of the shipping market; and identified that the price of a ship, including bargaining power and bargaining surplus of the players, highly depends on the characteristics of the market because the characteristics of the players are frequently changing in line with the behaviours of the shipping market. Secondly, in line with the characteristics of the market, this study analysed the buyer's maximum price willing to buy a vessel in the S& P market and the seller's minimum price willing to sell the same vessel in a specific period to estimate the bargaining surplus of the players. By applying the basic bargaining model (Rubinstein's dynamic bargaining game model), this paper examined the buyer's (seller's) maximum (minimum) trading range for an individual transition. By doing so, it was identified that there is a big gap between the buyer's maximum and seller's minimum price, which is

considered a total bargaining surplus for an individual transaction. By identifying the gap between the buyer (seller) maximum (minimum) price in the S & P shipping market, this study examined the importance of bargaining power for individual trade and claimed that well-informed players gained more surplus compared with the uninformed player.

Thirdly, we analysed the discount factor of the players and found that the minimum discount factor of the buyer is higher than the minimum discount factor of the seller. It indicates that the buyers traded in the S&P market are comparatively more patient than the sellers. Hence the buyers gained more surplus than the sellers throughout the study period. On the other hand, the actual trading price was very close to the seller's minimum price willing to sell; which indicates that the seller had an urgency to finish the deal. Hence, he/she offers less price for selling the vessel to meet the urgent demand. Due to less patience, the seller's discount factor was lower than the buyer's; forcing him/her to gain less surplus in the S & P market.

Finally, among the other variables, the size of the vessel affects the discount factor of the buyer and seller. This revealed that the bigger the vessel size, the lower the price due to low demand. Which ultimately pushes the seller for less discount factor. On the other hand, the discount factor of the seller increases in the case of selling a Handymax vessel in the sale and purchase shipping market. It has also been noted that due to the high demand for the Handymax vessels in the S & P market, 646 Handymax bulk carriers were sold between 01-09-2019 to 01-06-2022 (study period). However, this number was only 187 for Capesize bulk carriers. In accordance with the higher demand, the price of the vessel, as well as the discount factor of the seller, increased, which led to an increasing surplus for the seller compared with the buyer. This study also examined that the bargaining power of the players is highly correlated with the earning of a vessel. When the earnings of the vessel increased, then the total surplus of an individual trade also expanded. In contrast, the total surplus of an individual trade decreased when the earnings of a vessel were reduced. Moreover, this research analysed the relationship between the age of the vessels and the bargaining outcome of the players. This indicate that the bargaining power of the players are affected by the age of the vessel. In addition, bunker price, characteristics of the buyers and sellers, London interbank offer rate (LIBOR), and the scrap value

of the vessel also affect the bargaining ability, discount factor, and bargaining surplus in the second-hand shipping market.

1. 5. Structure of the thesis

This paper is structured as follows. Chapter 1 discussed the background of the study, aims and objectives, research question, contribution of the study, brief findings, and finally, the structure of the study. Chapter 2 provides a comprehensive literature review; of the most relevant literature related to the topic. This chapter identified the research gap between the previous study and the current research. Moreover, this chapter briefly introduced the sales and purchase (S&P) shipping market, the mechanism of trade in the S&P market, and the role of bargaining in the S& P market. Further, it discussed the bargaining model and contribution of the research to fill the research gap. Chapter 3 focused on the conceptual framework of bargaining behaviour in the S & P market. This chapter discussed four major factors that may affect the bargaining power of the players in the S & P shipping market: the character of the players (buyer and seller), characteristics of the market, and finally, product-related factors. Moreover, it focused on the operationalization of the bargaining concept in the S & P shipping market. Chapter 4 represented the data, method, and research design. Moreover, this chapter described the relationship between the dependent and independent variables. Further, it provides a critical analysis of the empirical results in accordance with the aims and objectives of the research. In addition, this chapter examines the factors that affect the bargaining surplus and the discount factor of the players in the S&P shipping market. Chapter 5 consists of a discussion, limitations, and scope of future research. Finally, chapter 6 ends with a conclusion and recommendation.

Chapter 2: Literature Review

2.1. Introduction

When two persons are involved in collaborating, their mutual benefit between themselves and taking the opportunity to divide the surplus in different ways is considered a bargaining situation (Nash, 2016). In the shipping industry, almost all contracts are signed when two parties agree on an agreement and trust that each party will perfectly honour the contract. Before an agreement is signed, both parties negotiate with each other on various issues and apply different strategies to achieve the terms and conditions of the contract, including the price in favour of them. Hence the player with more bargaining power gets more advantage and makes a profit than the other player (Wilhelmsson, 2008). So, bargaining can play a vital role in winning the negotiation process in the shipping market; almost all trades are conducted through physical interaction between buyers and sellers. Since the aim of the study is to apply the bargaining model in the sales and purchase (S&P) market to determine the shipping asset price, so first of all, this chapter discusses the S&P market in shipping, followed by the mechanism of trade and the role of bargaining in the S&P market. Then it analyses the theoretical development of price bargaining literature and the empirical literature on asset pricing for a better understanding of the bargaining concept. Finally, this chapter identifies the research gap by reviewing the existing relevant literature and also discusses the study's contribution to defining the research's importance.

2.2. Sale and purchase (S&P) market in shipping

In the shipping industry, there are mainly four types of markets: the freight market, second-hand market, new building market, and demolition (or recycling) market (Stopford, 2008, p.175). Although the four markets are separate, they are highly correlated. (Lun et al., 2010, p. 33). Among the four markers, the second-hand market is considered the sales and purchase market, where the second-hand ship is traded between buyers and sellers. Like the freight market, there are three players, such as buyers, sellers, and brokers usually involved in the sale and purchase market.

The average economic life of a ship is 25 years (Ma, 2020, P.204). So, in the shipping industry, it is very common that the ownership of a vessel changes several times in the whole economic life of a ship for various reasons, i.e., ups and downs of the market, increasing the maintenance cost, a crisis of the cash flow to maintain the operating cost, making a profit (minimizing the lose), replacing the old vessel, or due to the possibility of falling the price. Similar to the sellers, the buyers also have diverse objectives behind trading in the second-hand market, i.e., fulfilling the business commitment or thinking that it is the best time to invest in the shipping asset. Actually, the supply of the vessels does not affect due to the transaction of the S&P market. Because it only influences the carrying capacity of the individual company rather than the actual fleet of the shipping industry (Fan et al., 2021). On the other hand, the buyer also enjoys some benefits, such as less capital required to acquire a second-hand ship than new construction of the same size and specification. In addition, it is also possible to have instant access to the market to meet the present demand instead of waiting around two years to construct a new vessel. As such, the sales and purchase (S&P) market plays an essential role in the shipping industry, as thousands of second-hand vessels are bought and sold in this market every year (Ma 2020, P. 204), with a cumulative market value of over USD 17 billion (Clarkson's SIN).

According to the study conducted by Fan et al., (2021), 6806 vessels were traded in the S&P market between 2005 to 2019. During this period, 848 vessels (the highest number) were traded in 2017. This number was 662 in 2016 and 680 in 2018. However, due to the financial crisis, only 207 vessels were transacted in 2008. Although there are some variations in trading numbers over time, no apparent time trend was found for these variations. Instead, some factors or the condition of the market affect the trading pattern in the S&P market. Since the bulk market is competitive, more shipping companies are involved in this market for its flexible nature of business. Around 5065 vessels (bulk carriers) were sold in the second-hand market from 2005 to 2019. Whereas due to the monopoly characteristics and higher cost involvement, fewer companies are involved in the container shipping business, and only 1741 container vessels were sold in the S&P market in the same period (Fan et al., 2021).

2.2.1. Mechanism of trade in the S&P market

In the second-hand market, shipbrokers act as a mediator between buyers and sellers. First of all, the shipowner (buyer) informs a single or multiple brokers to find the potential buyer (seller) for the vessel. As per instructions, the broker communicates with the client who requires (want to sell) the same type of vessel. In addition, the broker also passes the information to other brokers for marketing the vessel's information. However, it is also possible to buy and sell the vessel directly by communicating between the buyer and sellers. The second stage of the sales process is to negotiate the price and the conditions of the contract between buyers and sellers, but there is no fixed rule for this process. In the third step, a memorandum of understanding is signed by the parties, which covers the administrative procedure. The final and most important step is the physical inspection of the vessel because most contrasts fail in this stage. If the buyer is not satisfied with the present condition and other histories of the vessel, usually, the process is stopped here. However, renegotiation may happen regarding the defects of the vessel in this stage. Finally, if the buyer is happy, the ship is delivered, and payment is made as per the contract (Stopford, 2008, p.198-199).

So, the main mechanism of trade in the sales and purchase market is price negation between the sellers and buyers. As there are no entry and exit barriers in the second-hand market, the participants can also take the opportunity to buy and sell directly between them and enjoy the free transaction facilities of the market (Hale & Vanags, 1992). Due to the volatile nature of the S&P market, the investors are more interested in making a profit by selling the vessels at a high rate and buying at a lower price through proper analysis of the market, rather than operating the vessels (Alizadeh and Nomikos, 2007). As trading in the second-hand market is conducted through a negotiation process, and the parties prefer the "buying low and selling high" strategy, the bargaining power of the participants can play a vital role in buying the ships at a minimum price and selling the vessels at the highest rate. Mainly, there are three types of motives of the investors for investing in the shipping market: a) In the rising market; the shipping company enjoy a lucrative cash flow that influence them for new investment; b) during the depressed market; investor prefer asset play strategy

(buying low selling high); and c) replacing the aged ship to minimize the maintenance cost (Merikas et al., 2008).

Since the four markets in the shipping industry are highly correlated so, when the freight rate increases, then the price of the vessels becomes high. Alternatively, the value of the ship decreases during the low freight market (Merikas et al., 2008). There is a positive relationship between the value of the ship and the seller's bargaining power. For instance, when the demand for the ship increases in the booming market, there are multiple buyers, and the sellers take the opportunity of the outside option by negotiating with multiple buyers instead of one (Fudenberg et al.,1987). This kind of situation positively affects the bargaining power of the sellers. However, the scenario can be changed during a depressed market, when the demand for the vessels becomes low.

According to Beenstock (1985), for determining the price of a ship, it is important to consider the discount value of the ship and freight earnings during the period. Actually, there are many macro and micro factors that affect the value of the ship in the second-hand shipping market. For example, the price of a second-hand vessel is highly correlated with new building prices and the future expectation of the worldwide shipping industry, time charter rate, and the value of the scrap vessel (Veenstra,1999). So, the buyers and sellers should analyse the overall market condition before trading in the S& P market. Tsolakis et al., (2003) studied the volatile nature of the sales and purchase market and claimed that the time charter rate and the new building price positively affect all types of ships in the S&P market except handy tankers and bulk carriers. Due to the volatile nature of the second-hand market, the price of the vessels rises and falls rapidly, which is helpful in predicting the volume of trade in the S&P market. That means if the price of the vessel is high, the seller gains more capital and encourages more trade in the market (Alizadeh & Nomikos 2003).

The trading strategy in the S&P market is also influenced by the rational price of the ship. For example, it is the best time for an investor to invest in a second-hand vessel when the price is lower than her fundamental value. Because the vessel is under-priced compared to the future earnings through the operation. Alternatively, from the

ship owner's perspective, it would be a good decision to charter a vessel instead of buying during the peak market because the ship is overpriced compared with the corresponding rational value (Alizadeh & Nomikos, 2007). So, the profit and loss of the shipping business mainly depend on the proper timing for investment. According to Alizadeh and Nomikos (2007), the investor can get important information regarding the future attitude of the ship's price by analysing the present relationship between the ship's price and the earnings from the freight.

Numerous studies have investigated ship price information and trading strategies in the shipping industry. For instance, amongst others, Alizadeh and Nomikos (2007) studied trading strategies & Investment timing in the second-hand vessels market; Fan and Yin (2021), analysed some factors that affect the investment decision in sales and purchase market; Merikas et al.,(2008) developed a model to investigate the investment decision between new built or second-hand vessel; Alexandridis et al., (2017) investigated the dry bulk sector in the international shipping industry; Kavussanos and Alizadeh (2002), Beenstock (1985) and Tvedt (1997), invested the valuation of the ship. Only fewer studies investigate whether the fundamental or technical analysis should be the best for sales and purchase decision of merchant's vessel in terms of profit. For instance, Ådland (2000), and Ådland and Koekebakker (2004) studied the technical trading performance in the second-hand shipping market and argued that when the demand for ships is high in the market, the technical trading strategy is not suitable for making a profit rather simple buy and sale strategy is more effective.

2.2.2. The role of bargaining in the S&P market

The value of the ship decreases compared with her fundamental price when the market goes down, and the bargaining power of the shipowner becomes weak. However, the buyer enjoys a great bargaining opportunity during this situation (Stopford, 2008, p.203). Usually, the shipowner decides to sell the vessel in the disastrous market due to a shortage of cash flow or forced by the bank for loan payment. Hence, the shipowner becomes worried about raising funds urgently, which means he/she has lesser patience vis-a-vis the counterpart. The lower level of

patience decreases the bargaining power of the shipowner (Kousser & Phillips, 2009); fails to gain surplus from the market.

In the negotiation process, each party applies different strategies to take more advantage of its counterpart. Actually, the bargaining power of the individual parties can play an important role in winning the negotiation process as well as the terms of the contract and associated prices. For instance, similar to the second-hand price, the price of a new building vessel mostly depends on the negotiation between the investor and the shipyard. Before signing a contract with a specific shipbuilding company, Shipowners usually collect quotations from various shipyards and sit at the negotiation table to make a win-win situation. (Stopford, 2008, p.629). The shipyards feel pressure and become worried about signing a contract when they have limited orders and think that there is no possibility of increasing the demand in the future. Under this situation, they have weaker bargaining power and offer lower prices to the buyer. That means the price of a vessel (new building or second-hand) may vary in line with the bargaining parameter of the parties.

Due to some special characteristics of the sale and purchase market, price bargaining can play an important role. For example, the price of the vessels is not fixed in the second-hand market and changes rapidly within a short period of time in spite of the same technical specification. Further, there are no established rules for calculating second-hand vessel prices (Stopford, 2008, p.199). Hence the price of the ship is influenced by the bargaining power of the players. As huge capital is required to buy a ship, the party who wins the bargaining process gets more surplus and gains huge profit. Again, each bilateral contract signed by the parties in the second-hand market is not the same kind of nature, and the price of the vessel may vary in accordance with the age, time charter rate, inflation, and expectation (Stopford, 2008, p. 204). Moreover, due to distinct physical and technical specification, buyers do not have enough opportunity for negotiating the physical or technical features of a vessel. Hence, there is a big space for bargaining where both parties have a chance to play around to obtain potential pay-off by setting an agreement with another party (Stahl, 1972).

For selling a vessel in the sales and purchase market, first of all, the owner employs a price for the vessel, called the asking price. This price is offered to attract potential buyers. When a buyer comes to the market and accepts the offer or makes a counteroffer against the asking price, the bargaining game starts (Arnold, 1999). The value of the seller increases due to the lower asking price because the new buyer will appear immediately if present bargaining is terminated with the current buyer. Since the lower asking price reduces the value of the asset, it also weakens the bargaining position of the seller (Arnold, 1999).) However, the buyer takes the opportunity to gain more surplus in the trade when the seller has weaker bargaining power.

Due to the volatile nature of the second-hand market, the price of the vessels goes up and down in accordance with the demand and supply of the market. Due to the high demand, the price of the vessel increases, so buyers usually have less opportunity to inspect more vessels and get detailed information from the sellers. That means buyers have to make prompt decisions without detailed information (Stopford, p.199). As such, at the negotiation table, sellers gain some advantage over their counterparts. The buyer who has less information about the market could be a loser player due to weaker bargaining power (Wilhelmsson, 2008). For instance, the buyer who is a first-time trader in the market usually has less experience and less information compared with an experienced buyer. Hence the buyer who has enough experience, knowledge, and information obviously gains more surplus in the S&P market due to strong bargaining power.

Various studies have been conducted to anticipate the volatile nature of the shipping industry, investment strategy and to understand the factors that affect the asset and service price of the shipping industry to make efficient investment decisions. For instance, Kalouptsidi (2014), investigates the volatile nature of the bulk shipping industry and the proper time for entry and exit of the new building shipping marker by developing a dynamic model. On the other hand, Alizadeh and Nomikos (2006) and Alizadeh and Nomikos (2007), investigate the relationship between the price and the freight rate to identify the proper investment and disinvestment time in the bulk shipping sales and purchase market. Alexandridis et al., (2017) investigated the dry bulk sector in the international shipping industry and found the spillover effects among the freight options, time charter rates, and freight futures for Supramax, Panamax,

and Capesize vessels. However, Tvedt (1997) and Kavussanos and Alizadeh (2002) investigate the price of a very large crude oil carrier (VLCC) during the period when the freight is uncertain and illustrate that the value of a VLCC is highly influenced by the flexible operational policy at the time of market uncertainty. Angelopoulos et al., (2020) investigate the correlation between the commodity, financial market, and maritime transportation by using a novel dynamic factor model. They have found that the price of crude oil has a significant influence on maritime transportation as well as the freight market.

2.3. Review of the price bargaining

Trading between two nations or negotiations between employers and labour unions are the first situations identified as bargaining problems. To solve those concerns, theories for strategic postures and how to make offers and reach a better deal in the negotiations are set. In this regard, the game theory that characterized the early stages of bargaining seeks to benefit both parties in the exchanges. Therefore, the first objective of bargaining is to reach an equilibrium that satisfies players (Nash, 1950). A player gains information in interpersonal negotiations gives him/her more bargaining power. Therefore, the player with incomplete information about only himself will have a different payoff than the player with complete information, which includes some about his/her vis-à-vis (Harnett & Hamner, 1973). The outside option is another significant determinant of bargaining power as it influences the relations between offers and the payoffs for the player (Dalmazzo, 1995).

2.3.1. Theoretical development of price bargaining literature

In the 1950s Axiomatic theory of bargaining was published to identify the payoff of two individuals (Nash,1950 as cited by Thomson, 2010). Later Rubinstein (1982) developed a bargaining model with perfect equilibrium to identify the possible solution for making a contract agreement between rational behavioural players. Further, this model was modified by a study conducted by Rubinstein and Wolinsky (1985). Amongst the others, Hart and Mas-Colell (1996) investigated a non-cooperative bargaining model, and Brooks et al., (1997) analysed the factors that affect the price negotiation between insurers and hospitals by developing a bargaining model. This study concludes that a hospital's bargaining power varies from state to state.

However, Gavazz. (2016), developed a model to analyse the trade friction effect on the decentralised asset market and the intermediary's role (bargaining power) in minimising the frictions in the asset pricing market. Further, MacLeod and Malcomson (1995) developed a bargaining model where contract bargaining was included in the Rubinstein model of bargaining.

Price bargaining characterized the business-to-business (B2B) relationship. The theoretical development of price bargaining implies that the trade between entities depends on search, bargaining, and adjustment along the margin. When the price adjustment is costly, one player has relatively high bargaining power. The price dynamic, therefore, has to reach equilibrium through bargaining processes (Kavussanos, 1996).

Behavioural factors are essential in bargaining, and they influence the bargaining outcomes. The main factor, in that sense, is the first offer. This offer can be precise or round, and a First Precise Offer (FPO) leads to a better deal. The party who receives a precise first offer replay with less aggressive counteroffers as opposed to those who receive round offers (Kimbrough et al., 2021).

2.3.1.1. Mechanism of Bargaining

The centralized type of bargaining is the unique mode that reaches equilibrium. The endogenous choice of centralized bargaining, as opposed to decentralized bargaining, is the best strategy in a vertically-related market where an upstream monopolist bargains with other downstream firms (Din & Sun, 2022).

Decentralized or collective bargaining between three parties has a significant effect on the payoffs of the merged partners. Still, it reduces the payoff of the third player due to more frequent conflicts caused by the higher ambitions of the merged party (Berninghaus et al., 2003).

Bargaining happens between a seller and a buyer over the quantities and the prices of goods. The study of the multidimensional bargaining between players with private information about their preferences shows that incentive compatibility, individual rationality, and budget balance can only be fulfilled by generalized posted-price

mechanisms. Generalized posted-price mechanisms request minimal information from the players, and they only need a strategy to place their optimal bundles. This mechanism doesn't require the seller and the buyer to reveal their entire cost and value functions, respectively (Hagen & Hernando-Veciana, 2021).

Ultimatum is used as a tool in the bargaining process, where player 1 determines her own demand and then sends the proposal to player 2 to distribute the payoff between them. In this case, player 2 faces the ultimatum from player 1, take it or leave the proposal. If the proposal is denied, there is no agreement, and any of the parties do not have a chance to get a benefit. However, the games may continue to the next round where there is no conflict for the non-acceptance; this may help for the successful outcome of the bargaining (Güth and Tietz,1990).

In addition, cheap talk can play an important role in the negotiation process of a two-stage bargaining game. There are some differences between the cheap-talk equilibrium and the equilibrium without cheap talk in the bargaining outcomes (Farrell and Gibbons,1989). For instance, by using cheap talk such as, unbelievable threats and unverifiable and costless lies about personal information, responders may receive higher proposals compared with others (Croson et al., 2003). Moreover, Deutsch and Krauss (1962) illustrate that a participant's cooperative interest rather than a competitive attitude is helpful to reaching an agreement, because, in a bilateral bargaining procedure, a threat is harmful to reaching an agreement between the parties.

2.3.1.2. Bargaining power

Information and Communications Technology affect bargaining power. Regarding the airline, the price determination for the low-price ticket is highly related to the internet. The ICTs allow the buyers to increase their bargaining power, comparing different airlines tickets to choose the most competitive flight. From the companies' perspectives, they can easily analyze users' behaviour to adapt their pricing strategies. However, the ICT effect on bargaining is not symmetrical. It gives more advantages to the airline service providers. An empirical model using several variables shows that the internet contributes to the equilibrium of the low price of

airline tickets. It tailors the demand and supply of low-cost airline tickets (Moreno-Inquired et al., 2015).

According to Bacharach and Lawler (1981) and Martin (1992), bargaining power is a strategy by which the players can influence the terms and conditions of the contract, including the price in their own favour. Hence the player who has more bargaining power can enjoy a higher portion of the surplus. Smith and Thanassoulis (2008), differentiate the economic consequences of bargaining power between supplier and retailer through Branded goods and private-label goods. There is more competition and uncertainty faced by private goods suppliers compared to branded goods. As such, the larger retailer enjoys more buyer power in the private goods market. Matsui (2020), analyses the best time for bargaining between a manufacturer and a retailer to determine the wholesale price; when the manufacturer adopts a dual-channel system supply chain. This study concludes that to achieve the best outcome of the bargaining process, the manufacturer should negotiate with the retailer to fix the wholesale price before deciding the direct price for the direct channel customers. The wholesale price is determined by the negotiation between the manufacturer and the wholesaler, and both parties have some bargaining power. Hence, the manufacturer enjoys some flexibility in the controlling process of the direct price because, in this process, the manufacturer did not commit to the direct price before fixing the wholesale price with negotiation with the retailer.

Kousser and Phillips (2009), investigate the factors which influence the bargaining power between legislators and governments. To overcome the lacking of the previous model, they developed a state budget negotiation model, which shows that the budget proposed by the cheap executive had a positive effect on the national budget that finally passed. However, the success of the legislatures is highly influenced by the level of professionalism and their bargaining patience. Bulow (1982), investigated the monopoly of durable goods, including a firm's monopoly power in the case of sale and production of durable goods. It also illustrates that the renters and the monopolist of nondurable goods gave more monopoly power compared to sellers, so it would be possible that the loss of the seller may be higher than other types of monopolies.

However, according to the study of Wilhelmsson (2008), the buyers who are not adequately informed pay more than properly informed buyers to purchase a similar house. This indicates that the buyer who has sufficient information regarding the overall market can enjoy more bargaining power and pay fewer amounts due to more knowledge, information, and experience in the same field. For purchasing a single-family house, it is good for the buyer to inspect the house properly, but it does not mean that the buyer has to pay less due to this technical inspection. Further, the characteristics of the household are also not important for bargaining outcome Wilhelmsson (2008).

2.3.1.3. Price bargaining models

2.3.1.3.1. Model with outside option

The outside option plays a sensitive role in bargaining, and it helps to deflate or even avoid the effects of obstinacy. Inflexibility in bargaining reduces the chance of reaching the equilibrium strategies among players. The outside options can diminish the effect of obstinacy in bargaining. When opting out is considered over the acceptance of the rigidity of the other party, it drives to a unique Perfect Bayesian Equilibrium in which each party demonstrates rationality as soon as possible. Therefore, the availability of the outside option induces the bargaining parties not to be unyielding (Compte & Jehiel, 2002). Externalities with resale possibilities favour the seller, who takes advantage of the competition between buyers. He would prefer to respond to bids rather than make offers (Cornet, 2000).

2.3.1.3.2. Model with incomplete information

The bargaining process is significantly influenced by supply and demand forces. Players consider the market supply levels and past prices to tailor their strategies and make offers. Therefore, bargaining is critical in price discovery. Information on major economic forces and trade influence bargaining behaviours (Folwell et al., 1998).

The seller's cost and the buyer's revenues are private information. Under incomplete information, transfer prices and quantities should be negotiated cooperatively. This bargaining mechanism satisfies individual rationality, incentive compatibility, and ex-post efficiency and guarantees fair transfer payments and transfer quantities.

Therefore, there is a trade-off between ex-post efficiency and fairness (Haake & Recker, 2018).

2.3.1.3.3. Model with incomplete information and outside options

Two equilibriums are reached when outside options and incomplete information simultaneously affect the bargaining play. After the seller makes an offer, the buyers outside option cannot be credibly communicated as opposed to the case where the buyer can communicate his outside option, the seller is worse off, and the game results in a search for a smaller set of values of trade-off to quickly reach the equilibrium (Haake & Recker, 2018).

2.3.1.3.4. Basic Model

The basic bargaining model can be considered Rubinstein's dynamic bargaining game model. In this model, player -1 offers a price, and player -2 can either accept or reject the offer, which may also be called a simple bargaining model. According to Guth and Tietz (1990), if player-1 proposes the offer, then the payoff of player-1 is 1, and player-2 gets 0. It is a single-stage game or can be considered an ultimatum bargaining model.

2.3.2. Empirical literature of asset pricing using price bargaining

Many scholars use the bargaining model for asset pricing in the real estate literature. For instance, Wilhelmsson (2008), uses the framework of the search model to identify whether the buyers who are not adequately informed pay more than properly informed buyers to purchase a similar house. This indicates that the buyer who has sufficient information regarding the overall real estate market can enjoy more bargaining power and pay fewer amounts due to more knowledge, information, and experience in the same field. For purchasing a single-family house, it is good for the buyer to inspect the house properly, but it does not mean that the buyer has to pay less due to this technical inspection. Further, the characteristic of the household also not important for bargaining outcome (Wilhelmsson, 2008),

Arnold (1999), studied the search and bargaining model to analyze how the asking price can change the bargaining power of the parties in the real estate transaction.

This study argued that by offering a suitable asking price, it is possible to attract more customers, which plays a vital role in increasing the value of the seller. However, lower asking prices also reduce the bargaining power of the seller.

Gavazza (2016), developed a search and bargaining model to analyze the trade friction effect on the decentralized asset market and the intermediary's role in minimizing the frictions in the asset pricing market. This study suggests that inefficient asset allocation generates a trade fraction. Moreover, around 2.88 percent of the asset price may increase as well, as 20.6% of asset misallocating would be due to the lack of dealers in the decentralized asset market. Further, the price of a house is also affected by demand and supply. That means when the demand is high, the price of the house also increases significantly. In this situation, the bargaining power of the seller increases, while the buyer's bargaining power becomes weak. For estimating the asset price, this study used the basic bargaining model (Novy-Marx, 2009).

2.4. Research Gaps and Contribution

In the sales and purchase market, the price of a ship is determined through multiple negotiation processes between buyers and sellers (Stopford, 2008, p.199-203). There is no clear-cut formula to determine the shipping price in the S&P market, so the vessel's price varies in accordance with the bargaining power of the parties, the operating history of the vessel, and finally, the demand and supply (Ma, 2020, P.204) of the market. Since the second-hand market is more volatile and exciting than the new building market, the simple depreciation method does not exist in the S&P market (Ma, 2020, p.204) to calculate the vessel's price. As such, the bargaining power of the players can play an important role in determining the trading price in this market. The player who has more bargaining power can be able to gain more surplus than the other player (Wilhelmsson,2008). However, there is a lack of research and no standard format for applying the bargaining concept in the S & P market.

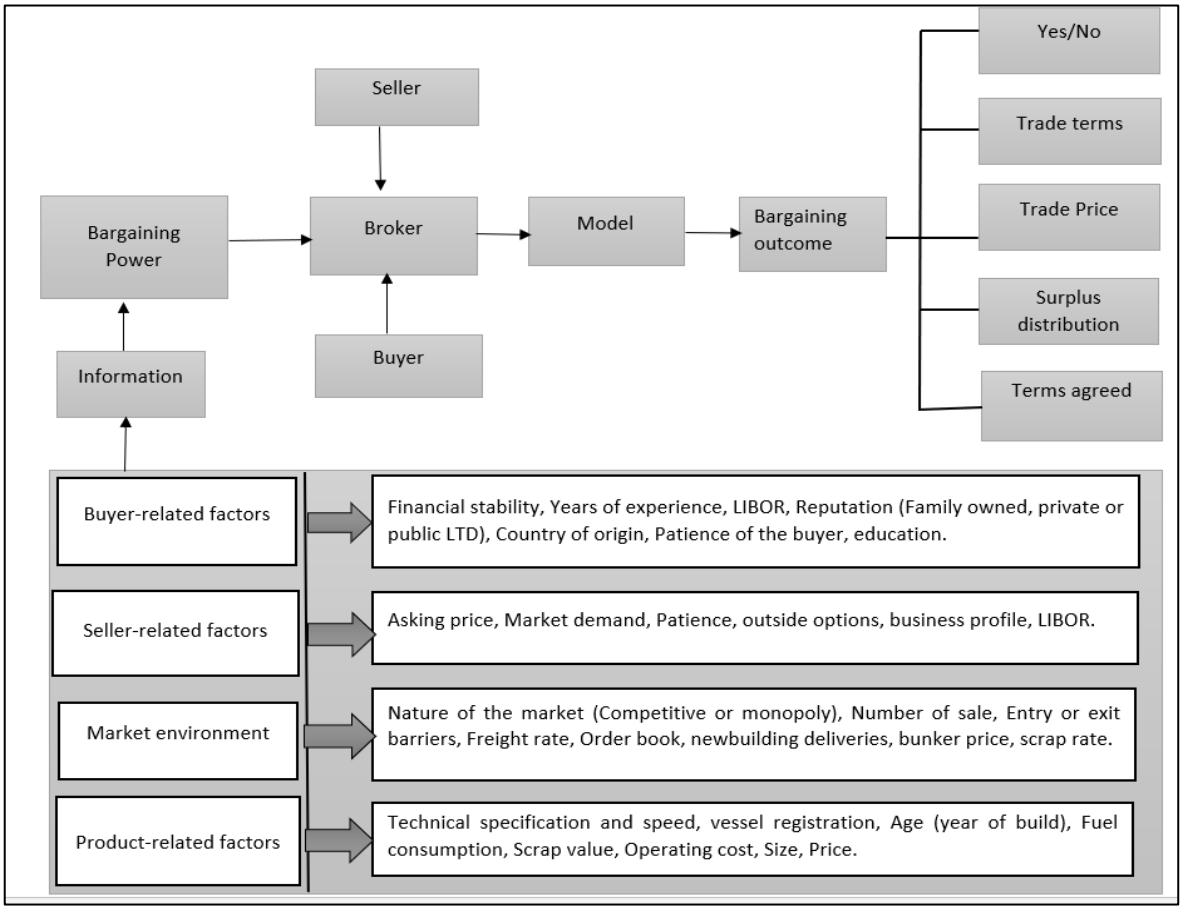
In the shipping literature, there has been long-term interest in pricing the shipping asset and identifying the factors affecting the asset and service prices for efficient decision-making. For instance, Kavussanos et al., (2014) and Tsouknidis (2016), analysed the relationship between the commodity futures market and different kinds of freight rates and their spill-over effect. While amongst the others, Alizadeh and

Talley (2011), Jing et al., (2008), Drobetz et al., (2012), and Xu et al., (2011) investigated the volatile nature of the shipping industry and the factors that affect the freight rate. However, in order to better understand the pricing mechanism in the sale and purchase shipping market, it is essential to analyze the factors that influence the bargaining ability of the buyers and sellers. Because in the S & P market, almost all contracts are signed when two parties are agreed with an agreement through multiple negotiation processes. Although bargaining is considered the crucial determinant for asset and service trade pricing in the shipping business, it is observed that there were no studies regarding the role of bargaining in the negotiation process of the shipping market; and no implications of the bargaining model in this sector. Hence, developing and applying a price bargaining model in the shipping business can be helpful for determining the price of shipping assets in the sale and purchase market for sustainable growth of the sale and purchase shipping market.

Chapter 3: Conceptual Framework

To understand the factors that affect the bargaining outcome and bargaining power between sellers and buyers in the second-hand shipping market we developed a conceptual framework (figure-2)[2]. This framework provides a foundation for a better understanding of bargaining behaviour in the sale and purchase (S & P) market and also helps to analyze the relationship between the factors. According to Maxwell (as cited by Ravitch & Riggan, 2016), a conceptual framework is an idea, a system of concepts, beliefs, expectations, and theories that guide and support the research throughout the study.

Figure 2: Conceptual framework of bargaining behavior in S & P market.



[2]Figure 2, represents the conceptual framework of the study; which indicate that bargaining power is influenced by the information of four major factors (buyer, seller, market and product). Further, it also highlights the final outcome of the bargaining process.

The aim of this chapter is to discuss the bargaining framework in accordance with the sale and purchase shipping market. We will start by discussing the mechanism of the bargaining behaviour in the S & P market; then, we will explain the concept of bargaining and the choice of bargaining model for our study. Finally, we will focus on the operationalization of the bargaining concept in the S & P shipping market.

3.1. Mechanism of bargaining behaviour in S & P market

In the sale and purchase (S & P) market transaction price of a vessel is determined through the bargaining process between the buyers and sellers, where a specialist broker plays a vital role in the successful execution of the trade (Stopford, 2008). Usually, it takes one to two months to complete a transaction in the S & P market with physical inspection and other formalities. The broker provides necessary information and other support to the parties involved in the trade until the completion of the whole procedure (Alizadeh & Nomikos 2003). Like the shipping market, bargaining behaviour is also common in the housing market, car market (Scott Morton et al., 2011), tourist shopping market (Zhang et al., 2018), wage market (Cahuc et al., 2006), and many other industries. As there are no hard and fast rules for the negotiation process and pricing mechanism, like in the real estate market, the trading price of a vessel with the same specification can vary depending on the information, bargaining power of the players, and search and matching process. The final transaction prices are the outcome of the bargaining process that actually lies between the buyer's maximum price and the seller's minimum price to accept for a specific trade, also called the "reservation prices" of the players (Song, 1995). The trading price is also affected by the buyer's and seller's characteristics, market information and product-related factors (Zhang et al., 2018). For the purpose of this study, we have identified four major factors (buyer, seller, market, and product-related factors) that affect the bargaining power of the players in the S&P market in accordance with the information and search cost. This study considered the basic bargaining model (Rubinstein's dynamic bargaining game model) to split the surplus and determine the outcome of the bargaining process.

3.1.1. Information and search cost in bargaining process

To set their bargaining strategies, the players look at the relevant information related to their trade before starting the bargaining game. Therefore, they can decide whether to proceed with the bargaining process and which strategy to use to make their offers. (Gillison et al., 2014). For instance, in the second-hand shipping market, the buyer (seller) is involved in the search option to find out the specific vessel (potential customer) as per their technical specification and other requirements. Both parties (buyer and seller) usually engage the broker to help them (by providing necessary information) in the whole trading process. In the second stage, the buyer and seller determine the transaction price through proper negotiation. The same scenario is also seen in the real estate market; If both parties agree on the price, the transaction occurs. Otherwise, the players continue their searching process (Williams, 1995). From the buyer's perspective, an optimal search strategy is considered the price that is less than or equivalent to his/her reservation price. However, he/ she will continue searching until the price is lower than the reservation price (Rothschild,1978; Einav, 2005). In the bargaining situation, the bargaining power of the players mostly depends on how much information they have gathered regarding the price, market condition, and overall characteristics of the goods. Hence, a buyer (seller) with proper information about the overall market, price, and outside options of the product can be able to gain a fifteen percent (15%) margin compared to an uninformed buyer. Moreover, the buyers (sellers) who have lower search costs have a chance to achieve an average of eighteen percent (18%) lower cost compared with other buyers (sellers) (Scott Morton et al., 2011). Because due to the higher search costs, the buyer stopped the searching procedure earlier, which led to pay more rather than a low-cost buyer (Wilhelmsson, 2008).

Similar to the housing market, the seller and the buyer in the sale and purchase market in the shipping industry do not know the reservation price of their counterpart for a specific transaction. Hence due to the lack of information, they usually engage in search activities to collect relevant information relevant to their trade. The potential buyers visit the ship they are interested in, contact the seller, start bargaining, and generate multiple offers and counter offers to determine the final transaction price. A potential buyer may be able to make a suitable offer when he or she has more

information about the seller's reservation price and the other buyer's offer price for the same goods (Song, 1995). The selling price of a vessel with the same technical specification can differ due to the lack of proper information and the uncertainty between the searching and matching process, and finally, the bargaining power of the players.

3.1.2. Characteristics of the players (buyers and sellers)

There is a strong relationship between bargaining outcomes and the characteristics of the buyers and sellers. Such as age, willingness to bargain, education level, country of origin, gender, financial stability, experience, and patience. According to Kestens et.al., (2006) the educated and reputed seller provides a premium to the customer for holding their goodwill in the market. That means they get a lower surplus due to less bargaining power. They also claimed that the buyer who is new in the market (first-time buyer) on average pays four percent (4%) less than the repeated buyer; because he/she waits a long time to finish the deal with a lower price. The monopoly power of a seller negatively affects the bargaining power; that means when the seller enjoys monopoly power, his/her bargaining ability becomes low. On the other hand, by reducing monopoly power, the bargaining ability of a seller increase, which also reduces the expected selling price and search cost for the trade (Arnold & Lippman, 1998). In addition, the patience of the players (both sellers and buyers) positively affects the bargaining power, which is considered the main weapon in the bargaining situation. Between the buyers and sellers who are less interested in finishing the deal earlier means having higher patience and no urgency. So, he/she gains a better position in the bargaining situation compared to the counterpart (Kousser and Phillips, 2009). For instance, the price of a container vessel (13000/14000 TEU) can cost up to 150 million, similar to a jumbo jet. Usually, the shipping company raises funds from private sources, capital markets, and bank loans. Among these sources, a bank loan is the cheapest, flexible for the shipowner and the shipping company (Stopford, 2008, p.199-282). The interest rate of the bank loan is determined by the London interbank Offered Rate (LIBOR)+ margin of the bank. So, during the bearish market, if the LIROR increases, the cost of debt also increases, which negatively affects the cash flow of the shipowner; they face difficulties in maintaining operating costs and paying the bank loan due to a weak financial position. In this situation, the owner of the vessel

loses his/her patience and becomes worried about selling the vessel to minimize the loss, and this situation also decreases the bargaining power of the seller. Whereas, due to the weak bargaining power of the seller, the buyer gains the maximum surplus. Overall, the financial status, the patience of the players and their bargaining ability are strongly correlated with their bargaining power of the players.

From the seller's perspective, the asking price of a good is influenced by the characteristics of the seller. The asking price provides a signal to the market regarding the willingness and urgency of selling, so the seller who needs to finish the deal on an urgent basis will set a lower asking price (Arnold, 1999). It also lowers the seller's bargaining position and persuades less surplus from the trade. Further, the seller who has a higher loan-to-value ratio offers a higher asking price and stays a long time in the market to get a higher transition price (Genesove & Mayer, 1994). According to Chinloy (1980), the asking price of a seller is highly correlated with the reservation price, so the bargaining outcome and the selling price are affected by the seller asking price. Similar to the seller, the buyer's characteristics also influence the bargaining outcome. For instance, first-time buyers are less interested in bargaining more compared to experienced buyers because they have less knowledge and skill. In addition, the buyer who has a high income is also expected to bargain less, due to the high opportunity cost for searching (Song, 1995). Regarding the country of origin of the players, the study conducted by Pizam and Sussmann (1995), stated that tourists from Italy are usually willing to bargain more to pay the minimum price to the seller, while the inhabitant of Japan and America often prefer to pay the sellers asking price; they have less interest on bargaining. Similarly, in the shipping industry, most of the ship owners of Greece are family-owned shipping companies, so they have large experience, more practical knowledge, and are capable enough to handle any unexpected situation by taking quick decisions, compared to other shipping companies in the world. Hence, they have more chances to gain a larger surplus from the trade both in the buying and selling process.

There are some differences between the buyer and seller reservation prices due to the lack of information or gaps in knowledge. For instance, for purchasing a house, the average character of buyers is focused on the age of the house due to the lack of proper knowledge about the physical condition, whereas the seller is well aware of

the technical or structural problem, but they do not share the problem with the buyer. These kinds of interesting characteristics of the players and the information gap between them make a difference in both parties' reservation prices (Song, 1995). The seller's reservation price means the minimum price for which they are willing to sell their goods. On the other hand, the maximum amount that a buyer is interested in paying for buying a good is considered as buyer reservation price. So, when the buyer's maximum price is bigger than the seller's reservation price, a transaction may occur; otherwise, the outcome of the bargaining process will not be successful. So, it could be claimed that the selling price is the function of the seller's (buyer's) surplus and the buyer's and sellers' reservation price, which are influenced by their characteristics.

3.1.3. Market environment

The Bargaining power of the parties in the S&P shipping market is highly influenced by the demand and supply of the market (Ma, 2020, P.204). The shipping demand also depends on the world's sea-borne trade, economic fluctuation, GDP, International policy, political stability, and many other factors. On the other hand, the supply of shipping services is adjusted through new construction and the scrapping of ships (Kalouptsidi, 2014). So, when the demand for shipping service becomes high, the freight rate and price of the vessel both are increased, which is considered a bullish market. In this bullish market, the bargaining power of the seller is higher than the buyer due to the high demand and increasing freight rates. However, this scenario is changed in the bearish market (Dai et al., 2015). The bargaining power of the players is also affected by the characteristics of the market. For instance, when the number of buyers is higher than the number of sellers due to the high demand for the product, the seller holds a strong bargaining position. In this case, due to offering the unique product, the seller achieves monopoly power and gains more surplus due to higher bargaining power (Lindblom, 1948). For instance, In the shipping industry, the characteristics of container shipping and bulk shipping are different from various perspectives. Due to the free entry and easy exit procedure, thousands of shipping companies are involved in the bulk shipping market. Whereas due to the higher capital investment and entry and exit barriers, fewer shipping companies are involved in the liner shipping business. So, container shipping is considered an oligopoly market (Fan

et al., 2021). And due to this characteristic of the market, the owner of the container vessel can be able to gain more surplus by trading at a higher price. However, bargaining is absent in the market of generic products because the product is well defined and well known to its buyers and sellers, and the market is larger than the market of heterogeneous products. So, if the price of this product rises, then both buyers and sellers get the message, and there is no secret about determining the price in this market (Harding et al., 2003). On the other hand, the market of heterogeneous products (like the S & P market) is thin, and the original price of the product or service is unknown to the parties. There is a very good connection between bargaining and the heterogeneous product, so the price is influenced by the bargaining power of the sellers and buyers as well as the characteristics of the services and the goods.

In the shipping industry, the four shipping markets (new building, second-hand, freight and demolition) are correlated with each other, so the price of a new building vessel affects the second-hand vessel price (Beenstock,1985). The same assumption was also made by Strandenes (1984). His study suggests that the second-hand and new building markets are linked by the new building price. Moreover, increasing the freight rate provides a signal to the market regarding the possibility of increasing the scrap value and price of the vessel. So bargaining power of the buyers and sellers also changes depending on the signal of the market. For instance, the bargaining power of the shipyard and shipowner decreases in the bearish market due to low demand; that means the price of a vessel (new building or second-hand) and the bargaining ability of the parties may vary in line with the parameter of the market. For constructing a new vessel, the actual time of delivery mostly depends on the capacity of the shipyard, which is also correlated with the volume of its order book and the bargaining power of the buyer. Further, the London interbank Offered Rate (LIBOR) also negatively affects the price of the vessels and the bargaining ability of the players. Due to the higher interest rate, the cost of the capital increase, and the liquidity of the shipowner decrease, which also limit the ability of the shipowner from higher bidding to the second-hand ship (Tsolakis et al., 2003). In addition, investors' decisions on ship financing are also influenced by the international bunker price; that means the buyers intend to buy vessels when the price of the bunker is lower. Since bunker

constitutes the major portion of the operating cost of a vessel, so the number of second-hand vessel trading decrease during the pick bunker market (Fan et al., 2021). Other variables, such as fleet size and the order book, also influence second-hand prices by providing a signal for the future development of the market.

3.1.4. Product information

For determining the price of heterogeneous goods, bargaining can play an important role because the price of these goods is not readily noticeable, and the market of these goods is relatively thin. Hence the final trading price is influenced by the bargaining power and negotiation skill of the parties and the characteristics of the goods (Harding et al., 2003). Like the housing market, the price of a vessel in the sale and purchase shipping market is also determined by the bargaining process between seller and buyer, which mostly depend on the characteristics of the ship. For example, registration of a vessel is important for her identity, and different flag states have different policies and requirements for ship registration. There are three types of ship registration such as open registration, international registration, and national registration. Registration fees, tax, and the wages of the crew member can vary in line with the types of registration. For instance, the wage of a crew member maybe 50% lower for those registered under Panama, Liberia, and Singapore compared to the European flag (Stopford, 2008, p. 666 & 229). So, as a part of the cost minimization strategy, the buyer always prefers an open registered vessel to avoid complex registration policy and overcharges and taxes imposed by the flag state (Fan et al., 2021). As such, the seller of the open registration vessel gets more bargaining power compared to the other seller.

The technical specification of a vessel also affects the bargaining ability of the seller. In line with the capacity of the main engine, the speed and fuel consumption may vary. To provide faster service to the customers, the demand for higher-speed vessels is more than for low-speed vessels (Fan et al., 2021). Hence the buyer who wants to purchase a higher-speed vessel gains less surplus. The price of a second-hand ship mostly depends on future demand and expectations and the development of the shipping market. As such, it is important to consider the present and future expected income, the age of the vessel, and the depreciation factor, to determine the value of

a ship (Tsolakis et al., 2003). All these factors also influence the bargaining ability of the players. For instance, the average time charter rate is considered for calculating the income of the vessel, because it explains the charter and the shipowner's expectations of the ship. So, it has been assumed that the higher time charter rate means the higher price of the ship due to the higher profit. In this situation, the buyer's and seller's reservation prices increase, and the buyer is satisfied without getting the higher portion of the surplus due to the discount factor. In addition, the size of the vessel is also important in the bargaining situation; for the construction of a new vessel, the smaller vessel is not as preferable as, the larger vessel. However, in the second-hand market, the Handymax is the preferable size, which positively affects the bargaining ability of the seller (Fan & Luo, 2013). Further, the opportunity cost of a product can also affect the bargaining power of the player involved in the negotiation process. For instance, when a home is vacant, then the owner has to carry all the costs without having any benefit from it. In that case, the owner of the home becomes more impatient to sell the home, which also decreases the bargaining power of the seller (Binmore, 1992). Similarly, in the shipping industry, the cash flow of the ship owner decreases when the freight rate becomes low. Since the operating cost of a ship becomes unchanged, many shipowners cannot continue their business and decide to sell the ship to minimize loss. Thus, they become worried about selling their vessel and failing to gain more surplus in the bargaining process.

3.1.5. Outcome

The outcome of the bargaining process depends on the acceptance of the proposal; that means when one party accepts the offer made by the other party, the bargaining game ends (Rubinstein,1982). If a party rejects the offer, he/she then makes a counteroffer, and the game continues until they reach an agreement. After reaching an agreement, the terms of the contract and the price of the trade are determined. To get the largest surplus in a specific trade, a buyer searches for potential sellers by comparing their offer price of a similar type of product (Quan & Quigley, 1991). A trade is feasible when the seller's reservation price is lower than the buyer's reservation price. Then the surplus is distributed between the parties as per their bargaining power. If one of the parties rejects the offer of the other party, then no trade occurs, and no parties get any portion of the surplus from the trade.

3.2. Bargaining in concept in shipping assets (S & P market)

Numerous factors should be considered for the evaluation of the second-hand ship's price. Namely, freight rate, ship size, ship age, technical characteristics, and new build ship price. In addition, the bargaining power of the players also plays an important role in determining the price due to the lack of standardization (Stopford, 2008) and asymmetric information in the S & P shipping market.

3.2.1. Asymmetric information

When it comes to bargaining, information about the object of a bargain is not evenly spread between seller and buyer. It is considered that there is at least some information that only one party possesses, which is beneficial for gaining higher bargaining power and more surplus in a specific transaction compared to the counterpart. For instance, buying a second-hand car where the seller knows the quality of the car better than the buyer, thus the seller may gain an advantage for bargaining power (Muthoo, 1999). The same applies to the second-hand ship sale and purchase market; due to the illiquid nature of the shipping asset (Ådland & Koekebakker, 2004), information plays an important role in price determination (Benmelech & Bergman, 2018). However, a lack of market transparency in shipping information generates asymmetric information. As such, having updated information from reliable sources about the variable can be decisive in gaining bargaining power.

Many variables consist in the formation of a ship's price. Namely: freight rate, demand and supply, scrap value, ship age, LIBOR, and inflation. Among those variables, some are constant such as ship age, while others can drastically change overnight, which leads to price jumps in the S&P shipping market. For instance, the freight rate is the main source of income for the shipowners; thus, it greatly impacts the vessel price. It means that, during the freight boom, second-hand vessels might cost more than a new-build one (Açık & Başer, 2018). Another example of visualizing the scale of volatility is to look at the economic crisis in 2008. Capesize dry bulk carriers cost USD 140 million in the June of 2008. After six months, in December 2008, the value of the same ship dropped to 40 million dollars. Hence, an investor lost 100 million dollars or approximately 75% of the main asset just in 6 months. By the end of 2019, the losses still were not recovered (Celik Girgin, 2020). This characteristic indicates that sales

and purchase marker is indeed volatile, risky, and information is distributed asymmetrically; hence, the bargaining power of the players is also influenced by these characteristics of the nature of the market. However, this is what creates another market for speculating. Not only investing but pulling out of the business can generate an income. Particularly when the ship's price is at its peak, selling will be a rational decision due to the higher bargaining power of the seller.

3.2.2. Lack of standardization

Shipping by nature is not standardized; this means that due to the differences in technical specifications, unique features, and characteristics, each vessel is different from the others. In other words, a ship is heterogeneous in nature, so there are no specific rules for determining the price of a second-hand ship. However, dry bulk carriers are considered to be of simple construction (Gratsos et al., 2012), and the fleet is becoming more homogenous (Adland & Koekebakker, 2007), yet the characteristics and specifications can play a role in ship pricing and bargaining power. For example, geared bulk carriers are bulkers fitted with a crane for loading and unloading the vessel by means of a ship. Self-unloaders are ones fitted with a conveyor belt so that they discharge cargo by belt. There are also ore carriers which are designed solely for ore transportation. They differ in other dimensions as well; some may have a higher ice class, some not. They can differ in consumption and engine type. Recently, with the increase of GHG combat diversity of the fuel type is increasing. Hence in line with the specification of the vessel, the demand also varies, which affects the bargaining power of the sellers and buyers in the S & P market. Ships being non-homogeneous makes it challenging to evaluate them. A number of studies prove that technical vessel characteristics play a significant role in putting a price tag on them. This is especially true for chemical tankers due to their high technical diversity. According to the study of Adland and Köhn (2019), the technical specification of a ship, such as a tank coating, has a significant part in evaluating second-hand chemical tankers. Further, it was found that second-hand ship heterogeneity might be enhanced by geographical area. The price of the ship differs by the country it was built in because some countries have a reputation for building better quality ships. For instance, pre-owned tankers having Korean origins are more valuable than European-built ones. Bulk carriers built in Japan or Korea tend to cost

higher than the ones built anywhere else. Hence, the owner of these vessels can get higher bargaining power compared with others.

3.3. Bargaining model in shipping assets

3.3.1. Market information and number of players

Market information: Proper information on services, goods, or assets influences the bargaining ability of the players. Thus, due to the lack of information about the counterpart and the product, trade uncertainty may generate. In accordance with the overall market information, the bargaining model may vary, which is discussed in the following sections.

Number of Players: Refers to the number of sellers or buyers in the market with the same service/goods/Asset. If there are a lot of players (buyers/ sellers) in the market, indicate a high possibility of other options (outside options) in case of bargaining failure. This scenario may change in case of a small number of players in the market.

Overall, market information and the number of players play a major role in determining the bargaining model for dividing the surplus between the parties. Based on these two parameters, four bargaining models are used to determine the bargaining power and the surplus of the buyers and sellers in an individual trade.

I. High information with a small number of players

In the case of sufficient information about the counterpart with a small number of players in the market, the basic bargaining model may apply to estimate the discount factor and surplus of the players. According to this setup, the outside option is limited due to the lack of a large number of potential buyers and sellers.

ii. High information with a large number of players

Under this model, the seller(buyer) makes all the concessions and bargains with each bidder separately. The buyer(seller) has the right to withdraw from discussions at any time and begin talks with a different party. Even when it is obvious that there will be benefits from trade between the two parties, the seller is free to leave a negotiation if there are many buyers because her reservation value exceeds her consumption

value. If the seller can switch buyers without incurring any fees, the outside opportunity might also allow the seller to commit to a specific price. When switching, the vendor typically sets a respectable take-it-or-leave-it fee (Fudenberg et al., 1987). In this situation, a basic bargaining model with an outside option strategy may use to determine the bargaining surplus of the players.

Each sensible party now prefers to expose oneself instead of seeking to establish a reputation for rigidity when the parties have access to adequate outside possibilities. Consequently, the parties play when a player's reasoning matches that of the game without obstinate types. External factors have a significant impact on eliminating the possibility (Compte & Jehiel, 2002).

If many sellers/buyers are interested in the same service, good or asset, there is a good chance that they will have other options if negotiations fail. In contrast to a small number of retail players, a big number of market participants increases product volatility and gives the player greater bargaining leverage.

iii. Low information with a small number of players

If a player has no other options and only a limited amount of knowledge about the counter player, they will have weak negotiating power. A basic bargaining model with incomplete information may use in this situation to split the bargaining surplus. In the worst-case scenario, the player might still receive a minimal dividend, and the opposing player will take home the entire surplus.

iv. Low information with a large number of players:

A basic bargaining model with incomplete information and an outside option strategy may use in this situation. With a large number of players, the game theory can be cooperative. Players are in coalition and make decisions as a group. Different groups will be the big offer makers. The sizes of the groups are the criterion of strength. The negotiations are mainly done within the group. Before the bargaining process starts, prices in the shipping market will not follow the correlation between demand and supply and other market factors (Thomson, 1994).

The game can be non-cooperative as another market is set up with a large number of players. In this case, players use their individual strategies to make offers. The bargaining game is very complex and requires a bunch of information. The prices for ships in this market can be highly volatile. The duality between demand and supply drives the market and determines the main characteristics of the market (Sutton, 1986).

3.3.2. Basic bargaining model in S&P market

Since this study did not consider the outside options and lack of information, hence the basic bargaining model (Rubinstein's dynamic bargaining game model) has been applied to determine the discount factor and surplus of an individual trade. In the shipping market, like any other economic activity, bargaining is a practice to maximize profit or minimize loss. There are many strategies for parties to make offers in the sale and purchase market. The Rubinstein bargaining model entails alternating offers in an infinite time horizon. It is a dynamic model that is opposed to the static bargaining game. Thus, it considers the different strategies of players over time. Therefore, players in this setup consider the offers of the other players in the previous periods to frame their following bargaining strategies. This game theory confirms Nash's model (Rubinstein, 2016). Rubinstein's model is a non-cooperative bargaining method that uses a sequential form. It is the situation where two parties have to reach an agreement even though their interests are different and even opposed. Furthermore, the contractual agreement obtained by parties should be Pareto optimal. In other words, there is no other agreement that both would prefer.

In the S&P shipping market, if a seller and a buyer have to achieve an agreement on the purchase of a vessel, the seller has to make a proposal. When he has made an offer, the buyer has to decide between two options:

I.) whether accept the offer.
II.) Or, reject the offer and continue the game by providing a counter offer.

This game will continue until they reach an agreement.

The basic bargaining model is also considering as take it or leave it offer, where the payoff of the players is discounted as per their discount factor δi (where i =1, 2) and the surplus of the bargaining game the can be divided as follows:

$$\text{Payoffs for first player} \qquad p_1 = 1 - \frac{\delta_2}{1 - \delta_1 \delta_2}$$

$$\text{Payoffs for second player} \qquad p_2 = \frac{\delta_2}{1 - \delta_1 \delta_2}$$

The player who has a higher discount factor having the patience or no urgency to close the deal compared to his/her counterpart. In our case, we assume that there is not too many buyers and sellers in the market for taking the opportunity of the outside options. So, we consider the basic bargaining model to determine the price and the bargaining surplus in the second-hand shipping market.

3.4. Operationalization of bargaining concept for S & P market

The shipping industry has an active and separate market known as the sale and purchase (S & P) market, where second-hand ships are traded between potential sellers and buyers through multiple negotiation processes. As thousands of ships are traded every year with a cumulative market value of over USD seventeen billion in this market (computed from Clarkson's SIN), the economic role of the S & P market is very important in the shipping industry (Tsolakis et al., 2003). The investors and shipowners are allowed to buy and sell ships directly through this market and can enjoy the free entry and easy exit procedure in the freight market (Hale & Vanags, 1992).; which is a great opportunity for the investors to engage in the instant shipping business rather than waiting around two years for a new building vessel. Moreover, due to the historically volatile nature of this industry and the unpredictable value of the ship, investors may also gain huge profits through asset play by following the 'buying low" and "selling high" strategy (Alizadeh et al., 2017). For instance, the price of a five-year-old Capesizes (180k) vessel has changed from USD 27.50 million to USD 45.50 million between January-2021 to August 2022. And the average price of the same vessel was USD 39.88 million during the same period. In January 2021, the price of the vessel was only USD 27.50 million, which means buyers who bought the vessel in this period gained more surplus compared with the buyers who bought the same vessel at USD 46.50 million. Similarly, from the seller's perspective, the

shipowner who sold the vessel between May 2022 to June 2022 at a price of USD 46.60 also gained the highest surplus compared with the seller who sold the vessel only at USD 27.50 million; because the price of the vessel was at its peak (USD 46.50 million) in this period. So, among the four shipping markets (new building, sale and purchase, freight, and demolition), the concept of price bargaining can be successfully applied in the S & P shipping market. In addition, due to the fluctuation of freight rate in line with asset value, nature of the market, characteristics of the vessels, and the players, the application of the bargaining concept can also play an important role in the shipping freight market. However, the new building market is monopolistic and less competitive due to the limited number of shipyards (act as sellers) compared to the buyers of this market. Further, the price volatility in the demolition market is also low, and the valuation of the scrap vessels does not change dramatically in accordance with the characteristics of the players. So bargaining is not attractive in the new building and demolition market.

Amongst the other factors, it is essential to consider the age of the vessel, freight rate, and finally, the buyer's and seller's expectations from the trade for determining the value of a second-hand vessel (Park et al., 2018). The expectation of the players from a specific trade is highly correlated with the seller's minimum price willing to sell the vessel, the buyer's maximum price willing to pay for buying the ship, and finally, the final transaction price, which is also linked with the bargaining power and ability of the buyers and sellers. If the seller's expectation is higher than the buyer's highest price, then the negotiation process may not succeed. For example, In the S & P market, almost all trades take place through the bargaining process between the sellers and buyers (Stopford, 2008). So, if the seller of a five years old Capesize (180k) bulk carrier wants to sell the vessel at a minimum price of USD 60 million between January 2021 to August 2022, and the buyer wants to pay USD 50 million dollars for the same vessel; in that case, due to the sellers' more expectations, there is no trade between the parties, and the payoff of both parties is equal to zero. However, after successful completion of the trade, both players might gain some payoff in accordance with their bargaining power. The surplus is the difference between the seller's and buyer's valuation for a specific trade. Estimating and dividing surplus between the players according to their bargaining ability is one of the main challenges for asset valuation

using bargaining theory. Because the reservation price (the sellers/buyers' willingness to sell/ buy a specific product) is an internal issue of the players (Song, 1995); it is not shared by the parties and is very difficult to estimate.

3.4.1. Estimation of the characteristics of the market

Usually, from a shipowner's perspective, it is not possible to generate massive revenue by operating a ship; however, the sale and purchase activities can be considered an important source of generating revenue in the shipping industry. So, it is to be argued that ship owners have two roles, one is operating the ship; making profits through cargo transportation, and another one is making decisions to buy a vessel in a weak market and sell in the peak market to make more money (Stopford, as cited by Park et al., 2018). Significant research has been conducted to determine the price of second-hand ships because it is highly correlated with the S & P activities. For valuation purposes, most of the researchers highlight the market environment, such as order book, new delivery, freight rate, and the size of the vessel. For example, Alizadeh & Nomikos (2007), introduced the relationship between the volatility of the freight rate and the fluctuation of the new building and second-hand ship price. Tsolakis et al, (2003) argued that depending on the type and size of the ship, different factors have a different impact on pricing the second-hand vessel, so multiple analysis is required depending on the characteristic of the vessel. Amongst others, Rau & Spinler (2016), Beenstock & Vergottis (1989), and Haralambides et al., (2005) analyzed the shipping price based on some assumptions: such as whether investors can be able to gain profit through the operation of the vessel or capital gain through buying and selling activities. They also assume that investors in the shipping industry apply different strategies and use all available sources to collect all relevant information to maximize their profit and make investment and disinvestment decisions. Usually, there are two main reasons behind a shipowner taking a decision to sell a vessel. The first one is related to asset playing; that means when the shipping market goes up, the shipowner sell a ship to make huge profit. Secondly, when the market goes down the ship owner sell the vessel to minimize the loss.

The four-shipping markets are highly correlated. Because of that, when the price of the second-hand vessel increases, the price of the new building, freight market, and

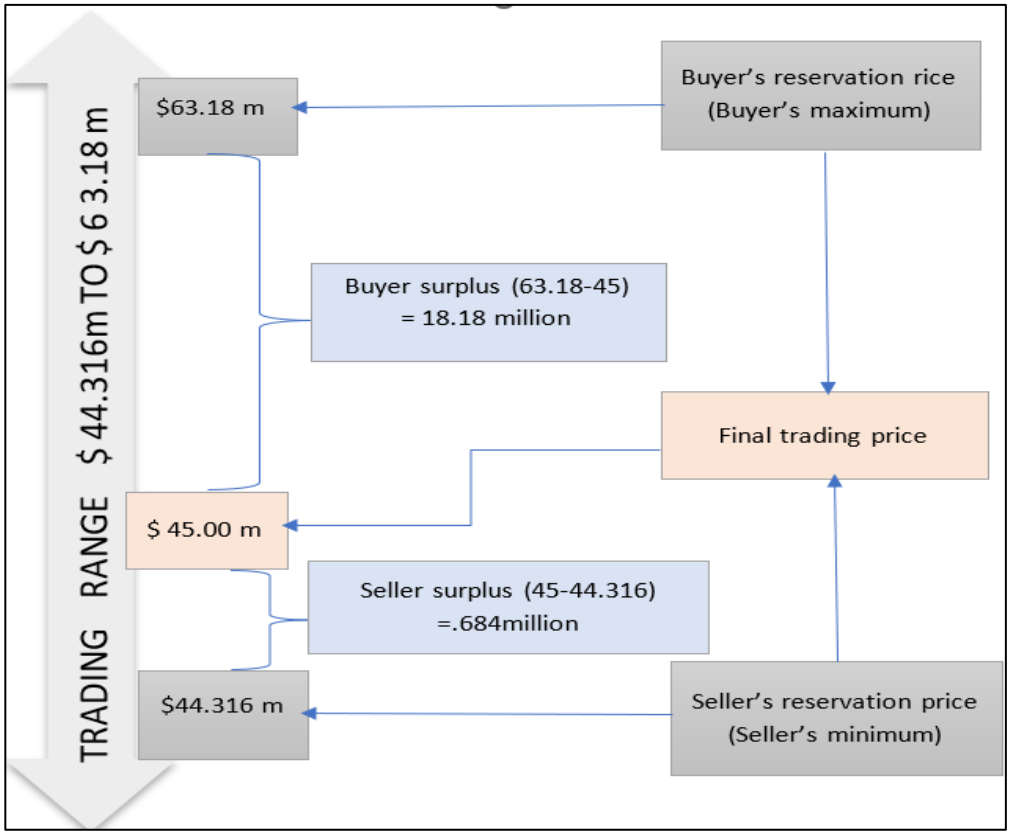
demolition market also increases. Since shipping is a derived demand of the seaborne trade (Jansson and Shneerson as cited by Lun & Quaddus, 2009), so demand for shipping services is highly influenced by the volume of seaborne trade. When the volume of world seaborne trade increases, then the demand for shipping services also increases, which first of all affects the freight market. This increasing freight rate provides a signal to the other three shipping markets as well as shippers and carriers regarding the demand and supply of the shipping market. In line with the characteristics of the market, the freight rate goes up when the demand for the shipping service exceeds the supply (Lun & Quaddus, 2009). This is considered the blooming market or bullish market. Freight rate frequently increases in the bullish market. It could be argued that the vessel's price and the seller's bargaining power also increase in line with the market characteristics. For the purpose of our study, we assume that if the present value of a vessel is higher than the last one-year average price, then it can be considered a bullish market. In contrast, if the characteristic of the market is the opposite of the bullish market, which means today's vessel price is lower than the last one-year average price, then it is considered a bearish market. Usually, the ship owner sells the vessel in the bullish market to maximize the profit and in a bearish market to minimize the loss (Merikas et al., 2008) or due to a shortage of cash flow i.e., Pay to a bank loan or pressure to pay bunker bill (Stopford, 2008). That also reduce the bargaining power of the sellers. In this situation, our assumption is as follows:

(1) If Price Today - last one-year average price > 0 that is considered a bullish market

(2) If Price Today - last one-year average price < 0 that is considered a bearish market

In the next section, this study illustrates how a seller (buyer) estimates his/her reservation price (seller's minimum price & buyer's maximum Price) in line with the seller's asking price by analyzing a simple case study. In addition, it also finds out the bargaining surplus for both parties, which is represented by figure 3.

Figure 3**:** Estimation of reservation price, Trading price, surplus, and trading range[3]



3.4.2. A simple case study (analyse the reservation price, and surplus)

The following section provides a simple case study to understand the application of the bargaining model in the shipping asset market and splitting the surplus between the parties. For example, H-line shipping (a Korean shipping company) intends to sell their vessel named "HL pride". The vessel was built in 2016 by the Dalian shipbuilding company, and the size of the vessel was 179,656 DWT (Capesize bulk carrier). The company was incorporated in 2014, and they have fifty vessels in its fleet (data obtained from Clarkson'sClarkson's SIN), so this study assumes that the seller is a well-experienced and well-informed seller. For selling the vessel in the S & P market,

[3] According to figure 3, selling price of a Capesize bulk carrier was USD 45.00 million. Seller's (buyer's) minimum (maximum) price willing to sell (buy) the vessel has been estimated USD.44.316 million and USD. 63.18 million; which is the trading range for this transaction. Difference between trading price and seller's minimum = seller's surplus. Similarly, buyer's maximum price – trading price = Buyer's surplus.

the seller needs to provide an asking price to attract the potential customer and to start the bargaining process, which is also called the offer price (Arnold, 1999). Usually, the asking price is higher than the reservation price (sellers' minimum price) because the final transaction price may be lower than the asking price but not less than the reservation price. In this case, for fixing the asking and reservation price, it is important to identify the characteristics of the market, whether it is a bullish or bearish market. As the seller is a reputed shipping company in Korea, we may think that they are well aware of the volatile nature of the shipping market. Due to the volatile nature of the market, the price of the vessel may decrease at any time, so this study assumes that the seller should consider the last one-year average price for the seller's reservation price. However, in the bullish market, sellers may offer a higher asking price due to the higher bargaining power, which should be the highest price in the last year. On the other hand, the price of the vessel reduces continuously in the bearish market, which means today's price may be lower than the last twelve moth's average price; that also reduces the bargaining ability of the seller.

However, from the buyer's perspective, it is important to analyze the earnings of the vessel and the scrap value by considering the discount factor for determining the price of the vessel (Alizadeh & Nomikos, 2007). Having all of these in mind, this study estimates the seller's (buyers) reservation price and asking price as follows:

(3) In a bullish market seller's reservation price = the average market price of the previous one-year price.

(4) In a bullish market seller's asking price = is the highest market price of the previous one-year price.

(5) In a bearish market seller's reservation price = price today- (last one-year average price. -today's price).

(6) In a bearish market seller's asking price = is the highest market price of the previous one-year price.

(7) In bullish/ bearish market the buyer's reservation is = {(Earning per day x yearly operational day x remaining life) + scrap value} considering discount factor

In this case, the vessel was built in 2016, so the age of the vessel is six (6) years. According to Clarkson's SIN, in June 2022, the price of five years and ten years old Capesize bulk carriers was USD 53.00 million and USD 37.00 million, respectively. Depending on this price, we have calculated the six (6) year old Capesize vessel (appendix-1). According to our calculation in June 2022, the price of a six-year-old Capesize vessel was USD 49.8 million and the average price for the last one -year for the same vessel was USD 44.316 million. That means today's price (USD 49.8 million) is greater than the Last-one year's average price (USD 44.316 million). So, according to our assumption one (1), this market is considered a bullish market. Now according to our assumptions four (4), the seller's asking prices should be the highest market price of the last year (USD. 49.8 million) price. And in accordance with our assumption 3 (three), the seller's reservation price should be the average market price of the last year, which is USD 44.316 million (Appendix-1).

However, the earning per day of a Capesize vessel in June 2022 was USD 14,062 per day, the scrap value was USD 12.73 million, and the age of the vessel was 6 years, so the remaining life of the vessel is (25-6) years = 19 years; as the average economic life of a ship is 25 years (Ma, 2020, P.204). This study also considers that the operational day of the vessel is 350 days in a year. For financing the shipping asset, the bank loan is considered the easiest and cheapest source. The interest of the bank is the combination of the London interbank offer rate (LIBOR) + bank spread (range from 20-200 basis points over the financing cost) + other administering and transaction costs (Stopford, 2008, p.289). This study {(considers the LIBOR 6 month's average market interest rate 3.24% + bank spread (based on 200 basis point) 2% (1 basis point = 0.01%) + Other charges .76%, so rate of interest = 6% (this was used for calculating net present value). So, in accordance with our assumption 7, buyers' reservation price should be {(earning per day USD 14,062 X 350 days X 19 years) + USD 12.73 million} considering 6% discount factor =USD 63.18 million (Appendix-2). This vessel was sold in June 2022, and the trading price was USD 45.00 million. So, the seller's surplus was (45.00-44.316) = .684 million, and the buyer's surplus was (63.18-45.00) = 18.18 million. This result indicates that the buyer had higher bargaining power than the seller, so the buyer gained more surplus than the seller. Figure 3 illustrates the reservation price, asking price, transaction price, and the

surplus of the trade. In the next chapter, this study estimates the discount factor of the buyers and sellers from the individual trade to identify their patience, individual bargaining ability, and surplus from the individual trade.

Chapter 4: Data and Empirical Result

The objective of this study is to operationalize the bargaining concept in the sale and purchase shipping market. Hence, this study has conducted a comprehensive literature review in the previous chapter to identify the research gap. To contribute to the literature in line with the research gap, this study applied the price bargaining concept in different sizes (Capesize, Panamax, and Handymax) of bulk carriers in the sale and purchase (S & P) shipping market. For the purpose of the study, bulk carrier's monthly secondary sales data covering the period from 2019 to 2022 of Capesize (186 observations), Panamax (416 observations), and Handymax (650 observations) including builder's information, size of the vessel, Year of build, buyer, and seller information has been collected from the Clarkson's shipping intelligence network (SIN) database; which is considered the leading data storage centre for all aspects of shipping and trade. In addition, data were also collected for the scrap value, average long-term historical Earnings, the London interbank offered rate (LIBOR), new building price, fleet development, demolition, order book, fleet average age, and bunker price from the same source.

The aim of this chapter is to introduce the method, research design, and analyze the result of the study for a better understanding of the price bargaining concept in the Capesize, Panamax, and Handymax bulk carriers in the S & P shipping market. Keeping this in mind, the chapter first analysed the characteristics of the market (bullish or bearish) to estimate the seller's and buyer's reservation prices. Which is the seller's minimum price willing to sell a product in a specific period and the buyer's maximum price for willing to buy the same product in the same time. Then it analysed the surplus of the players in accordance with the market's actual trading price and the characteristics of the players. Further, this study estimated the discount factor of the buyers and the sellers considering the surplus and the minimum and maximum trading range for the individual trade. Microsoft Excel has been used to calculate and statistically analyse the study's result. In addition, for identifying the factor that affects the discount factor and the surplus of the buyers and sellers (considered as dependent variable-Y), this study conducted regression analysis by MATLAB software.

4.1. Method and research design

As discussed in the previous chapter (operationalization of the price bargaining concept in the S & P shipping market), the surplus of a specific trade can be divided between the sellers and buyers in accordance with the characteristics and bargaining power of the players. Among other variables, the bargaining power of the players is also influenced by the characteristics of the market (Zhang et al., 2018). As there is no standard format for trading in the sales and purchase market (Kuester Simic & Prigge 2016); hence for the purpose of the study, we have made the following assumptions for estimating the Characteristics of the market, seller's (buyer's) minimum (maximum) trading price, bargaining surplus and their minimum discount factor.

Characteristics of the market:

If PT - AVG of 1 year > 0 = Bullish market. (1)
If PT - AVG of 1 year < 0 = Bearish market. (2)

Seller's minimum:

Bullish = AVG of 1 year (3)
Bearish= {PT - (AVG of 1 year - PT)} (4)

Buyer's maximum:

Bullish/Bearish= {(EPD x OPD x RL) + SV (5)

Surplus:

Buyer = BM - TP (6)
Seller = TP- SM (7)

Minimum discount factor:

Buyer = 1- (SSP/TSP) (8)
Seller = 1- (BSP/TSP) (9)

Where PT represents today's vessel price in the sale and purchase market, AVG is the average rate, bullish can be expressed as the increasing market price of the vessel, and bearish means the period when the vessel price decreases. The seller's minimum and the buyer's maximum prices are their internal price for a specific trade that are not disclosed in the market (Song, 1995). EPD represents the earning per day of a vessel, OPD is the operational day in a year (350 days), and RL means the remaining life of a vessel (economic life is 25 years), and SV denotes the scrap value after operational life. Moreover, BM illustrates the buyer's maximum price, TP is the Total transaction price, and SM indicates the seller's maximum price. Finally, the discount factor estimates the patience of the players, SSP is the seller's surplus, BSP denotes the buyer's surplus, and TSP represents the total surplus. In the previous chapter (operationalization of the price bargaining concept in the S & P shipping market), we discussed how to estimate the characteristics of the market. Minimum (maximum) price for sellers (buyers) and the bargaining surplus of the players of an individual trade. In line with that, this chapter estimated the discount factor of the players to find out the individual trading range for a specific trade. As this study consider the basic bargaining model (Rubinstein's dynamic bargaining game model) for dividing the surplus, so according to Rubinstein (1982), the payoff and discount factor of the parties have been calculated as follows (where δ is the discount factor of the players):

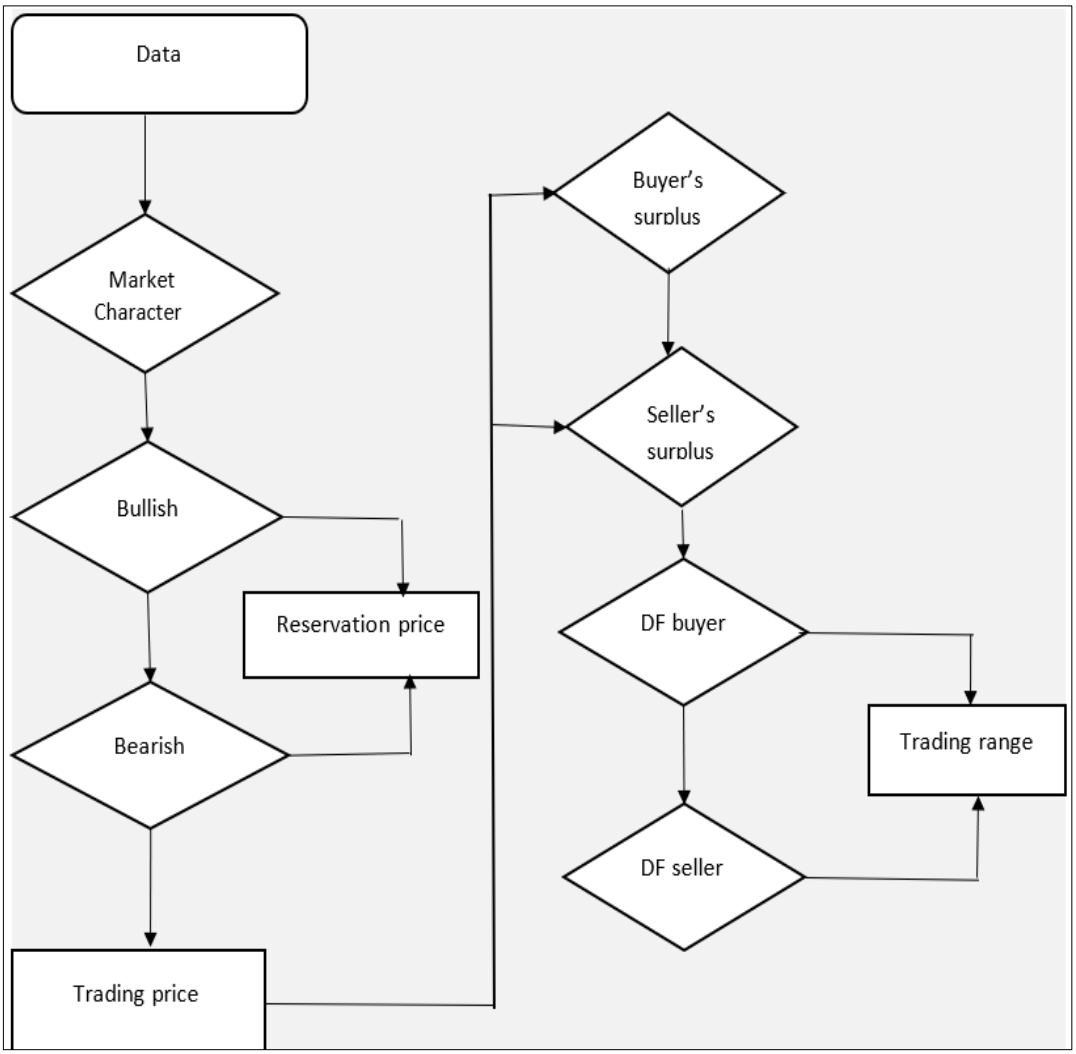
Payoffs for $p_1 = 1 - \frac{\delta_2}{1-\delta_1\delta_2}$ (1)

Payoffs for $p_2 = \frac{\delta_2}{1-\delta_1\delta_2}$ (2)

Figure 4 represents the flowchart of our study, starting from data collection and ending at the maximum and minimum trading price (trading range) for the individual transaction. According to the flowchart, it is important to analyse the characteristics of the market to estimate the seller's minimum and buyer's maximum price for willing to sell or buy a specific product; the difference between the buyer's maximum and seller's minimum price is considered as bargaining space. The maximum and the minimum trading prices (trading range) have been calculated based on the players' discount factor; the discount factor may be considered one of the key issues that

affect the final outcome of the bargaining process. The higher discount factor indicates the higher bargaining power (Knight, 2005) and more surplus of the player compared to the counterpart.

Figure 4: Research Design (flowchart).[4]



Source: created by the author.

[4]Figure 4, represents the flowchart of the research; where reservation price is the buyer's (sellers) maximum (minimum) price for the individual trade. DF (buyer/seller) is the discount factor of the players; which indicates the characteristics (patience) of the players. The trading range is the difference between the buyer's maximum and the seller's minimum price.

4.2. Dependent and independent variables

According to Rubinstein (1982), the surplus should be divided between the players using their discount factor, which means the payoff of the buyers and sellers is discounted by their individual discount factor. So, the delay of the bargaining outcome indicates a loss of opportunity cost and obviously decreases the payoff value. This is also related to the patience of the players to finish the deal. Keeping the same in mind, this study considered the discount factor and the surplus of the buyers (sellers) as dependent variables to find the relationship between the dependent variables (Y)and various independent variables (Xs); which are represented in table 1.

Table 1: Dependent and Independent variables:

Dependent/Independent variables	Description
Dependent variables	Discount factor of the buyer
	Discount factor of the seller
	Buyer's surplus
	Seller's surplus
Independent variables:	Age of the vessel
	Price of the vessel
	Builders name
	Bunker price
	earning of the vessel
	Name of the buyers
	London interbank offer rate (LIBOR)
	Scrap value
	Size of the vessel (DWT)
	Seller’s name
	Newbuilding price
	Maximum trading price
	Minimum trading price
	Fleet development

	Demolition
	Orderbook
	Fleet average age
	Name of the buyers

The variables are considered in accordance with the relationship between the x and Y variables, relevant literature, and economic justification. Monthly cross-sectional data has been used to conduct four regression models for each type of vessel; where one model was developed by utilizing the buyer's minimum discount factor, another one was conducted based on the seller's minimum discount factor, and the third and fourth regression has been conducted based on the buyer's and seller's surplus as Y variables with significant independent variables (Xs); which may affect the discount factor and the surplus of the players in a specific trade. Although the price of a vessel in the S & P market is determined by multiple negotiation processes, yet, there is no standard format for the trading process in this market (Kuester Simic et al., 2016). So, applying the bargaining concept in a standard format is essential for the sustainable growth of the modern shipping industry.

4.3. Empirical result and finding

The results of this research obtained from Microsoft Excel and regression analysis by MATLAB software; which are discussed in the following sections.

4.3.1. Result from Microsoft Excel analysis

Microsoft Excel analysis was conducted to find out the following factors: trading range, the minimum discount factor, and the relationship between earning and surplus for the individual trade. It also analysed the characteristics of the market, the seller's minimum price, and the buyers' maximum price. Based on our previous assumptions no-1 to 9 (section 4.1), this study has estimated the minimum discounting factor of the buyers and the sellers. By applying Rubinstein's (1982) equilibrium solution, this study calculated the maximum and minimum trading price (trading range) for each individual trade. Figure 5 to 10 represents the actual trading price and the individual trading range (maximum and minimum trading price for the players) for Capesize, Panamax,

and Handymax bulk carriers through a line graph and box plot. According to figure 5 to 10, it can be seen that throughout the study period, there was a significant gap between the maximum and minimum trading price compared with the actual trading price, which indicates a big room for bargaining in the S & P shipping market. For the purpose of the study, the actual trading price of the Capesize, Panamax, and Handymax bulk carriers has been collected from Clarkson's SIN between 2019 to 2022.

4.3.1.1. Actual trading price and the individual trading range (Capsize)

Figures 5 and 6 illustrate the actual trading price and the individual trading range for Capesize bulk carrier throughout the study period (between 2019 to 2022).

According to figure 5, the mean or average value of the buyer's maximum trading price (willingness to buy a Capesize bulk carrier) was USD. 81.47 million. However, the average value of the seller's minimum price (willingness to sell) for the same vessel was USD 24.28 million, which indicates that there was a big difference between the buyer's and seller's individual prices. Due to this big difference between individual prices, room for bargaining has been generated in the S and P market throughout the study period. On the other hand, the average trading price (actual selling price) for the Capesize bulk carrier was USD 27.43 million, which is very close to the seller's minimum price and far from the buyer's maximum price. This also implies that the buyers of the vessel gained more surplus compared to the sellers.

Figure 6, also illustrates the same scenario for surplus distribution. For instance, in October 2021 (figure 6), there was the highest gap between the individual maximum and minimum trading price; which was USD 223.07 million as the maximum trading price and USD 52.99 million as the minimum trading price (trading range was USD 223.07 to USD 52.99 million; obtained from Microsoft Excel analysis.), however, the actual trading price (selling price) was USD 65 million (obtained from Clarkson's SIN). This indicates that there was a big space for playing the price bargaining games in that particular trade, where the seller of the vessel gained less bargaining surplus compared to the buyer. According to our study (Excel analysis), the minimum discount factor of the seller for this particular trade was .08. However, it was .92 for the buyer. As a discount factor can decrease the probability of recognition, hence a discount

factor that is lower than 1 can be expressed as impatience (Knight, 2005). In this case, the higher discounting factor of the buyer indicates that the buyer is more patient compared with the seller for this particular trade. As such, from the context of the bargaining game, it can be recognized that due to the higher discount factor, the buyer gained more surplus from the trade. However, figure 6 also illustrates that in February 2021, the individual maximum trading price and the minimum trading price became very closer, which indicates that there was not too much space for bargaining in that particular trade.

Figure 5: Actual trading price and buyer(seller) maximum (minimum) price for Capesize bulk carrier (box plot)

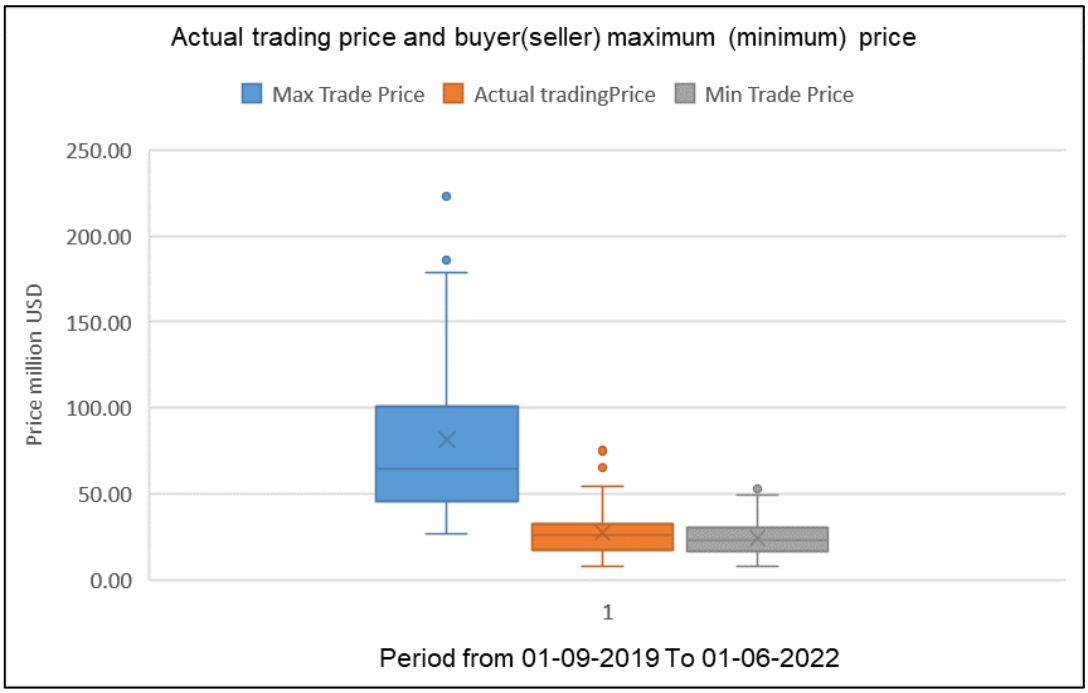
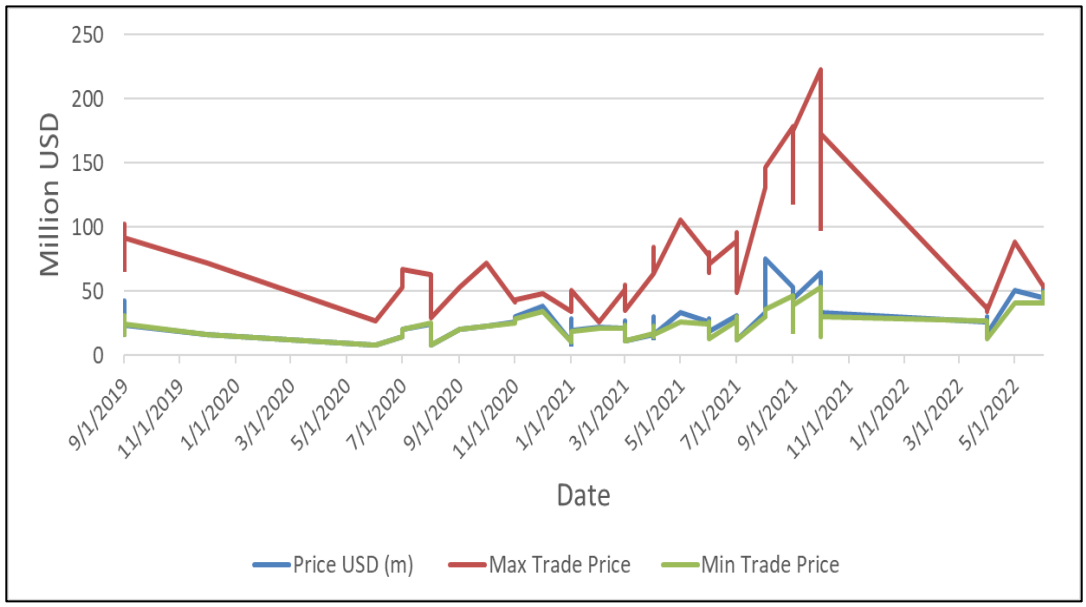


Figure 6: Actual trading price and buyer(seller) maximum (minimum) price for Capesize bulk carrier (Line graph).



Source: Data collected from Clarkson's SIN (created by the author)

4.3.1.2 Actual trading price and the individual trading range (Panamax)

Figures 7 and 8 illustrates the actual trading price and the individual trading range for Panamax bulk carrier throughout the study period (between 2019 to 2022).

According to figure 7, the buyer's maximum (highest) price willing to buy a Capesize vessel has been estimated at USD.125.77 million, and the average price the buyer willing to pay for buying a Panamax bulk carrier has been estimated at USD 53.22 million throughout the study period. However, from the seller's perspective, the highest minimum price seller was willing to sell a Panamax vessel was USD.13.50 million, and the average price (seller's minimum price) was USD 6.60 million. In this situation, there was also a big space between the buyer's maximum and the seller's minimum price, which also indicates a big room for bargaining in the S & P shipping market for trading Panamax bulk carrier.

Similar to figure 7, figure 8 also represents the same behaviour of the individual trading price for Panamax bulk carriers. For instance, in September 2021, the trading

price of a Panamax bulk carrier was USD 28 million (obtained from Clarkson's SIN), and the individual trading range was USD 7 to 121 million (obtained from Microsoft Excel analysis). There was also a big difference between the minimum and maximum trading prices, and the buyer gained the major portion of the surplus. This study analysed the reasons for buyer's major portion of surplus and identified that around 113 Panamax bulk carriers were sold in 2021 (data obtained from Clarkson's SIN). Among them, 91 vessels were sold between January to June 2021. However, only 22 vessels were sold between July to December of the same year. Due to the low demand in the last six months of the year (July to December), the price of the vessel, volume of sale, and bargaining power of the seller decreased. On the other hand, the buyer enjoyed more surplus due to the higher bargaining power in the bearish market.

Figure 7: Actual trading price and buyer(seller) maximum (minimum) price for Panamax bulk carrier (box plot).

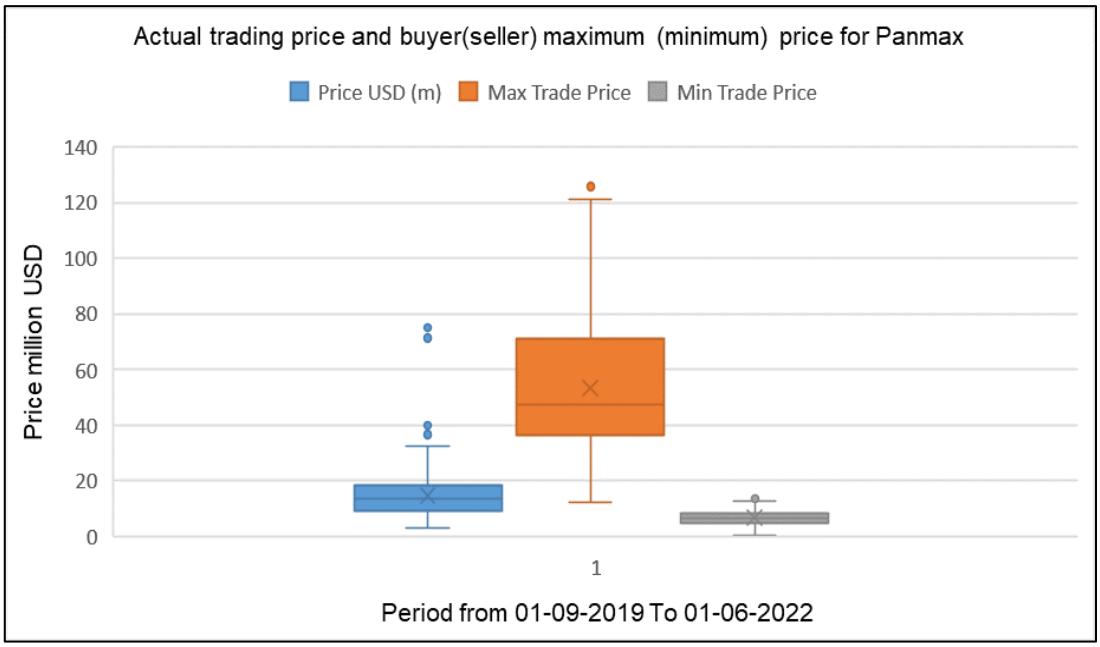
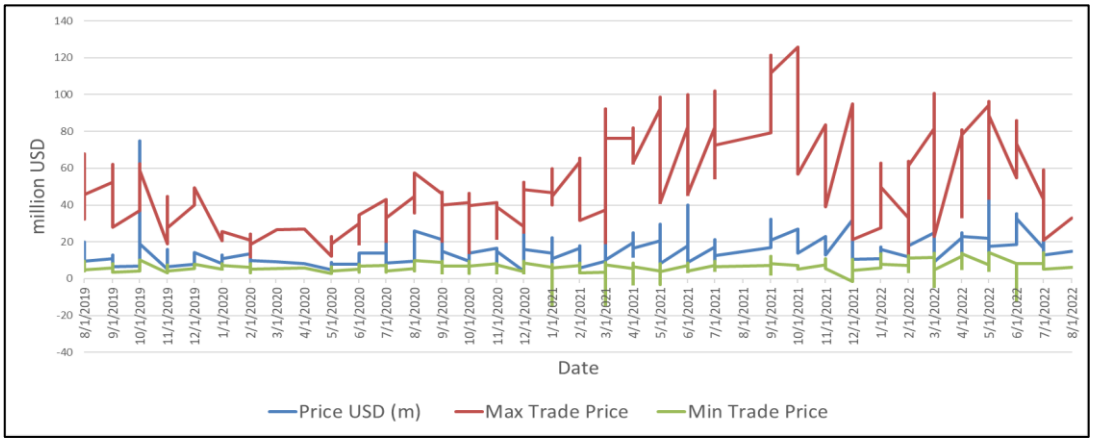


Figure 8: Actual trading price and buyer(seller) maximum (minimum) price for Panamax bulk carrier (Line graph).



Source: Data collected from Clarkson's SIN (created by the author).

4.3.1.3. Actual trading price and the individual trading range (Handymax)

Figures 9 and 10 illustrate the actual trading price and the individual trading range for Handymax bulk carriers throughout the study period (between 2019 to 2022).

According to figure 9, the mean or average value of the buyer's maximum trading price (willingness to buy a Handymax bulk carrier) was USD. 57.23 million, however, the average value of the seller's minimum price (willingness to sell) for the same vessel was USD 10.64 million, and the average trading price (actual selling price) for the Handymax bulk carrier was USD 16.68 million. This means the average surplus of the buyers and sellers was USD 40.55 million and USD 6.04 million. So, the difference between the buyer's and seller's surplus was USD 34.51 million. On the other hand, the average surplus of the sellers and buyers for Capesize vessels was (27.43-24.28) = USD 3.15 million and (81.47-27.43) = USD 54.031 million. Hence, the difference between the buyer's and seller's surplus for the Capesize bulk carrier was USD 50.88 million. Although there is a big difference between the buyer and seller surplus in the Capsize bulk carriers (USD 54.031 million) throughout the study period, this gap seemed to be less (USD 34.51 million) for the Handymax sale in the S&P shipping market.

This study critically examined the difference in the surplus gap between the Capsize and Handymax bulk carrier and claimed that around 184 Capsize bulk carriers were sold from 16-09-2019 to 15-08-2022 in the S & P market (Clarkson's SIN). However, the number of Handymax sale was 640 in the same period. Due to the high demand for the Handymax vessel in the S&P market, the volume of sales increases, which also affects the bargaining power of the players (Fan & Luo, 2013). Due to the high demand for the Handymax bulk carrier, the seller of the Handymax bulk carrier gained more bargaining power compared with the Panamax and Capesize bulk carrier sellers. Hence, the price gap between the maximum and minimum trading price and the surplus gap for the Handymax vessels is lesser than for the Panamax and Capesize bulk carriers.

Figure 9: Actual trading price and buyer(seller) maximum (minimum) price for Handymax bulk carrier (box plot).

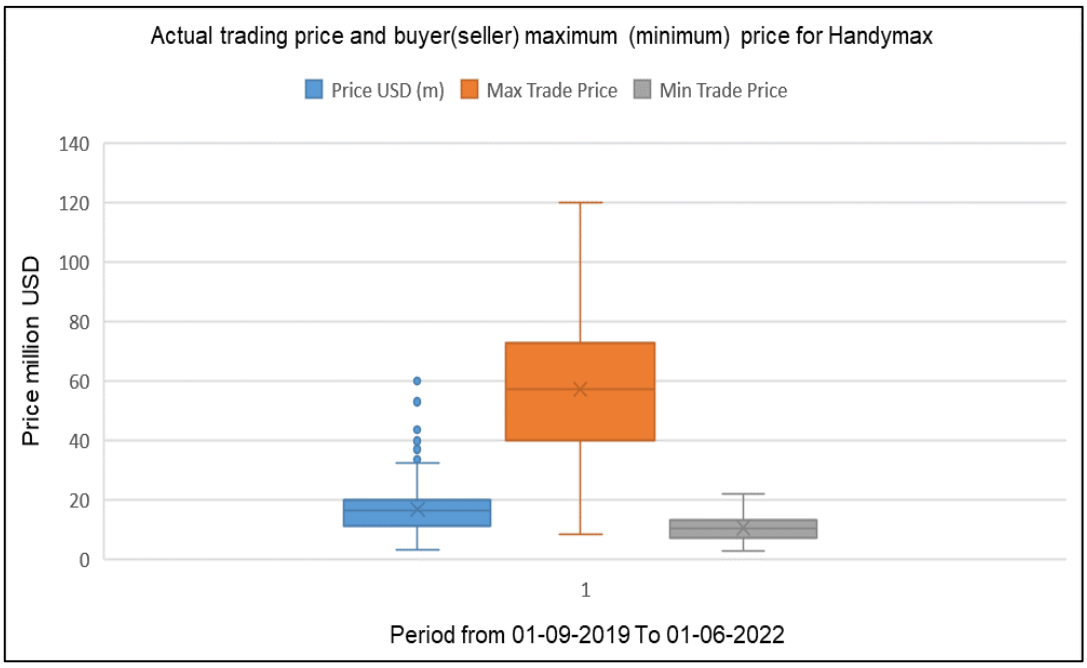
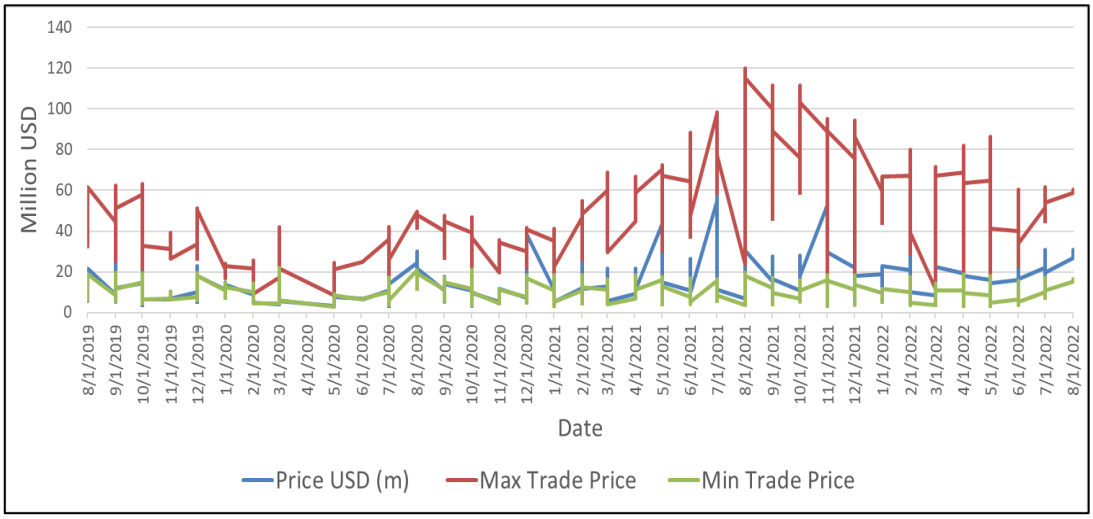


Figure 10: actual trading price and buyer(seller) maximum (minimum) price for Handymax bulk carrier (Line graph).



Source: Data collected from Clarkson's SIN (created by the author)

Overall, on average, there was a big gap between the seller (minimum) and buyer (maximum) prices throughout the study period for Capsize, Panamax, and Handymax bulk carrier [5](figure 5 to 10), which provides a signal for the importance of the price bargaining concept in the second-hand shipping market. However, this price gap is considered the total bargaining surplus for an individual trade. Between the two players, who have a higher discount factor may gain more surplus compared to their counterparts.

4.3.1.4. Relationship between discount factor and the surplus

Table 2 illustrates the minimum discount factor and surplus for the buyers and sellers for Capesize, Panamax and Handymax bulk carriers from 01-09-2019 to 01-06-2022 (study period). It has been observed that the average minimum discount factor and the average surplus of the buyer were the highest for the Capesize vessel, which was .90 and USD 54.15 million. On the other hand, the average discount factor and the

[5] Figure 5 to 10 illustrates the maximum (minimum) trading price of the buyers (sellers) and the actual selling price for Capesize, Panamax ad Handymax bulk carrier. It has been claimed that the actual selling price is very closer to the seller's minimum price; which means the seller has less bargaining power. This also implies that the buyer has more bargaining power and gained a higher portion of the surplus compared to the seller for all types of vessels.

surplus of the seller were the lowest (.10 and USD 4.12) for the Capesize vessel throughout the study period.

The average discount factor of the seller has been increased for Panamax and Handymax vessels compared to the Capesize vessel. Hence the average surplus of the seller also improved for the Panamax and Handymax vessels in comparison to the Capesize. Further, the discount factor and the surplus of the buyer for Panamax and Handymax have decreased compared to the buyer of the Capesize vessels. This implies that there is a positive relationship between the discount factor and the bargaining surplus in the S&P shipping market.

Table 2**:** Minimum Discount factor and surplus for all sizes of the bulk carriers.

Size of the vessel	Number of the sales	Minimum discount factor buyer (Average)	Minimum Discount factor seller (Average)	Avg. Buyer surplus (million USD)	Avg. Seller surplus (Million USD)
Cap size	184	.90	.10	54.15	4.12
Panamax	405	.80	.20	39.71	10.13
Handymax	640	.85	.15	40.72	7.00

Source: Data collected from Clarkson's SIN (created by the author).

4.3.1.5. Relationship between the earnings and surplus (Capesize)

Figures 11 and 12[6] represent the relationship between the earnings and surplus for Capsize bulk carriers in the sale and purchase shipping market. Figure 11 illustrates the minimum, maximum and average surplus of the buyers (sellers) and the highest, lowest and average yearly earnings of a Capsize bulk carrier between 01-09-2019 To 01-06-2022. It has to be noted that the highest surplus for buyers (sellers) has been

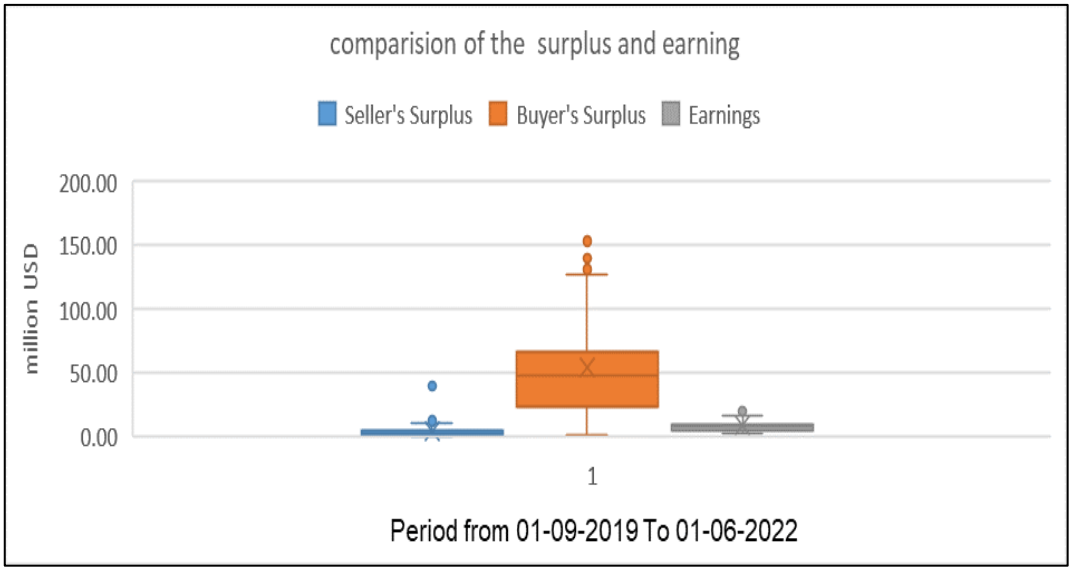
[6] Figure 11 to 13, examine the relationship between the earning and bargaining surplus of Capesize and Panamax bulk carrier. The result implies that there is a positive relationship between the earnings and the surplus of a specific trade; this means when the earnings increase than the total surplus also increases.

estimated at USD 153.04 million and USD 39.88 million. However, the highest yearly earning was USD 19.79 million. Actually, there is a positive correlation between the earnings of the vessel and the bargaining surplus, which is also represented by figure 12.

According to figure 12, the surplus of the players significantly decreased between 01-01-2021 to 01-03-2021 due to the lower freight rate for Capesize bulk carriers. This study analysed the earning data of a Capesize bulk carrier from 01-09-2019 to 01-06-2022 and identified that per day earning of a Capesize vessel was only USD 7,310.00 on 01-02-2021. However, it was USD 54,963.00 on 01-10-2021. Since the earnings per day decreased on 01-02-2021, it affects the total surplus of the players (only USD 6.82 for both players).

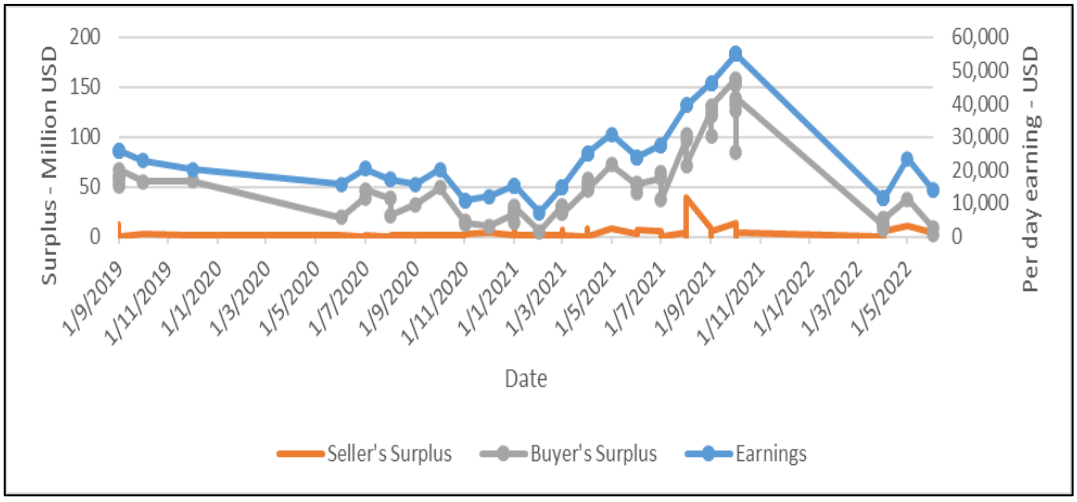
Due to the lower bargaining power of the seller, the buyer achieved more surplus (USD 4.79 million), and the seller gained only USD 2.03 million surplus (obtained from Microsoft Excel analysis). Usually, the price of a vessel increases when the freight rate increase, which is considered a bullish market. Due to the high demand, the value of a ship becomes above its fundamental value in the blooming market, and the speculators make huge profits by selling at a higher price (Alizadeh et al., 2017). In line with the higher freight rate and increasing value of the ship, the bargaining power of the players is also affected.

Figure 11: Relationship between earning and surplus for Capesize bulk carriers.



Source: Created by the author.

Figure 12: Relationship between earning and surplus for Capesize bulk carriers.



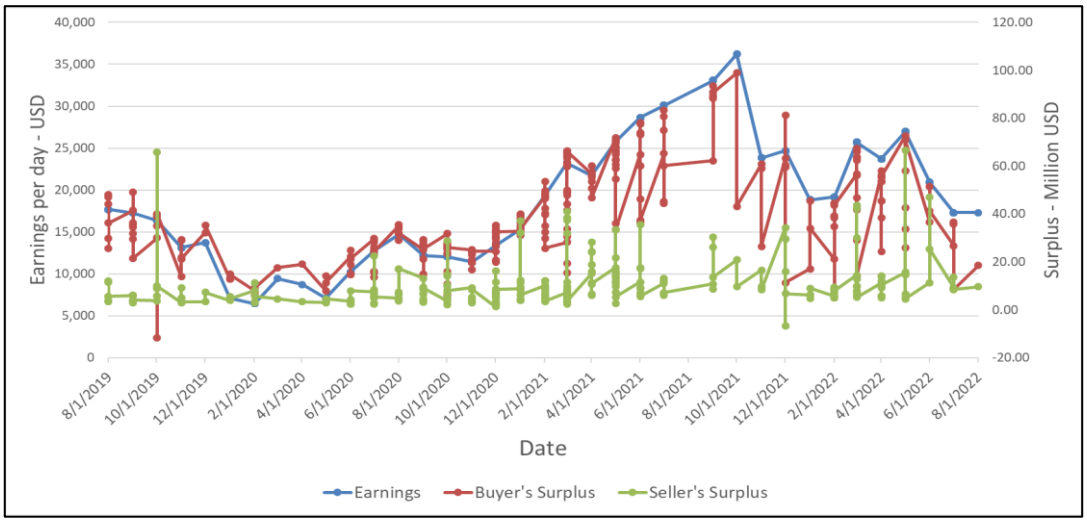
Source: Created by the author.

4.3.1.6. Relationship between the earnings and surplus for (Panamax)

Figures 13 represent the relationship between the earnings and surplus for Panamax bulk carrier. Similar to the Capesize bulk carrier, Figure13 also discusses the same

characteristics between the earnings and the surplus for the Panamax bulk carrier. For instance, per day earning of a Panamax bulk carrier was USD 36,206.00 on 01-08-2019, and the total surplus for the buyer and seller was USD 119.77 million, while the total surplus of the players dramatically decreased up to USD 10.41 million (for both players) on 01-02-2020 due to the lower-earning (USD.64,49.00 per day); which indicate that there is a positive correlation between the earnings of the vessel and the surplus of the players.

Figure 13: Relationship between earning and surplus for Panamax bulk carriers.



Source: created by the author

4.3.1.7. Relationship between average earning and surplus.

Table 3 discuss the relationship between earnings and surplus for 3 different sizes of bulk carriers. From table 3 it has also been observed that the average earning of Capesize vessels is greater than Panamax and Handymax bulk carriers throughout the study period. In accordance with the earnings, the total surplus of the players is also higher for Capesize vessels (USD 58.27 million) compared with the Panamax (USD 46.84million) and Handymax (USD 47.72 million).

Table 3: Relationship between earning and surplus for 3 different sizes of bulk carriers.

Size of the vessel	Average earning (per day USD)	Avg. Buyer surplus (million USD)	Avg. Seller surplus (Million USD)
Cap size	25,423.00	54.15	4.12
Panamax	18,754.00	39.71	7.13
Handymax	18,955.00	40.72	7.00

Source: created by the author

4.3.2. Empirical result and findings (OLS regression)

This research has conducted four regressions for each type of vessel. The first and second regression was conducted based on the buyer's and seller's surplus as Y variables. Another two models have been developed by utilizing the buyer minimum discounting factor and seller minimum discounting factor as dependent variables (Y) with significant independent variables (Xs); which may affect the surplus and discount factor of the players in a specific trade. After analyzing the regression result, this study has identified some significant variables (Xs) that affect the Y variables.

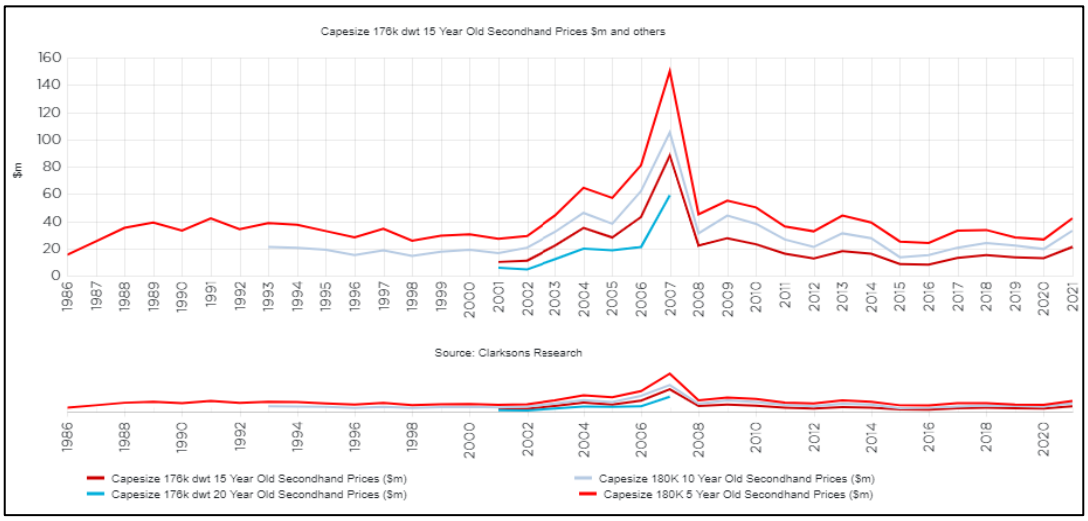
4.3.2.1. Significant variables

Age of the vessel

There is a strong relationship between the age of the vessel and the volume of trade in the S and P shipping market. According to the study conducted by Fan and Yin (2021), only 461 vessels (6.78%) which were more than 20 years old, were traded in S& P market between 2005 to 2019. However, the average age of the vessels which were significantly traded in the S & P market was 10.2 years during the same period. The maintenance cost of a vessel increases in line with the age of the vessel, which

means that the higher age leads to higher maintenance costs and less demand in the market due to lower technical specifications. According to figure 14, the average price of a 5 year old Capesize vessel was USD 40.15 million. However, it was USD 28.67, 22.08, and 20.07 million for 10, 15, and 20 years old Capesize vessels between 1986 to 2021. In accordance with age, the demand, price of the vessel, the bargaining power, surplus and discount factor of the parties also vary in an individual trade.

Figure 14: Price of the capesize vessel (5, 10, 15, and 20 years old).



Source: Clarkson's SIN

Price of the vessel

There is a strong correlation between the price of the vessel and the bargaining power and surplus of the players. For instance, in a bullish market price of the vessel increases sharply, which positively affects the bargaining power of the seller. On the other hand, the bargaining power of the buyer increases in the bearish market due to low demand in the market (Stopford, 2008). To minimize the cost, the ship owner worried about selling the vessel urgently, which negatively affected the discount factor of the seller; becoming impatient to sell the vessel; led to a lower surplus (Knight, 2005).

Builders

The quality of a vessel highly depends on the reputation of the builders. If the vessel had been constructed in a reputed shipyard, then the demand for the vessel would have become higher than a non-reputed shipyard vessel. There are more than 300 major shipyards in the world, but all shipyards do not have the same capability. For instance, more than 10.000 workers are employed in the Korean shipyard; they are very good at constructing the gas tanker and the container vessel (Stopford, 2008). In addition, the Korean shipyard also provides a competitive price for tanker construction due to huge investment, currency issues and improvement in the quality of the product (Tsolakis et.al., 2003). As such, the seller of the gas tanker and container vessel, which were constructed in Korea, could enjoy more bargaining power and a higher discount factor compared to the other seller.

Bunker price

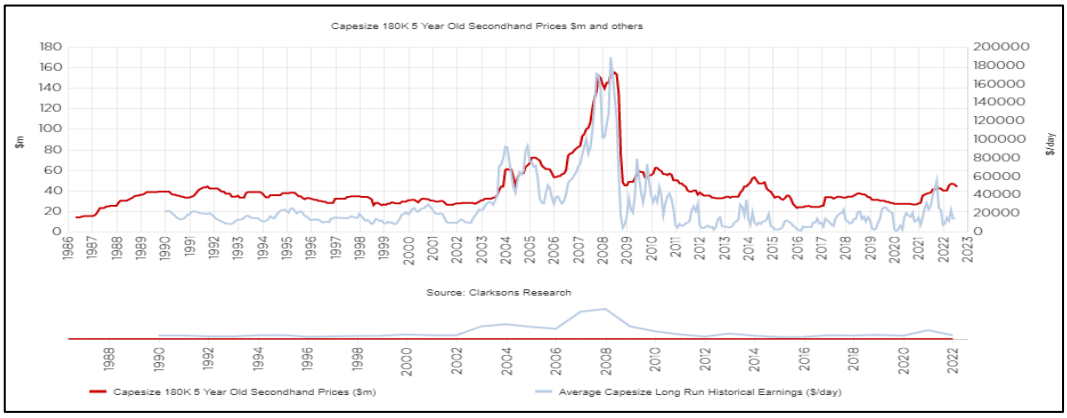
A large portion of the operation cost of a vessel is involved with the bunker price. So, one of the important variables for pricing ships is considered bunker price in the traditional ship pricing model (Alizadeh & Nomikos, 2007). Since the investor invests huge capital in buying a vessel, they want to make profit from operating the ship. However, due to higher bunker prices, operational cost increases, leading to a decrease in profit. As such, demand for the vessel decreases in accordance with the high bunker price, which also lowers the discount factor and bargaining power of the seller. Hence the price of the bunker influences the investor's decision to finance the shipping project, which indicates that buyers prefer to buy the vessel when the price of the bunker is low (Fan et al., 2021).

Earning of the vessel

From the buyer’s perspective, the price of a vessel is highly correlated with her earnings (Alizadeh & Nomikos, 2007). As such, the vessel of the same technical specification varied in accordance with the present and predicted freight rate of the market. Hence, earnings might be considered an important indicator in studying the vessel price and bargaining power in the S & P shipping market. Figure 11 indicates that the price of a Capesize bulk carrier is highly correlated with earnings. The price

of a 5-year-old Capesize (180k) was USD 153 million in MAY 2008 due to higher earnings (per day USD 188,641). However, the price of the same vessel decreased to USD 23 million in January 2016 due to a decline in the average earnings in that period (only USD 5425 per day). So, in line with the earning of the vessel, not only the price change but also barging power, surplus, and the discount factor of the players also varies.

Figure 15: Relationship between price and earning of a Capesize bulk carrier.



Source: Clarkson's SIN

Buyer's and seller's

In the S & P shipping market, the price of the vessel is determined by multiple negotiation processes between the buyer and the seller. As such, the characteristics of the players can play an important role in this process. According to Kousser and Phillips (2009), the two players (buyers and sellers) who have more patience to finish the deal mean having a higher discount factor and no urgency. So, he/she gains a better position in the bargaining situation compared to the counterpart. Hence, to understand the discount factor of the players, it is important to analyze the characteristics of the buyers and sellers.

London interbank offer rate (LIBOR)

As it requires huge capital to buy a vessel, hence Most shipowners arrange a bank loan for shipping finance; due to the cheapest and most flexible source of funds (Stopford, 2008). However, the interest of the bank loan is highly dependent on the

LIBOR; which means the bank interest increases if the LIBOR rate rises. Due to the high-interest rate, investors may avoid investing in the shipping project, leading to a decrease in the demand for a second-hand ship. Which negatively affects the bargaining power of the seller. According to Merika et al., (2019), LIBOR acts as a proxy for the cost of debt, so the price of a vessel in the S & P market is affected by the LIBOR. Hence, it is important to study the LIBOR rate to determine the second-hand vessel price and estimate the bargaining surplus between the players.

Scrap value

The scrap value of the vessel positively affects the price in the sale and purchase shipping market. When the price of the scrap ship increases, that obviously expands the volume of sale of the scrap vessel. Due to the increasing demand for the scrap ship, the supply of the vessel decreased, which led to an increase in both the vessel price and the freight rate (Merika et al., 2019). As there is a strong relationship between the vessel price and the bargaining power of the players, hence this variable has been considered in the study.

Table 4 illustrates that in 2001 scrap value of a Capesize vessel was USD 2.93 million and the price of a 5-year-old Capesize bulk carrier was USD 27 million. Due to lower scrap prices, vessel prices went down; hence only 18 vessels were sold during that period. The scrap price increased up to USD10.42 million in 2007; which led to the increase of the 5-year-old Capesize vessel price up to USD 150 million, and 75 vessels were sold due to the higher price. This study analysed scrap value for determining the bargaining surplus of the players and identified the relationship between them.

Table 4: Relationship between the scrap value, price and number of sales[7]

Date	Capesize Sales (No)	Scrap Value ($m)	Capesize 5-Year-old Prices $m
2001	18	2.93	27.00
2002	34	3.89	29.00
2003	41	5.60	44.00
2004	42	8.30	64.50
2005	38	7.28	57.00
2006	56	8.62	81.00
2007	75	10.42	150.00
2008	33	5.97	45.00
2009	48	7.18	55.00
2010	46	9.97	50.00
2011	39	11.22	36.00
2012	69	9.03	32.50
2013	63	9.25	44.00
2014	50	9.21	39.00
2015	71	6.44	25.00
2016	94	7.38	24.00
2017	86	9.26	33.00
2018	68	9.23	33.50
2019	32	8.36	28.00
2020	72	8.89	26.50
2021	93	12.62	42.00

Source: Clarkson's SIN

Size of the vessel (DWT)

Vessel size also affects the bargaining ability of the players. For instance, when two Cap-size vessels are being sold in the sale and purchase market, it has been shown that the price of the larger one is comparatively lower than, the smaller one. One of the reasons may be the root and the condition of the cargo (Merika et al., 2019). According to the study conducted by Fan and Luo (2013), the demand for the handy-size vessel is higher in the S & P market compared with other sizes. However, for the

[7] According to table 4, the volume of sale and the price of the vessel increased (decreased) in line with the scrap value of the vessel. Since bargaining power is influenced by the price of the vessel and the price of the vessel increases when the scrap value increased. Hence it may claim that there is a strong relationship between scrap value and the bargaining power of the players.

construction of a new vessel, the buyer usually prefers the bigger vessel; thus, the size of the vessel affects the bargaining ability in the s & P shipping market.

4.3.2.2. OLS regression result and findings (Capesize)

Model for buyer surplus (Capesize bulk carrier)

Table 5 represents the impact of different variables on the buyer surplus (Y). Among the variables, the HSFO, Buyer's Clients of Castor Maritime and the size of the vessel significantly affect the surplus of the buyer. The p-value of these variables are 0.067,0.085, and 0.074; which means they are significant at 10% level, and the estimated coefficients are 0.137 with HSFO, -0.013 with Buyers Clients of Castor and -2.184 with the size of the vessel. This result indicates that HSFO has a positive correlation, and the other two variables have a negative correlation with buyer surplus. For instance, the estimated coefficient between the buyer's surplus and the size of the vessel is -2.184; which means the size of the vessel negatively affects the bargaining surplus of the buyer.

Table 5: Model for buyer surplus
Linear regression model:
buyer's surplus ~ [Linear formula with 16 terms in 15 predictors]

Estimated coefficients	Estimate	SE	tStat	pValue
(Intercept)	0.485	0.253	1.918	0.079
Size	-2.184	0.000	-1.959	0.074
Buyers_ClientsofAlphaTankers	-0.002	0.008	-0.218	0.831
Buyers_ClientsofBaoliMarineShpg	0.005	0.008	0.630	0.540
Buyers_ClientsofBergeBulk	-0.008	0.009	-0.887	0.393
Buyers_ClientsofCMBLeasing	0.007	0.009	0.872	0.400
Buyers_ClientsofCastorMaritime	-0.013	0.007	-1.881	0.085
Buyers_ClientsofCharterwell	0.002	0.006	0.401	0.695
Buyers_ClientsofChartworldShipping	0.010	0.008	1.202	0.253
Buyers_ClientsofCinerDenizcilik	0.002	0.010	0.241	0.814
Buyers_ClientsofCyprusSeaLines	-0.007	0.010	-0.669	0.516
Buyers_ClientsofDiaYuanIntlShpg	0.000	0.008	-0.035	0.973
Buyers_ClientsofEasternPacific	0.001	0.009	0.085	0.934
Buyers_ClientsofEddieSteamshipCo.	0.004	0.007	0.544	0.597
Buyers_ClientsofEneselSA	0.014	0.009	-1.588	0.138

Buyers_ClientsofFranboLines	0.034	0.010	-3.546	0.004
Buyers_ClientsofGlobalMaritime	0.026	0.010	2.574	0.024
Buyers_ClientsofGlobalMeridian	0.008	0.008	1.009	0.333
Buyers_ClientsofGlobalMtimeInvst	0.015	0.019	0.760	0.462
Buyers_ClientsofHMCShipmngt	0.002	0.008	-0.260	0.800
Buyers_ClientsofIndochinaShpg	0.007	0.010	0.692	0.502
Buyers_ClientsofMaranDry	0.039	0.011	3.487	0.004
Buyers_ClientsofMoundreas,N.G.	0.003	0.009	0.286	0.780
Buyers_ClientsofNingboFTZCosnavi	0.012	0.008	1.538	0.150
Buyers_ClientsofOceanYield	0.016	0.017	0.929	0.371
Buyers_ClientsofOceonixServicesLtd	0.036	0.011	-3.367	0.006
Buyers_ClientsofOrionReederei	0.004	0.008	-0.545	0.596
Buyers_ClientsofSAMC	0.016	0.014	1.126	0.282
Buyers_ClientsofSeacon	0.008	0.010	-0.820	0.428
Buyers_ClientsofSeaconShips	0.025	0.007	3.331	0.006
Buyers_ClientsofSeanergyMaritime	0.007	0.008	-0.867	0.403
Buyers_ClientsofThenamaris	0.002	0.008	-0.299	0.770
Buyers_ClientsofUCShippingPteLtd	0.004	0.007	-0.650	0.528
Buyers_ClientsofUnimarSuccess	0.005	0.008	-0.690	0.503
Buyers_ClientsofUnionCommercial	0.000	0.008	0.060	0.953
Buyers_ClientsofWeihaiShipping	0.003	0.007	0.418	0.684
Buyers_ClientsofWinning	0.001	0.008	-0.100	0.922
Buyers_ClientsofWinningIntl	0.002	0.007	0.248	0.809
Buyers_ClientsofZhejiangXiehaiShpg	0.015	0.015	0.996	0.339
Buyers_ClientsofZodiacMaritime	0.017	0.015	1.107	0.290
Buyers_Europeaninterests	0.002	0.007	0.235	0.818
Buyers_Greekinterests	0.003	0.006	0.514	0.617
Buyers_Indianinterests	0.000	0.008	-0.059	0.954
Buyers_Indonesianinterests	0.266	0.015	-17.393	0.000
Buyers_Koreaninterests	0.020	0.017	1.195	0.255
Buyers_Singaporeaninterests	0.003	0.009	-0.280	0.784
Buyers_Undisclosedinterests	0.003	0.010	0.265	0.796
PV_earnings	0.000	0.000	11919.000	0.000
PV_scrap	0.994	0.008	131.220	0.000
sellers_surplus	1.000	0.000	-4342.700	0.000
min_DF_buyer	1.310	0.015	-85.593	0.000
min_trade_price	1.002	0.001	-735.870	0.000
NBP	0.000	0.001	0.264	0.796
FleetDevelopment	0.001	0.000	3.155	0.008

Fleet_AverageAge	0.043	0.038	-1.107	0.290
LIBOR	0.027	0.007	4.024	0.002
HSFO	0.137	0.000	-2.348	0.067
Demolition	0.000	0.000	-0.699	0.498

Number of observations: 72, Error degrees of freedom: 14
Root Mean Squared Error: 0.00514
R-squared: .90, Adjusted R-Squared: .90
F-statistic vs. constant model: 1.05e+08, p-value = 2.34e-54

Model for seller surplus (Capesize bulk carrier)

According to table 6, there are five estimated coefficients that are significant, which are HSFO, LIBOR, present value (PV) scrap, Buyer's Clients of Castor Maritime and the size of the vessel. Among these PV scrap positively affects the seller's surplus. This indicates that the Scrap value of the vessel positively affects the price of the vessel in the sale and purchase shipping market, which was already mentioned in the previous section. So, when the scrap value increases, then the bargaining surplus of the seller also increases. However, LIBOR and the other two variables have a negative correlation with the seller surplus. Accordion to Merika et al., (2019), LIBOR act as a proxy for the cost of debt, so the price of a vessel in the S & P market is affected by the LIBOR; hence the investors became less interested in investing in the S&P market when the rate of LIBOR is increased; which negatively affect the bargaining power, discounting factor and the bargaining surplus of the seller in a specific trade.

Table 6: Model for seller surplus.
Linear regression model:
Seller's surplus ~ [Linear formula with 16 terms in 15 predictors]

EstimatedCoefficients:	Estimate	SE	tStat	pValue
(Intercept)	0.485	0.253	1.919	0.079
Size	0.001	0.000	-1.960	0.074
Buyers_ClientsofAlphaTankers	-0.002	0.008	-0.219	0.831
Buyers_ClientsofBaoliMarineShpg	0.005	0.008	0.631	0.540
Buyers_ClientsofBergeBulk	-0.008	0.009	-0.888	0.392
Buyers_ClientsofCMBLeasing	0.007	0.009	0.872	0.400
Buyers_ClientsofCastorMaritime	-0.013	0.007	-1.881	0.084
Buyers_ClientsofCharterwell	0.002	0.006	0.401	0.695

Buyers_ClientsofChartworldShipping	0.010	0.008	1.203	0.252
Buyers_ClientsofCinerDenizcilik	0.002	0.010	0.239	0.815
Buyers_ClientsofCyprusSeaLines	-0.007	0.010	-0.670	0.516
Buyers_ClientsofDiaYuanIntlShpg	0.000	0.008	-0.035	0.973
Buyers_ClientsofEasternPacific	0.001	0.009	0.084	0.935
Buyers_ClientsofEddieSteamshipCo.	0.004	0.007	0.544	0.597
Buyers_ClientsofEneselSA	-0.014	0.009	-1.589	0.138
Buyers_ClientsofFranboLines	-0.034	0.010	-3.545	0.004
Buyers_ClientsofGlobalMaritime	0.026	0.010	2.574	0.024
Buyers_ClientsofGlobalMeridian	0.008	0.008	1.008	0.333
Buyers_ClientsofGlobalMtimeInvst	0.015	0.019	0.759	0.463
Buyers_ClientsofHMCShipmngt	-0.002	0.008	-0.259	0.800
Buyers_ClientsofIndochinaShpg	0.007	0.010	0.692	0.502
Buyers_ClientsofMaranDry	0.039	0.011	3.485	0.005
Buyers_ClientsofMoundreas,N.G.	0.003	0.009	0.286	0.780
Buyers_ClientsofNingboFTZCosnavi	0.012	0.008	1.538	0.150
Buyers_ClientsofOceanYield	0.016	0.017	0.928	0.372
Buyers_ClientsofOceonixServicesLtd	-0.036	0.011	-3.369	0.006
Buyers_ClientsofOrionReederei	-0.004	0.008	-0.544	0.596
Buyers_ClientsofSAMC	0.016	0.014	1.127	0.282
Buyers_ClientsofSeacon	-0.008	0.010	-0.820	0.428
Buyers_ClientsofSeaconShips	0.025	0.007	3.331	0.006
Buyers_ClientsofSeanergyMaritime	-0.007	0.008	-0.868	0.402
Buyers_ClientsofThenamaris	-0.002	0.008	-0.300	0.770
Buyers_ClientsofUCShippingPteLtd	-0.004	0.007	-0.651	0.527
Buyers_ClientsofUnimarSuccess	-0.005	0.008	-0.691	0.503
Buyers_ClientsofUnionCommercial	0.000	0.008	0.059	0.954
Buyers_ClientsofWeihaiShipping	0.003	0.007	0.418	0.684
Buyers_ClientsofWinning	-0.001	0.008	-0.101	0.922
Buyers_ClientsofWinningIntl	0.002	0.007	0.248	0.809
Buyers_ClientsofZhejiangXiehaiShpg	0.015	0.015	0.997	0.339
Buyers_ClientsofZodiacMaritime	0.017	0.015	1.106	0.291
Buyers_Europeaninterests	0.002	0.007	0.234	0.819
Buyers_Greekinterests	0.003	0.006	0.514	0.617
Buyers_Indianinterests	-0.001	0.008	-0.060	0.953
Buyers_Indonesianinterests	-0.266	0.015	-17.428	0.000
Buyers_Koreaninterests	0.020	0.017	1.194	0.256
Buyers_Singaporeaninterests	-0.003	0.009	-0.281	0.784
Buyers_Undisclosedinterests	0.003	0.010	0.264	0.796
PV_earnings	0.000	0.000	4903.500	0.000
PV_scrap	0.137	5.853	2.347	0.069
buyers_surplus	-1.000	0.000	-4342.700	0.000

min_DF_buyer	-1.310	0.015	-86.531	0.000
min_trade_price	-1.002	0.001	-737.260	0.000
NBP	0.000	0.001	0.264	0.796
Fleet Development	0.001	0.000	3.156	0.008
Fleet_AverageAge	-0.043	0.038	-1.109	0.289
LIBOR	-0.027	0.007	4.027	0.097
HSFO	0.002	0.001	-2.347	0.069
Demolition	0.000	0.000	-0.699	0.498

Number of observations: 72, Error degrees of freedom: 14
Root Mean Squared Error: 0.00514
R-squared: .90, Adjusted R-Squared: .90
F-statistic vs. constant model: 1.05e+08, p-value = 2.34e-54

Model for buyer's minimum discount factor (Capesize bulk carrier)

The study conducted OLS regression to identify the factors that affect the minimum discount factor of the buyer, which is presented in table-7. This result indicates that three variables significantly affect the buyer's discount factor, which are NBP, PV earning and Sellers Alpha Bulkers. Among the variables, the present value (PV) earning and Sellers Alpha Bulkers positively affect the buyer's discount factor, while the new building price (NBP) has a negative correlation with the buyer's discount factor. The estimated correlation between the buyer's discount factor and PV earning is 0.061; which indicates that if the earning increases 1 unit, then the buyer's discount factor increases 0.061 units. This happens because when the earnings increase, the cash flow of the buyer also increases, which supports the buyer to invest more in the S&P market. That ultimately helps to get more surplus due to more discount factors for a specific trade. However, more discount factor indicates that the buyer is more patient.

Table 7: Model for buyer's minimum discount factor.
Linear regression model:
min_DF_buyer ~ [Linear formula with 12 terms in 11 predictors]

EstimatedCoefficients:	**Estimate**	**SE**	**tStat**	**pValue**
(Intercept)	4.382	4.431	0.989	0.342
Size	0.000	0.000	-0.827	0.424

Sellers_AlcyonShpg.	-0.180	0.291	-0.618	0.548
Sellers_AlphaBulkers	0.023	0.253	0.089	0.093
Sellers_Bocimar	0.052	0.156	0.332	0.746
Sellers_CTransportMaritime	0.005	0.165	0.029	0.978
Sellers_CLdNCobelfret	0.019	0.209	0.089	0.930
Sellers_CSSCShpgLeasing	-0.068	0.123	-0.553	0.591
Sellers_CaraShipping	-0.176	0.178	-0.989	0.342
Sellers_CardiffMarine	-0.101	0.105	-0.964	0.354
Sellers_CarrasHellas	-0.003	0.236	-0.012	0.991
Sellers_CelesteHolding	-0.745	0.245	-3.041	0.010
Sellers_DaiwaKisenCoLtd	-0.085	0.176	-0.483	0.638
Sellers_DakotaHolding	-0.458	0.178	-2.579	0.024
Sellers_DounKisen	-0.079	0.158	-0.503	0.624
Sellers_DrylogServices	0.028	0.237	0.120	0.907
Sellers_E.R.Schiffahrt	0.032	0.173	0.185	0.856
Sellers_EikoKisen	-0.015	0.179	-0.082	0.936
Sellers_FukunagaKaiun	0.158	0.163	0.968	0.352
Sellers_GoodBulk	0.092	0.207	0.444	0.665
Sellers_H-LineShipping	0.130	0.188	0.693	0.502
Sellers_HsinChienMarine	0.026	0.190	0.136	0.894
Sellers_ImabariSenpaku	0.010	0.178	0.058	0.955
Sellers_K-Line	0.181	0.183	0.991	0.034
Sellers_KowaMarineService	-0.016	0.205	-0.079	0.938
Sellers_KumiaiNavigation	0.161	0.169	0.957	0.357
Sellers_KumiaiSenpaku	0.001	0.178	0.008	0.994
Sellers_MangrovePartners	-0.141	0.155	-0.907	0.382
Sellers_MinshengFinancial	0.030	0.229	0.131	0.898
Sellers_MisugaKaiunCoLtd	0.037	0.169	0.222	0.828
Sellers_MitsubishiCorp	-0.197	0.204	-0.969	0.352
Sellers_MitsuiOSKLines	-0.085	0.172	-0.496	0.629
Sellers_MiyazakiSangyo	0.167	0.200	0.836	0.419
Sellers_MizuhoSangyo	0.098	0.149	0.659	0.522

Sellers_NSUnitedKK	0.142	0.174	0.816	0.430
Sellers_NikkoKisenKK	0.034	0.185	0.182	0.858
Sellers_NipponYusenKaisha	0.122	0.158	0.773	0.454
Sellers_NissenKaiun	0.000	0.156	0.002	0.998
Sellers_OldendorffCarriers	-0.041	0.206	-0.200	0.845
Sellers_OlympicShpg&Mgmt	-0.028	0.153	-0.183	0.858
Sellers_RewoodOceanShpg	-0.199	0.188	-1.060	0.310
Sellers_SamosSteamship	0.249	0.259	0.963	0.354
Sellers_SeanergyMaritime	0.000	0.197	-0.002	0.999
Sellers_ShikishimaKisen	0.275	0.186	1.473	0.167
Sellers_ShunzanKaiun	0.175	0.160	1.096	0.295
Sellers_SinokorMerchant	-0.103	0.109	-0.944	0.364
Sellers_SpringMarineBulkSA	-0.013	0.204	-0.065	0.949
Sellers_SwissMarineServices	-0.129	0.165	-0.781	0.450
Sellers_ToyoSangyo	0.022	0.192	0.112	0.912
Sellers_U-MingMarine	0.034	0.232	0.146	0.886
Sellers_XinYuanEnterprises	0.278	0.257	1.080	0.301
PV_earnings	0.609	0.000	2.068	0.061
PV_scrap	0.067	0.063	1.065	0.308
sellers_surplus	-0.007	0.002	-2.855	0.014
min_trade_price	0.010	0.015	0.669	0.516
NBP	-0.013	0.016	-0.866	0.070
FleetDevelopment	-0.003	0.003	-0.833	0.421
Fleet_AverageAge	0.259	0.434	0.598	0.561
LIBOR	-0.088	0.126	-0.695	0.500
HSFO	0.000	0.001	0.153	0.881

Number of observations: 72, Error degrees of freedom: 14
Root Mean Squared Error: 0.0422
R-squared: 0.987, Adjusted R-Squared: 0.933
F-statistic vs. constant model: 18.3, p-value = 3.12e-07

Model for seller's minimum discount factor (Capesize bulk carrier)

Table 8 represents the variables that affect the minimum discount factor of the seller. Among the variables, the present value (PV) earning, sellers_CLdN Cobelfret, and size of the vessel significantly affect the seller's minimum discount factor. All these variables have a negative correlation with the seller minimum discount factor. For example, when the earnings of a vessel decrease, the owner of the vessel become worried about selling the vessel urgently to minimize the loss, which decreases the discount factor of the seller. That means the seller becomes more impatient and gains less surplus. So, the discount factor of the seller and the PV earning has a negative correlation.

Table 8: Model for seller's minimum discount factor.
Linear regression model:
min_DF_seller ~ [Linear formula with 12 terms in 11 predictors]

Estimated Coefficients:	**Estimate**	**SE**	**tStat**	**pValue**
(Intercept)	-3.382	4.431	-0.763	0.460
Size	-1.708	5.690	0.827	0.062
Sellers_Alcyon Shpg.	0.180	0.291	0.618	0.548
Sellers_Alpha Bulkers	-0.023	0.253	-0.089	0.930
Sellers_Bocimar	-0.052	0.156	-0.332	0.746
Sellers_C Transport Maritime	-0.005	0.165	-0.029	0.978
Sellers_CLdN Cobelfret	-0.019	0.209	-0.089	0.093
Sellers_CSSC Shpg Leasing	0.068	0.123	0.553	0.591
Sellers_Cara Shipping	0.176	0.178	0.989	0.342
Sellers_Cardiff Marine	0.101	0.105	0.964	0.354
Sellers_Carras Hellas	0.003	0.236	0.012	0.991
Sellers_Celeste Holding	0.745	0.245	3.041	0.010
Sellers_Daiwa Kisen Co Ltd	0.085	0.176	0.483	0.638
Sellers_Dakota Holding	0.458	0.178	2.579	0.024
Sellers_Doun Kisen	0.079	0.158	0.503	0.624
Sellers_Drylog Services	-0.028	0.237	-0.120	0.907
Sellers_E.R. Schiffahrt	-0.032	0.173	-0.185	0.856

Sellers_Eiko Kisen	0.015	0.179	0.082	0.936
Sellers_Fukunaga Kaiun	-0.158	0.163	-0.968	0.352
Sellers_GoodBulk	-0.092	0.207	-0.444	0.665
Sellers_H-Line Shipping	-0.130	0.188	-0.693	0.502
Sellers_Hsin Chien Marine	-0.026	0.190	-0.136	0.894
Sellers_Imabari Senpaku	-0.010	0.178	-0.058	0.955
Sellers_K-Line	-0.181	0.183	-0.991	0.341
Sellers_Kowa Marine Service	0.016	0.205	0.079	0.938
Sellers_Kumiai Navigation	-0.161	0.169	-0.957	0.357
Sellers_Kumiai Senpaku	-0.001	0.178	-0.008	0.994
Sellers_Mangrove Partners	0.141	0.155	0.907	0.382
Sellers_Minsheng Financial	-0.030	0.229	-0.131	0.898
Sellers_Misuga Kaiun Co Ltd	-0.037	0.169	-0.222	0.828
Sellers_Mitsubishi Corp	0.197	0.204	0.969	0.352
Sellers_Mitsui OSK Lines	0.085	0.172	0.496	0.629
Sellers_Miyazaki Sangyo	-0.167	0.200	-0.836	0.419
Sellers_Mizuho Sangyo	-0.098	0.149	-0.659	0.522
Sellers_NS United KK	-0.142	0.174	-0.816	0.430
Sellers_Nikko Kisen KK	-0.034	0.185	-0.182	0.858
Sellers_Nippon Yusen Kaisha	-0.122	0.158	-0.773	0.454
Sellers_Nissen Kaiun	0.000	0.156	-0.002	0.998
Sellers_Oldendorff Carriers	0.041	0.206	0.200	0.845
Sellers_Olympic Shpg & Mgmt	0.028	0.153	0.183	0.858
Sellers_Rewood Ocean Shpg	0.199	0.188	1.060	0.310
Sellers_Samos Steamship	-0.249	0.259	-0.963	0.354
Sellers_Seanergy Maritime	0.000	0.197	0.002	0.999
Sellers_Shikishima Kisen	-0.275	0.186	-1.473	0.167
Sellers_Shunzan Kaiun	-0.175	0.160	-1.096	0.295
Sellers_Sinokor Merchant	0.103	0.109	0.944	0.364
Sellers_Spring Marine Bulk SA	0.013	0.204	0.065	0.949
Sellers_SwissMarine Services	0.129	0.165	0.781	0.450
Sellers_Toyo Sangyo	-0.022	0.192	-0.112	0.912

Sellers_U-Ming Marine	-0.034	0.232	-0.146	0.886
Sellers_Xin Yuan Enterprises	-0.278	0.257	-1.080	0.301
PV_earnings	0.000	0.000	-2.068	0.061
PV_scrap	-0.067	0.063	-1.065	0.308
sellers_surplus	0.007	0.002	2.855	0.014
min_trade_price	-0.010	0.015	-0.669	0.516
NBP	0.013	0.016	0.866	0.403
FleetDevelopment	0.003	0.003	0.833	0.421
Fleet_AverageAge	-0.259	0.434	-0.598	0.561
LIBOR	0.088	0.126	0.695	0.500
HSFO	0.000	0.001	-0.153	0.881

Number of observations: 72, Error degrees of freedom: 12
Root Mean Squared Error: 0.053
R-squared: 0.982, Adjusted R-Squared: 0.894
F-statistic vs. constant model: 11.2, p-value = 3.1e-05

4.3.2.2. OLS regression result and findings (Handymax)

Model for buyer's minimum discount factor (Handymax bulk carrier)

For this study, we apply the bargaining model in the shipping market using empirical analysis to determine the process of selling and buying shipping assets. In the bulk ship section, the Handymax is a small size ship that is used to carry raw and agricultural materials on the East-West roads, mainly through the Atlantic Ocean.

We ran cross-sectional regressions using maritime economic factors, economic indicators, and S&P variables (Tabel 9). The regression uses the discount factor of the buyers (Buyer_DF) as dependent variables mixed with 16 independent variables (PV_earnings, PV_scrap, N.B.P., FleetDevelopment, Demolition, Fleet_AverageAge, SHP_AVE, LIBOR, HSFO, Size, max_price_buyer, sellers_surplus, buyers_surplus, min_trade_price, Buyers, Builder'). The model shows the significant variables which affect the minimum discount factor of the buyer. It uses 255 observations with a degree of freedom of 65.

This was noticed that 04 shipbuilders of Handymax are significant to the minimum discount of the buyer (Jiangsu New Hantong, J.M.U. Kure Shipyard, Nam Trieu S.B.,

I.H.I. (Yokohama)). However, the three significant builders (Jiangsu New Hantong, J.M.U. Kure Shipyard, Nam Trieu SB) have negative coefficients. It means that their market position and offers are related to a significant level of risk for the buyer in the long term. Meanwhile, the fourth builder (I.H.I. (Yokohama)) positively impacts the buyer's minimum discount. The investment of buyers with a negative coefficient is risky in the future. As opposed, those with a positive coefficient will have a positive present value (P.V.) of future cash flows for this investment.

Table 9: Model for buyer's minimum discount factor.

Estimated Coefficients:	***Estimate***	***SE***	***tStat***	***pValue***
'(Intercept)'	0.991	0.013	75.720	0.460
'Size'	0.000	0.000	0.396	0.694
'Builder_COSCO Zhoushan'	-0.001	0.007	-0.195	0.846
'Builder_CSC Jinling Shipyard'	-0.008	0.005	-1.463	0.149
'Builder_CSC Qingshan SY'	-0.001	0.007	-0.081	0.936
'Builder_Chengxi Shipyard'	0.003	0.006	0.582	0.563
'Builder_Daedong S.B.'	0.000	0.000	NaN	NaN
'Builder_Dalian COSCO KHI'	-0.002	0.007	-0.335	0.739
'Builder_Hyundai Mipo'	0.000	0.000	NaN	NaN
'Builder_I-S Shipyard'	0.007	0.008	0.854	0.397
'Builder_I.H.I. (Kure)'	0.000	0.000	NaN	NaN
'Builder_I.H.I. (Tokyo)'	-0.006	0.006	-0.964	0.339
'Builder_I.H.I. (Yokohama)'	0.013	0.008	1.708	0.093
'Builder_Imabari SB (Imabari)'	-0.001	0.006	-0.103	0.918
'Builder_Imabari SB Marugame'	0.001	0.007	0.143	0.887
'Builder_Iwagi Zosen'	-0.001	0.005	-0.176	0.861
'Builder_JMU Kure Shipyard'	-0.102	0.008	-13.178	0.076
'Builder_Jiangnan Shipyard'	0.003	0.007	0.427	0.671
'Builder_Jiangsu Hantong HI'	0.001	0.006	0.154	0.878
'Builder_Jiangsu New Hantong'	-0.012	0.007	-1.695	0.096
'Builder_Kanasashi K.K.'	0.002	0.006	0.341	0.734
'Builder_Kawasaki HI Kobe'	0.000	0.005	0.022	0.983
'Builder_Kawasaki HI Sakaide'	-0.002	0.005	-0.406	0.686
'Builder_Minaminippon (Ozai)'	0.004	0.007	0.572	0.570
'Builder_Mitsui SB (Chiba)'	-0.001	0.005	-0.185	0.854
'Builder_Mitsui SB (Tamano)'	0.000	0.005	0.074	0.941
'Builder_Nam Trieu SB'	-0.013	0.007	-1.935	0.058
'Builder_Namura Shipbuilding'	-0.010	0.006	-1.514	0.136
'Builder_Nantong COSCO KHI'	-0.002	0.006	-0.389	0.699

'Builder_New Century SB'	0.003	0.006	0.490	0.626
'Builder_New Times SB'	0.001	0.007	0.095	0.925
'Builder_Onomichi Dockyd'	0.001	0.006	0.133	0.895
'Builder_Oshima Shipbuilding'	-0.001	0.005	-0.118	0.906
'Builder_STX SB (Jinhae)'	0.007	0.005	1.442	0.155
'Builder_Sanoyas'	-0.009	0.006	-1.552	0.127
'Builder_Sanoyas Shipbuilding'	-0.006	0.007	-0.866	0.390
'Builder_Shanghai Chengxi'	0.005	0.007	0.760	0.451
'Builder_Shin Kasado Dock'	0.000	0.006	-0.078	0.938
'Buyers_Clients of El-Amira'	0.001	0.005	0.119	0.906
'Buyers_Clients of Empros Lines'	-0.001	0.006	-0.087	0.931
'Buyers_Clients of Eurobulk'	0.005	0.005	1.028	0.309
'Buyers_Clients of Fujian Hengfeng'	-0.012	0.005	-2.474	0.017
'Buyers_Clients of Fujian Shipping'	-0.003	0.006	-0.452	0.653
'Buyers_Clients of Fukunaga Kaiun'	-0.012	0.005	-2.344	0.023
'Buyers_Clients of Gdanska Zegluga'	-0.003	0.004	-0.714	0.479
'Buyers_Clients of Gleamray Maritime'	-0.006	0.005	-1.190	0.239
'Buyers_Clients of Glory Ships'	0.000	0.000	NaN	NaN
'Buyers_Clients of Goldenport Shipmgmt'	0.005	0.005	1.029	0.308
'Buyers_Clients of Graham Shipping'	-0.001	0.004	-0.315	0.754
'Buyers_Clients of Grammy Marine'	-0.005	0.005	-0.950	0.346
'Buyers_Clients of Grampus Marine'	-0.006	0.005	-1.235	0.222
'Buyers_Clients of Grieg Star Shipping'	-0.002	0.006	-0.414	0.680
'Buyers_Clients of Gurita Lintas'	-0.009	0.005	-1.891	0.064
'Buyers_Clients of HNA Tech'	-0.001	0.004	-0.350	0.728
'Buyers_Clients of HTK Shipping'	-0.004	0.006	-0.762	0.450
'Buyers_Clients of Hai Phuong Shipping'	0.000	0.000	NaN	NaN
'Buyers_Clients of Hainan Bofeng'	-0.006	0.007	-0.968	0.338
'Buyers_Clients of Hainan Kuaibanhai'	0.000	0.000	NaN	NaN
'Buyers_Clients of Haitongda Shpg'	0.005	0.006	0.969	0.337
'Buyers_Clients of Handal Corp'	-0.005	0.007	-0.769	0.445
'Buyers_Clients of Hanif Mrtm'	-0.001	0.005	-0.229	0.820
'Buyers_Clients of Hera Shipping (HK)'	-0.003	0.004	-0.592	0.557

'Buyers_Clients of Hong Kong Shunxinda'	-0.004	0.004	-1.071	0.289
'Buyers_Clients of Hongyuan Marine'	-0.001	0.007	-0.160	0.873
'Buyers_Clients of Hua Jin Shpg'	-0.012	0.005	-2.266	0.028
'Buyers_Clients of Hubei Qin Tai Ltd'	0.000	0.005	0.057	0.955
'Buyers_Clients of Iseaco Holdings Pte'	-0.003	0.004	-0.617	0.540
'Buyers_Clients of Jiangsu Ocean Shpg'	-0.009	0.005	-1.834	0.072
'Buyers_Clients of Jinhui Shipping'	-0.003	0.005	-0.695	0.490
'Buyers_Clients of Jinhui Shpg & Trans'	-0.004	0.003	-1.294	0.201
'Buyers_Clients of KC Maritime HK'	-0.007	0.005	-1.459	0.151
'Buyers_Clients of Kimura Kisen'	-0.003	0.005	-0.560	0.578
'Buyers_Clients of La Maritime'	-0.020	0.008	-2.457	0.017
'Buyers_Clients of Lamda Maritime SA'	0.004	0.004	0.817	0.417
'Buyers_Clients of Livanos N.G.'	-0.001	0.005	-0.222	0.825
'Buyers_Clients of Manta Denizcilik'	-0.017	0.005	-3.612	0.001
'Buyers_Clients of Meghna'	-0.010	0.005	-2.021	0.048
'Buyers_Clients of Meghna Marine'	-0.007	0.004	-1.770	0.082
'Buyers_Clients of Unisea Shipping'	-0.003	0.005	-0.567	0.573
'Buyers_Clients of Unity Team'	-0.004	0.005	-0.824	0.413
'Buyers_Clients of Vanguard'	-0.005	0.005	-0.986	0.329
'Buyers_Clients of Veritas Ship Mgmt'	-0.011	0.005	-2.238	0.029
'Buyers_Clients of Virono Shipping'	-0.005	0.004	-1.236	0.222
'Buyers_Clients of WYW Shpmngt'	-0.002	0.005	-0.459	0.648
'Buyers_Clients of Weifang Jiaquan'	-0.007	0.005	-1.470	0.148
'Buyers_Clients of Weihai Hongtong'	0.000	0.007	-0.018	0.986
'Buyers_Clients of Xiamen Xinfeng'	-0.004	0.005	-0.820	0.416
'Buyers_Clients of Xin Feng Shipping'	0.001	0.005	0.292	0.771
'Buyers_Clients of Yuanzhi Shpg'	0.001	0.005	0.259	0.796
'Buyers_Clients of ZX Shipping'	0.003	0.007	0.414	0.681
'Buyers_Clients of Zhangzhou Shipping'	-0.003	0.004	-0.775	0.442
'Buyers_Clients of Zhuhai Jiehongda'	0.000	0.000	NaN	NaN
'Buyers_Far Eastern interests'	-0.006	0.004	-1.405	0.166

'Buyers_Greek interests'	-0.005	0.002	-1.889	0.064
'Buyers_Hong Kong interests'	0.001	0.003	0.430	0.669
'Buyers_Indonesian interests'	-0.003	0.002	-1.263	0.212
'Buyers_Japanese interests'	-0.011	0.005	-2.017	0.049
'Buyers_Middle Eastern interests'	-0.003	0.003	-0.769	0.445
'Buyers_Norwegian interests'	-0.001	0.004	-0.226	0.822
'Buyers_Singaporean interests'	0.002	0.005	0.395	0.695
'Buyers_Turkish interests'	-0.003	0.003	-1.015	0.315
'Buyers_U.A.E. interests'	-0.023	0.007	-3.449	0.001
'Buyers_Ukrainian interests'	-0.001	0.003	-0.284	0.777
'Buyers_Undisclosed interests'	-0.002	0.002	-1.456	0.151
'Buyers_Vietnamese Interests'	0.001	0.005	0.236	0.814
'Buyers_Vietnamese interests'	-0.005	0.004	-1.122	0.267
'PV_earnings'	0.000	0.000	0.313	0.755
'PV_scrap'	0.000	0.000	NaN	NaN
'max_price_buyer'	0.759	0.009	84.968	0.000
'buyers_surplus'	-0.759	0.009	-84.813	0.000
'sellers_surplus'	-0.760	0.009	-87.472	0.000
'min_trade_price'	-0.759	0.009	-84.988	0.000
'NBP'	0.000	0.002	-0.104	0.917
'FleetDevelopment'	0.001	0.001	0.858	0.395
'Demolition'	0.000	0.000	-0.599	0.552
'Fleet_AverageAge'	-0.026	0.033	-0.790	0.433
'SHP_AVE'	0.001	0.001	0.399	0.691
'LIBOR'	0.000	0.003	-0.093	0.926
'HSFO'	0.000	0.000	0.060	0.952

Seller's minimum discount Factor (Handymax bulk carrier)

The regression results (Table 10), using the seller discount factor as the dependent variable associated with 16 predictors, indicate that 03 shipbuilders of Handymax are significant to the minimum discount of the seller (I.H.I. (Yokohama), JMU Kure Shipyard, Jiangsu New Hantong). Among the three significant builders, JMU Kure Shipyard positively impacts the seller's discount factor of Handymax vessels with the estimated coefficient of 0.10.

Furthermore, buyers' clients of Allseas Marine, C Transport Maritime, COSCO Shpg Spec, Dalian Sea Carrier, Dalian Sea Carrier, Eagle Bulk, Fujian Hengfeng, Fukunaga Kaiun, Gurita Lintas, Hua Jin Shpg, Jiangsu Ocean Shpg, La Maritime, Manta

Denizcilik, Meghna Marine, Merle Marine, SMC shipping, sea star chartering, Shanghai Huatai, Spring Valley, Third January Mar and Veritas Ship Mgmt impact significantly the seller minimum discount factor.

Table 10: Model for seller's minimum discount factor.

Estimated Coefficients:	Estimate	SE	tStat	pValue
'(Intercept)'	0.009	0.013	0.698	0.488
'Size'	0.000	0.000	-0.396	0.694
'Builder_COSCO Zhoushan'	0.001	0.007	0.195	0.846
'Builder_CSC Jinling Shipyard'	0.008	0.005	1.463	0.149
'Builder_CSC Qingshan SY'	0.001	0.007	0.081	0.936
'Builder_Chengxi Shipyard'	-0.003	0.006	-0.582	0.563
'Builder_Daedong S.B.'	0.000	0.000	NaN	NaN
'Builder_Dalian COSCO KHI'	0.002	0.007	0.335	0.739
'Builder_Hyundai Mipo'	0.000	0.000	NaN	NaN
'Builder_I-S Shipyard'	-0.007	0.008	-0.854	0.397
'Builder_I.H.I. (Kure)'	0.000	0.000	NaN	NaN
'Builder_I.H.I. (Tokyo)'	0.006	0.006	0.964	0.339
'Builder_I.H.I. (Yokohama)'	-0.013	0.008	-1.708	0.093
'Builder_Imabari SB (Imabari)'	0.001	0.006	0.103	0.918
'Builder_Imabari SB Marugame'	-0.001	0.007	-0.143	0.887
'Builder_Iwagi Zosen'	0.001	0.005	0.176	0.861
'Builder_JMU Kure Shipyard'	0.102	0.008	13.178	0.087
'Builder_Jiangnan Shipyard'	-0.003	0.007	-0.427	0.671
'Builder_Jiangsu Hantong HI'	-0.001	0.006	-0.154	0.878
'Builder_Jiangsu New Hantong'	0.012	0.007	1.695	0.096
'Builder_Kanasashi K.K.'	-0.002	0.006	-0.341	0.734
'Builder_Kawasaki HI Kobe'	0.000	0.005	-0.022	0.983
'Builder_Kawasaki HI Sakaide'	0.002	0.005	0.406	0.686
'Builder_Minaminippon (Ozai)'	-0.004	0.007	-0.572	0.570
'Builder_Mitsui SB (Chiba)'	0.001	0.005	0.185	0.854
'Builder_Mitsui SB (Tamano)'	0.000	0.005	-0.074	0.941
'Builder_Nam Trieu SB'	0.013	0.007	1.935	0.058
'Builder_Namura Shipbuilding'	0.010	0.006	1.514	0.136
'Builder_Nantong COSCO KHI'	0.002	0.006	0.389	0.699
'Builder_New Century SB'	-0.003	0.006	-0.490	0.626
'Builder_New Times SB'	-0.001	0.007	-0.095	0.925
'Builder_Onomichi Dockyd'	-0.001	0.006	-0.133	0.895
'Builder_Oshima Shipbuilding'	0.001	0.005	0.118	0.906
'Builder_STX SB (Jinhae)'	-0.007	0.005	-1.442	0.155
'Builder_Sanoyas'	0.009	0.006	1.552	0.127

'Builder_Sanoyas Shipbuilding'	0.006	0.007	0.866	0.390
'Builder_Shanghai Chengxi'	-0.005	0.007	-0.760	0.451
'Builder_Shin Kasado Dock'	0.000	0.006	0.078	0.938
'Builder_Sinopacific Dayang'	0.002	0.005	0.322	0.749
'Builder_Taizhou Sanfu'	-0.004	0.007	-0.579	0.565
'Builder_Toyohashi SB'	-0.002	0.008	-0.306	0.761
'Builder_Tsuneishi Cebu'	0.000	0.005	-0.076	0.940
'Builder_Tsuneishi Zhoushan'	-0.005	0.007	-0.750	0.456
'Builder_Tsuneishi Zosen'	0.001	0.005	0.120	0.905
'Builder_Xiamen Shipbuilding'	-0.007	0.008	-0.887	0.379
'Builder_Zhejiang Yangfan'	-0.002	0.006	-0.424	0.673
'Builder_Zhejiang Zhenghe SB'	0.004	0.006	0.638	0.527
'Buyers_Clients of ADNOC Logistics'	0.008	0.005	1.696	0.096
'Buyers_Clients of AM International'	0.000	0.005	-0.041	0.968
'Buyers_Clients of Adnoc'	0.016	0.007	2.261	0.028
'Buyers_Clients of Alexandria Shipping'	0.009	0.007	1.326	0.190
'Buyers_Clients of Allseas Marine'	0.016	0.006	2.723	0.099
'Buyers_Clients of Almi Marine Mgmt'	0.000	0.005	-0.038	0.970
'Buyers_Clients of Amoysailing Maritime'	0.005	0.005	1.003	0.320
'Buyers_Clients of Anosis Mrtm'	0.010	0.008	1.292	0.202
'Buyers_Clients of Aslan Denizcilik AS'	0.005	0.004	1.115	0.270
'Buyers_Clients of Atlantica Shipping'	0.002	0.004	0.547	0.586
'Buyers_Clients of Aulac Corporation'	0.012	0.008	1.627	0.110
'Buyers_Clients of Belships'	0.000	0.000	NaN	NaN
'Buyers_Clients of Blue Fleet'	0.001	0.004	0.123	0.902
'Buyers_Clients of Boda Shipping'	0.005	0.005	1.021	0.312
'Buyers_Clients of Bravo Shpmngt'	-0.006	0.006	-0.985	0.329
'Buyers_Clients of C Transport Maritime'	0.006	0.003	1.774	0.082
'Buyers_Clients of CDB Leasing'	0.012	0.006	2.196	0.032
'Buyers_Clients of CMB Leasing'	-0.017	0.009	-1.935	0.058
'Buyers_Clients of COSCO Shpg Spec'	0.014	0.003	4.571	0.075
'Buyers_Clients of Central Ship Mgmt'	0.008	0.006	1.425	0.160
'Buyers_Clients of Changzhou Dexin'	0.006	0.005	1.195	0.238

'Buyers_Clients of Common Progress'	-0.005	0.004	-1.411	0.164
'Buyers_Clients of Costamare Shipping'	0.002	0.003	0.626	0.534
'Buyers_Clients of DCT Shipping'	0.003	0.005	0.625	0.535
'Buyers_Clients of Dalian Haiying'	0.004	0.005	0.777	0.441
'Buyers_Clients of Dalian Sea Carrier'	0.010	0.005	2.074	0.053
'Buyers_Clients of Dasin Shipping'	0.000	0.004	0.043	0.966
'Buyers_Clients of Densay Shipping'	0.000	0.004	-0.043	0.966
'Buyers_Clients of Doriko'	0.002	0.007	0.252	0.802
'Buyers_Clients of EBE NV'	-0.012	0.006	-2.053	0.045
'Buyers_Clients of Eagle Bulk'	-0.016	0.007	-2.311	0.055
'Buyers_Clients of El-Amira'	-0.001	0.005	-0.119	0.906
'Buyers_Clients of Empros Lines'	0.001	0.006	0.087	0.931
'Buyers_Clients of Eurobulk'	-0.005	0.005	-1.028	0.309
'Buyers_Clients of Fujian Hengfeng'	0.012	0.005	2.474	0.067
'Buyers_Clients of Fujian Shipping'	0.003	0.006	0.452	0.653
'Buyers_Clients of Fukunaga Kaiun'	0.012	0.005	2.344	0.073
'Buyers_Clients of Gdanska Zegluga'	0.003	0.004	0.713	0.479
'Buyers_Clients of Gleamray Maritime'	0.006	0.005	1.190	0.239
'Buyers_Clients of Glory Ships'	0.000	0.000	NaN	NaN
'Buyers_Clients of Goldenport Shipmgmt'	-0.005	0.005	-1.029	0.308
'Buyers_Clients of Graham Shipping'	0.001	0.004	0.315	0.754
'Buyers_Clients of Grammy Marine'	0.005	0.005	0.950	0.346
'Buyers_Clients of Grampus Marine'	0.006	0.005	1.235	0.222
'Buyers_Clients of Grieg Star Shipping'	0.002	0.006	0.414	0.680
'Buyers_Clients of Gurita Lintas'	0.009	0.005	1.891	0.064
'Buyers_Clients of HNA Tech'	0.001	0.004	0.350	0.728
'Buyers_Clients of HTK Shipping'	0.004	0.006	0.762	0.450
'Buyers_Clients of Hai Phuong Shipping'	0.000	0.000	NaN	NaN
'Buyers_Clients of Hainan Bofeng'	0.006	0.007	0.968	0.338
'Buyers_Clients of Hainan Kuaibanhai'	0.000	0.000	NaN	NaN
'Buyers_Clients of Haitongda Shpg'	-0.005	0.006	-0.969	0.337

'Buyers_Clients of Handal Corp'	0.005	0.007	0.769	0.445
'Buyers_Clients of Hanif Mrtm'	0.001	0.005	0.229	0.820
'Buyers_Clients of Hera Shipping (HK)'	0.003	0.004	0.592	0.557
'Buyers_Clients of Hong Kong Shunxinda'	0.004	0.004	1.071	0.289
'Buyers_Clients of Hongyuan Marine'	0.001	0.007	0.160	0.873
'Buyers_Clients of Hua Jin Shpg'	0.012	0.005	2.266	0.088
'Buyers_Clients of Hubei Qin Tai Ltd'	0.000	0.005	-0.057	0.955
'Buyers_Clients of Iseaco Holdings Pte'	0.003	0.004	0.617	0.540
'Buyers_Clients of Jiangsu Ocean Shpg'	0.009	0.005	1.834	0.072
'Buyers_Clients of Jinhui Shipping'	0.003	0.005	0.695	0.490
'Buyers_Clients of Jinhui Shpg & Trans'	0.004	0.003	1.294	0.201
'Buyers_Clients of KC Maritime HK'	0.007	0.005	1.459	0.151
'Buyers_Clients of Kimura Kisen'	0.003	0.005	0.560	0.578
'Buyers_Clients of La Maritime'	0.020	0.008	2.457	0.097
'Buyers_Clients of Lamda Maritime SA'	-0.004	0.004	-0.817	0.417
'Buyers_Clients of Livanos N.G.'	0.001	0.005	0.222	0.825
'Buyers_Clients of Manta Denizcilik'	0.017	0.005	3.612	0.061
'Buyers_Clients of Meghna'	0.010	0.005	2.021	0.048
'Buyers_Clients of Meghna Marine'	0.007	0.004	1.770	0.082
'Buyers_Clients of Melissa Shpg HK'	0.004	0.004	0.861	0.393
'Buyers_Clients of Merle Marine'	0.019	0.008	2.412	0.079
'Buyers_Clients of Moral Bright Int.'	0.000	0.000	NaN	NaN
'Buyers_Clients of NAAF Marine'	0.004	0.005	0.809	0.422
'Buyers_Clients of NASCO'	0.004	0.005	0.869	0.389
'Buyers_Clients of NVL Trans Shipping'	0.006	0.006	1.072	0.289
'Buyers_Clients of Neptune Fleet'	0.003	0.005	0.485	0.629
'Buyers_Clients of Ningbo Beilun Shpg.'	0.000	0.005	0.078	0.938
'Buyers_Clients of Ningbo Hongsheng'	0.001	0.004	0.232	0.817
'Buyers_Clients of Nomikos Transworld'	-0.002	0.005	-0.405	0.687
'Buyers_Clients of Northstar Shipmgmt'	0.000	0.005	0.020	0.984

'Buyers_Clients of Nova Shpg & Log'	0.010	0.008	1.250	0.217
'Buyers_Clients of Overseas Bulker Ent'	0.003	0.005	0.691	0.492
'Buyers_Clients of Pan Ocean'	-0.010	0.007	-1.425	0.160
'Buyers_Clients of Pancaran Samudera Tr'	0.012	0.006	2.222	0.031
'Buyers_Clients of Propel Maritime'	0.000	0.003	0.089	0.930
'Buyers_Clients of QQ Intl'	0.002	0.005	0.454	0.652
'Buyers_Clients of RB Shipping'	-0.001	0.005	-0.170	0.865
'Buyers_Clients of Reederei Nord'	-0.002	0.007	-0.259	0.797
'Buyers_Clients of S-Bulkers Ltd'	0.000	0.000	NaN	NaN
'Buyers_Clients of SMC Shipping'	0.011	0.005	2.186	0.073
'Buyers_Clients of SR Shipping'	0.000	0.004	-0.057	0.954
'Buyers_Clients of Sailing Int"l'	0.001	0.005	0.242	0.810
'Buyers_Clients of Schulte Group'	0.007	0.005	1.355	0.181
'Buyers_Clients of Seacon Ships'	0.013	0.007	1.872	0.067
'Buyers_Clients of Sealink Navigation'	0.007	0.005	1.374	0.175
'Buyers_Clients of Seamax Marine'	0.006	0.005	1.251	0.216
'Buyers_Clients of Seaspire Maritime'	0.001	0.005	0.144	0.886
'Buyers_Clients of Seastar Chartering'	0.013	0.007	1.843	0.071
'Buyers_Clients of Serenity Ship Mgmt'	0.004	0.003	1.148	0.256
'Buyers_Clients of Shanghai Huatai'	0.017	0.005	3.351	0.081
'Buyers_Clients of Shanghai Qiguan'	0.000	0.005	-0.033	0.974
'Buyers_Clients of Shanghai Sinosailing'	-0.003	0.005	-0.677	0.501
'Buyers_Clients of Sheng Wen Shpg'	0.003	0.007	0.401	0.690
'Buyers_Clients of Spring Valley'	0.008	0.003	2.306	0.095
'Buyers_Clients of Taiwan Navigation'	0.006	0.006	0.940	0.351
'Buyers_Clients of Taylor Maritime'	0.005	0.004	1.433	0.158
'Buyers_Clients of Third January Mar.'	0.011	0.005	2.090	0.061
'Buyers_Clients of Tomini Shipping'	0.008	0.006	1.237	0.222
'Buyers_Clients of Truong Minh Intl JSC'	0.004	0.005	0.762	0.450
'Buyers_Clients of Unisea Shipping'	0.003	0.005	0.567	0.573
'Buyers_Clients of Unity Team'	0.004	0.005	0.824	0.413

'Buyers_Clients of Vanguard'	0.005	0.005	0.986	0.329
'Buyers_Clients of Veritas Ship Mgmt'	0.011	0.005	2.238	0.079
'Buyers_Clients of Virono Shipping'	0.005	0.004	1.236	0.222
'Buyers_Clients of WYW Shpmngt'	0.002	0.005	0.459	0.648
'Buyers_Clients of Weifang Jiaquan'	0.007	0.005	1.470	0.148
'Buyers_Clients of Weihai Hongtong'	0.000	0.007	0.018	0.986
'Buyers_Clients of Woori Shipping'	0.000	0.005	0.017	0.986
'Buyers_Clients of Xiamen ITG'	0.002	0.003	0.714	0.479
'Buyers_Clients of Xiamen Xinfeng'	0.004	0.005	0.820	0.416
'Buyers_Clients of Xin Feng Shipping'	-0.001	0.005	-0.292	0.771
'Buyers_Clients of Yuanzhi Shpg'	-0.001	0.005	-0.259	0.796
'Buyers_Clients of ZX Shipping'	-0.003	0.007	-0.414	0.681
'Buyers_Clients of Zhangzhou Shipping'	0.003	0.004	0.775	0.442
'Buyers_Clients of Zhuhai Jiehongda'	0.000	0.000	NaN	NaN
'Buyers_Far Eastern interests'	0.006	0.004	1.405	0.166
'Buyers_Greek interests'	0.005	0.002	1.889	0.064
'Buyers_Hong Kong interests'	-0.001	0.003	-0.430	0.669
'Buyers_Clients of Belships'	0.000	0.000	NaN	NaN
'Buyers_Clients of Blue Fleet'	0.001	0.004	0.123	0.902
'Buyers_Clients of Boda Shipping'	0.005	0.005	1.021	0.312
'Buyers_Clients of Bravo Shpmngt'	-0.006	0.006	-0.985	0.329
'Buyers_Clients of C Transport Maritime'	0.006	0.003	1.774	0.082
'Buyers_Clients of CDB Leasing'	0.012	0.006	2.196	0.032
'Buyers_Clients of CMB Leasing'	-0.017	0.009	-1.935	0.058
'Buyers_Clients of COSCO Shpg Spec'	0.014	0.003	4.571	0.000
'Buyers_Clients of Central Ship Mgmt'	0.008	0.006	1.425	0.160
'Buyers_Clients of Changzhou Dexin'	0.006	0.005	1.195	0.238
'Buyers_Clients of Common Progress'	-0.005	0.004	-1.411	0.164
'Buyers_Clients of Costamare Shipping'	0.002	0.003	0.626	0.534
'Buyers_Clients of DCT Shipping'	0.003	0.005	0.625	0.535
'Buyers_Clients of Dalian Haiying'	0.004	0.005	0.777	0.441
'Buyers_Clients of Dalian Sea Carrier'	0.010	0.005	2.074	0.043

'Buyers_Clients of Dasin Shipping'	0.000	0.004	0.043	0.966
'Buyers_Clients of Densay Shipping'	0.000	0.004	-0.043	0.966
'Buyers_Clients of Doriko'	0.002	0.007	0.252	0.802
'Buyers_Clients of EBE NV'	-0.012	0.006	-2.053	0.045
'Buyers_Clients of Eagle Bulk'	-0.016	0.007	-2.311	0.025
'Buyers_Clients of El-Amira'	-0.001	0.005	-0.119	0.906
'Buyers_Clients of Empros Lines'	0.001	0.006	0.087	0.931
'Buyers_Clients of Eurobulk'	-0.005	0.005	-1.028	0.309
'Buyers_Clients of Fujian Hengfeng'	0.012	0.005	2.474	0.017
'Buyers_Clients of Fujian Shipping'	0.003	0.006	0.452	0.653
'Buyers_Clients of Fukunaga Kaiun'	0.012	0.005	2.344	0.023
'Buyers_Clients of Gdanska Zegluga'	0.003	0.004	0.713	0.479
'Buyers_Clients of Gleamray Maritime'	0.006	0.005	1.190	0.239
'Buyers_Clients of Glory Ships'	0.000	0.000	NaN	NaN
'Buyers_Clients of Goldenport Shipmgmt'	-0.005	0.005	-1.029	0.308
'Buyers_Clients of Graham Shipping'	0.001	0.004	0.315	0.754
'Buyers_Clients of Grammy Marine'	0.005	0.005	0.950	0.346
'Buyers_Clients of Grampus Marine'	0.006	0.005	1.235	0.222
'Buyers_Clients of Grieg Star Shipping'	0.002	0.006	0.414	0.680
'Buyers_Clients of Gurita Lintas'	0.009	0.005	1.891	0.064
'Buyers_Clients of HNA Tech'	0.001	0.004	0.350	0.728
'Buyers_Clients of HTK Shipping'	0.004	0.006	0.762	0.450
'Buyers_Clients of Hai Phuong Shipping'	0.000	0.000	NaN	NaN
'Buyers_Clients of Hainan Bofeng'	0.006	0.007	0.968	0.338
'Buyers_Clients of Hainan Kuaibanhai'	0.000	0.000	NaN	NaN
'Buyers_Clients of Haitongda Shpg'	-0.005	0.006	-0.969	0.337
'Buyers_Clients of Handal Corp'	0.005	0.007	0.769	0.445
'Buyers_Clients of Hanif Mrtm'	0.001	0.005	0.229	0.820
'Buyers_Clients of Hera Shipping (HK)'	0.003	0.004	0.592	0.557
'Buyers_Clients of Hong Kong Shunxinda'	0.004	0.004	1.071	0.289
'Buyers_Clients of Hongyuan Marine'	0.001	0.007	0.160	0.873

'Buyers_Clients of Hua Jin Shpg'	0.012	0.005	2.266	0.028
'Buyers_Clients of Hubei Qin Tai Ltd'	0.000	0.005	-0.057	0.955
'Buyers_Clients of Iseaco Holdings Pte'	0.003	0.004	0.617	0.540
'Buyers_Clients of Jiangsu Ocean Shpg'	0.009	0.005	1.834	0.072
'Buyers_Clients of Jinhui Shipping'	0.003	0.005	0.695	0.490
'Buyers_Clients of Jinhui Shpg & Trans'	0.004	0.003	1.294	0.201
'Buyers_Clients of KC Maritime HK'	0.007	0.005	1.459	0.151
'Buyers_Clients of Kimura Kisen'	0.003	0.005	0.560	0.578
'Buyers_Clients of La Maritime'	0.020	0.008	2.457	0.017
'Buyers_Clients of Lamda Maritime SA'	-0.004	0.004	-0.817	0.417
'Buyers_Clients of Livanos N.G.'	0.001	0.005	0.222	0.825
'Buyers_Clients of Manta Denizcilik'	0.017	0.005	3.612	0.001
'Buyers_Clients of Meghna'	0.010	0.005	2.021	0.048
'Buyers_Clients of Meghna Marine'	0.007	0.004	1.770	0.082
'Buyers_Clients of Melissa Shpg HK'	0.004	0.004	0.861	0.393
'Buyers_Clients of Merle Marine'	0.019	0.008	2.412	0.019
'Buyers_Clients of Moral Bright Int.'	0.000	0.000	NaN	NaN
'Buyers_Clients of NAAF Marine'	0.004	0.005	0.809	0.422
'Buyers_Clients of NASCO'	0.004	0.005	0.869	0.389
'Buyers_Clients of NVL Trans Shipping'	0.006	0.006	1.072	0.289
'Buyers_Clients of Neptune Fleet'	0.003	0.005	0.485	0.629
'Buyers_Clients of Ningbo Beilun Shpg.'	0.000	0.005	0.078	0.938
'Buyers_Clients of Ningbo Hongsheng'	0.001	0.004	0.232	0.817
'Buyers_Clients of Nomikos Transworld'	-0.002	0.005	-0.405	0.687
'Buyers_Clients of Northstar Shipmgmt'	0.000	0.005	0.020	0.984
'Buyers_Clients of Nova Shpg & Log'	0.010	0.008	1.250	0.217
'Buyers_Clients of Overseas Bulker Ent'	0.003	0.005	0.691	0.492
'Buyers_Clients of Pan Ocean'	-0.010	0.007	-1.425	0.160
'Buyers_Clients of Pancaran Samudera Tr'	0.012	0.006	2.222	0.031
'Buyers_Clients of Propel Maritime'	0.000	0.003	0.089	0.930
'Buyers_Clients of QQ Intl'	0.002	0.005	0.454	0.652

'Buyers_Clients of RB Shipping'	-0.001	0.005	-0.170	0.865
'Buyers_Clients of Reederei Nord'	-0.002	0.007	-0.259	0.797
'Buyers_Clients of S-Bulkers Ltd'	0.000	0.000	NaN	NaN
'Buyers_Clients of SMC Shipping'	0.011	0.005	2.186	0.033
'Buyers_Clients of SR Shipping'	0.000	0.004	-0.057	0.954
'Buyers_Clients of Sailing Int"l'	0.001	0.005	0.242	0.810
'Buyers_Clients of Schulte Group'	0.007	0.005	1.355	0.181
'Buyers_Clients of Seacon Ships'	0.013	0.007	1.872	0.067
'Buyers_Clients of Sealink Navigation'	0.007	0.005	1.374	0.175
'Buyers_Clients of Seamax Marine'	0.006	0.005	1.251	0.216
'Buyers_Clients of Seaspire Maritime'	0.001	0.005	0.144	0.886
'Buyers_Clients of Seastar Chartering'	0.013	0.007	1.843	0.071
'Buyers_Clients of Serenity Ship Mgmt'	0.004	0.003	1.148	0.256
'Buyers_Clients of Shanghai Huatai'	0.017	0.005	3.351	0.001
'Buyers_Clients of Shanghai Qiguan'	0.000	0.005	-0.033	0.974
'Buyers_Clients of Shanghai Sinosailing'	-0.003	0.005	-0.677	0.501
'Buyers_Clients of Sheng Wen Shpg'	0.003	0.007	0.401	0.690
'Buyers_Clients of Spring Valley'	0.008	0.003	2.306	0.025
'Buyers_Clients of Taiwan Navigation'	0.006	0.006	0.940	0.351
'Buyers_Clients of Tangshan Dongfang'	0.000	0.000	NaN	NaN
'Buyers_Clients of Taylor Maritime'	0.005	0.004	1.433	0.158
'Buyers_Clients of Third January Mar.'	0.011	0.005	2.090	0.041
'Buyers_Clients of Tomini Shipping'	0.008	0.006	1.237	0.222
'Buyers_Clients of Truong Minh Intl JSC'	0.004	0.005	0.762	0.450
'Buyers_Clients of Unisea Shipping'	0.003	0.005	0.567	0.573
'Buyers_Clients of Unity Team'	0.004	0.005	0.824	0.413
'Buyers_Clients of Vanguard'	0.005	0.005	0.986	0.329
'Buyers_Clients of Veritas Ship Mgmt'	0.011	0.005	2.238	0.029
'Buyers_Clients of Virono Shipping'	0.005	0.004	1.236	0.222
'Buyers_Clients of WYW Shpmngt'	0.002	0.005	0.459	0.648
'Buyers_Clients of Weifang Jiaquan'	0.007	0.005	1.470	0.148

'Buyers_Clients of Weihai Hongtong'	0.000	0.007	0.018	0.986
'Buyers_Clients of Woori Shipping'	0.000	0.005	0.017	0.986
'Buyers_Clients of Xiamen ITG'	0.002	0.003	0.714	0.479
'Buyers_Clients of Xiamen Xinfeng'	0.004	0.005	0.820	0.416
'Buyers_Clients of Xin Feng Shipping'	-0.001	0.005	-0.292	0.771
'Buyers_Clients of Yuanzhi Shpg'	-0.001	0.005	-0.259	0.796
'Buyers_Clients of ZX Shipping'	-0.003	0.007	-0.414	0.681
'Buyers_Clients of Zhangzhou Shipping'	0.003	0.004	0.775	0.442
'Buyers_Clients of Zhuhai Jiehongda'	0.000	0.000	NaN	NaN
'Buyers_Far Eastern interests'	0.006	0.004	1.405	0.166
'Buyers_Greek interests'	0.005	0.002	1.889	0.064
'Buyers_Hong Kong interests'	-0.001	0.003	-0.430	0.669
'Buyers_Indonesian interests'	0.003	0.002	1.263	0.212
'Buyers_Japanese interests'	0.011	0.005	2.017	0.049
'Buyers_Middle Eastern interests'	0.003	0.003	0.769	0.445
'Buyers_Norwegian interests'	0.001	0.004	0.226	0.822
'Buyers_Singaporean interests'	-0.002	0.005	-0.395	0.695
'Buyers_Turkish interests'	0.003	0.003	1.015	0.315
'Buyers_U.A.E. interests'	0.023	0.007	3.449	0.001
'Buyers_Ukrainian interests'	0.001	0.003	0.284	0.777
'Buyers_Undisclosed interests'	0.002	0.002	1.456	0.151
'Buyers_Vietnamese Interests'	-0.001	0.005	-0.236	0.814
'Buyers_Vietnamese interests'	0.005	0.004	1.122	0.267
'PV_earnings'	0.000	0.000	-0.314	0.755
'PV_scrap'	0.000	0.000	NaN	NaN
'max_price_buyer'	-0.759	0.009	-84.968	0.000
'buyers_surplus'	0.759	0.009	84.813	0.000
'sellers_surplus'	0.760	0.009	87.472	0.000
'min_trade_price'	0.759	0.009	84.988	0.000
'NBP'	0.000	0.002	0.104	0.917
'FleetDevelopment'	-0.001	0.001	-0.858	0.395
'Demolition'	0.000	0.000	0.599	0.552
'Fleet_AverageAge'	0.026	0.033	0.790	0.433
'SHP_AVE'	-0.001	0.001	-0.399	0.691
'LIBOR'	0.000	0.003	0.093	0.926
'HSFO'	0.000	0.000	-0.060	0.952

Buyer's surplus (Handymax bulk carrier)

After running the regression model for the buyer's surplus in this set of variables (Table 11), we noticed that the following shipyards that build Handymax are significant: CSC Qingshang SY, I.H.I. (Yokohama), JMU Kure Shipyard, Jiangsu New Hantong. These four shipbuilders have different negative impacts on the buyer's surplus. Which indicates that buyers get less surplus when the ships are constructed by these builders.

The results of the regression model also show that among 24 buyers, only the two, which are EBE NV and Eagle bulk, positively impact the buyer's surplus from purchasing Handymax vessels. Moreover, all the market characteristics are insignificant. The maximum price of the buyer has the same sense of variation when the others are diverting with the surplus.

Table 11: Model for buyer's surplus

Estimated Coefficients:	Estimate	SE	tStat	pValue
'(Intercept)'	1.294	0.022	59.693	0.793
'Size'	0.000	0.000	0.317	0.753
'Builder_COSCO Zhoushan'	-0.001	0.009	-0.089	0.929
'Builder_CSC Jinling Shipyard'	-0.010	0.007	-1.357	0.181
'Builder_CSC Qingshan SY'	-0.022	0.008	-2.548	0.081
'Builder_Chengxi Shipyard'	0.005	0.007	0.667	0.507
'Builder_Daedong S.B.'	0.000	0.000	NaN	NaN
'Builder_Dalian COSCO KHI'	-0.003	0.009	-0.323	0.748
'Builder_Hyundai Mipo'	-0.008	0.009	-0.941	0.351
'Builder_I-S Shipyard'	0.006	0.011	0.527	0.601
'Builder_I.H.I. (Kure)'	-0.002	0.009	-0.197	0.845
'Builder_I.H.I. (Tokyo)'	-0.008	0.008	-0.941	0.351
'Builder_I.H.I. (Yokohama)'	-0.018	0.010	1.721	0.091
'Builder_Imabari SB (Imabari)'	0.000	0.007	-0.020	0.984
'Builder_Imabari SB Marugame'	0.001	0.009	0.107	0.915
'Builder_Iwagi Zosen'	-0.001	0.007	-0.106	0.916
'Builder_JMU Kure Shipyard'	-0.133	0.010	-13.027	0.075
'Builder_Jiangnan Shipyard'	0.005	0.009	0.503	0.617
'Builder_Jiangsu Hantong HI'	0.001	0.008	0.191	0.850
'Builder_Jiangsu New Hantong'	-0.016	0.009	-1.786	0.080
'Builder_Kanasashi K.K.'	0.003	0.008	0.347	0.730

'Builder_Kawasaki HI Kobe'	0.001	0.007	0.091	0.928
'Builder_Kawasaki HI Sakaide'	-0.002	0.007	-0.346	0.731
'Builder_Minaminippon (Ozai)'	0.005	0.009	0.534	0.595
'Builder_Mitsui SB (Chiba)'	-0.001	0.007	-0.140	0.889
'Builder_Mitsui SB (Tamano)'	0.001	0.007	0.163	0.871
'Builder_Nam Trieu SB'	0.000	0.000	NaN	NaN
'Builder_Namura Shipbuilding'	-0.013	0.008	-1.488	0.143
'Builder_Nantong COSCO KHI'	-0.002	0.007	-0.275	0.784
'Builder_New Century SB'	0.004	0.007	0.519	0.606
'Builder_New Times SB'	0.001	0.009	0.139	0.890
'Builder_Onomichi Dockyd'	0.001	0.008	0.163	0.871
'Builder_Oshima Shipbuilding'	-0.001	0.006	-0.097	0.923
'Builder_STX SB (Jinhae)'	0.010	0.007	1.495	0.141
'Builder_Sanoyas'	-0.011	0.008	-1.468	0.148
'Builder_Sanoyas Shipbuilding'	-0.007	0.009	-0.815	0.419
'Builder_Shanghai Chengxi'	0.008	0.009	0.891	0.377
'Builder_Shin Kasado Dock'	0.000	0.008	-0.010	0.992
'Builder_Sinopacific Dayang'	-0.002	0.007	-0.345	0.731
'Builder_Taizhou Sanfu'	0.007	0.010	0.716	0.477
'Builder_Toyohashi SB'	0.004	0.010	0.351	0.727
'Builder_Tsuneishi Cebu'	0.001	0.007	0.165	0.869
'Builder_Tsuneishi Zhoushan'	0.006	0.009	0.740	0.462
'Builder_Tsuneishi Zosen'	0.000	0.007	-0.022	0.983
'Builder_Xiamen Shipbuilding'	0.010	0.010	0.929	0.357
'Builder_Zhejiang Yangfan'	0.003	0.007	0.453	0.652
'Builder_Zhejiang Zhenghe SB'	-0.005	0.008	-0.647	0.521
'Buyers_Clients of ADNOC Logistics'	-0.011	0.006	-1.696	0.096
'Buyers_Clients of AM International'	0.000	0.006	0.002	0.998
'Buyers_Clients of Adnoc'	-0.022	0.009	-2.338	0.023
'Buyers_Clients of Alexandria Shipping'	-0.011	0.009	-1.274	0.208
'Buyers_Clients of Allseas Marine'	0.000	0.000	NaN	NaN
'Buyers_Clients of Almi Marine Mgmt'	0.000	0.006	0.056	0.955
'Buyers_Clients of Amoysailing Maritime'	-0.006	0.006	-1.016	0.314
'Buyers_Clients of Anosis Mrtm'	-0.013	0.010	-1.292	0.202
'Buyers_Clients of Aslan Denizcilik AS'	-0.006	0.006	-1.125	0.266
'Buyers_Clients of Atlantica Shipping'	-0.003	0.006	-0.563	0.576
'Buyers_Clients of Aulac Corporation'	-0.016	0.010	-1.610	0.113

'Buyers_Clients of Belships'	0.000	0.000	NaN	NaN
'Buyers_Clients of Blue Fleet'	-0.001	0.006	-0.177	0.860
'Buyers_Clients of Boda Shipping'	-0.007	0.006	-1.121	0.267
'Buyers_Clients of Bravo Shpmngt'	0.007	0.008	0.858	0.395
'Buyers_Clients of C Transport Maritime'	-0.008	0.005	-1.750	0.086
'Buyers_Clients of CDB Leasing'	-0.017	0.007	-2.325	0.024
'Buyers_Clients of CMB Leasing'	0.017	0.012	1.432	0.158
'Buyers_Clients of COSCO Shpg Spec'	-0.019	0.004	-4.654	0.000
'Buyers_Clients of Central Ship Mgmt'	-0.011	0.007	-1.427	0.160
'Buyers_Clients of Changzhou Dexin'	-0.009	0.007	-1.416	0.163
'Buyers_Clients of Common Progress'	0.006	0.005	1.314	0.195
'Buyers_Clients of Costamare Shipping'	-0.003	0.004	-0.619	0.538
'Buyers_Clients of DCT Shipping'	-0.005	0.007	-0.778	0.440
'Buyers_Clients of Dalian Haiying'	-0.005	0.007	-0.728	0.470
'Buyers_Clients of Dalian Sea Carrier'	-0.012	0.006	-2.043	0.046
'Buyers_Clients of Dasin Shipping'	0.000	0.005	-0.031	0.975
'Buyers_Clients of Densay Shipping'	0.000	0.006	0.007	0.994
'Buyers_Clients of Doriko'	0.000	0.000	NaN	NaN
'Buyers_Clients of EBE NV'	0.015	0.008	2.033	0.057
'Buyers_Clients of Eagle Bulk'	0.020	0.009	2.196	0.092
'Buyers_Undisclosed interests'	-0.003	0.002	-1.541	0.129
'Buyers_Vietnamese Interests'	0.001	0.007	0.171	0.865
'Buyers_Vietnamese interests'	-0.006	0.006	-1.149	0.256
'PV_earnings'	0.000	0.000	0.361	0.719
'PV_scrap'	0.000	0.000	NaN	NaN
'max_price_buyer'	1.000	0.001	800.549	0.625
'sellers_surplus'	-1.000	0.000	-2553.200	0.876
'min_DF_buyer'	-1.305	0.015	-84.813	0.000
'min_trade_price'	-1.000	0.000	-5468.540	0.987
'NBP'	0.000	0.003	-0.056	0.956
'FleetDevelopment'	0.001	0.002	0.730	0.468
'Demolition'	0.000	0.000	-0.374	0.710
'Fleet_AverageAge'	-0.030	0.044	-0.676	0.502
'SHP_AVE'	0.001	0.002	0.335	0.739
'LIBOR'	0.000	0.004	0.031	0.976

'HSFO'	0.000	0.000	0.001	0.999

Seller surplus (Handymax bulk carrier)

The regression shows that the same variables that are significant for the buyers' surplus are significant for the sellers' surplus. These significant variables are for the shipyards (builders): CSC Qingshan SY, I.H.I. (Yokohama), JMU Kure Shipyard, Jiangsu New Hantong. They all impact the surplus of sellers. The difference between the seller's minimum price willing to sell a vessel and the actual selling price is the seller's surplus for the individual trade.

Table 12: Model for seller's surplus

Estimated Coefficients:	Estimate	SE	tStat	pValue
'(Intercept)'	1.295	0.021	60.442	0.000
'Size'	0.000	0.000	0.319	0.751
'Builder_COSCO Zhoushan'	-0.001	0.009	-0.093	0.926
'Builder_CSC Jinling Shipyard'	-0.010	0.007	-1.358	0.180
'Builder_CSC Qingshan SY'	-0.022	0.008	-2.548	0.014
'Builder_Chengxi Shipyard'	0.005	0.007	0.665	0.509
'Builder_Daedong S.B.'	0.004	0.009	0.408	0.685
'Builder_Dalian COSCO KHI'	-0.003	0.009	-0.323	0.748
'Builder_Hyundai Mipo'	0.000	0.000	NaN	NaN
'Builder_I-S Shipyard'	0.006	0.011	0.541	0.591
'Builder_I.H.I. (Kure)'	0.000	0.000	NaN	NaN
'Builder_I.H.I. (Tokyo)'	-0.001	0.009	-0.114	0.910
'Builder_I.H.I. (Yokohama)'	0.018	0.010	1.721	0.091
'Builder_Imabari SB (Imabari)'	0.000	0.007	-0.021	0.983
'Builder_Imabari SB Marugame'	-0.011	0.009	-1.149	0.256
'Builder_Iwagi Zosen'	-0.001	0.007	-0.107	0.915
'Builder_JMU Kure Shipyard'	-0.133	0.010	-13.016	0.000
'Builder_Jiangnan Shipyard'	0.005	0.009	0.501	0.619
'Builder_Jiangsu Hantong HI'	0.001	0.008	0.190	0.850
'Builder_Jiangsu New Hantong'	-0.016	0.009	-1.781	0.081
'Builder_Kanasashi K.K.'	0.003	0.008	0.348	0.729
'Builder_Kawasaki HI Kobe'	0.001	0.007	0.090	0.928
'Builder_Kawasaki HI Sakaide'	-0.002	0.007	-0.347	0.730
'Builder_Minaminippon (Ozai)'	0.000	0.000	NaN	NaN
'Builder_Mitsui SB (Chiba)'	-0.001	0.007	-0.141	0.888
'Builder_Mitsui SB (Tamano)'	0.001	0.007	0.161	0.872

'Builder_Nam Trieu SB'	0.000	0.000	NaN	NaN
'Builder_Namura Shipbuilding'	-0.013	0.008	-1.488	0.143
'Builder_Nantong COSCO KHI'	-0.002	0.007	-0.278	0.782
'Builder_New Century SB'	0.004	0.007	0.518	0.607
'Builder_New Times SB'	0.001	0.009	0.138	0.890
'Builder_Onomichi Dockyd'	0.001	0.008	0.162	0.872
'Builder_Oshima Shipbuilding'	-0.001	0.006	-0.096	0.924
'Builder_STX SB (Jinhae)'	0.010	0.007	1.496	0.141
'Builder_Sanoyas'	-0.011	0.008	-1.470	0.147
'Builder_Sanoyas Shipbuilding'	0.000	0.000	NaN	NaN
'Builder_Shanghai Chengxi'	0.008	0.009	0.887	0.379
'Builder_Shin Kasado Dock'	0.000	0.008	-0.012	0.991
'Builder_Sinopacific Dayang'	-0.002	0.007	-0.342	0.733
'Builder_Taizhou Sanfu'	0.007	0.010	0.712	0.479
'Builder_Toyohashi SB'	0.004	0.010	0.350	0.728
'Buyers_Clients of Fujian Hengfeng'	-0.015	0.006	-2.367	0.022
'Buyers_Clients of Fujian Shipping'	-0.003	0.008	-0.407	0.685
'Buyers_Clients of Fukunaga Kaiun'	-0.016	0.006	-2.430	0.019
'Buyers_Clients of Gdanska Zegluga'	-0.004	0.006	-0.776	0.441
'Buyers_Clients of Gleamray Maritime'	-0.008	0.006	-1.283	0.205
'Buyers_Clients of Glory Ships'	-0.007	0.009	-0.817	0.418
'Buyers_Clients of Goldenport Shipmgmt'	0.006	0.006	0.992	0.326
'Buyers_Clients of Graham Shipping'	-0.001	0.005	-0.295	0.769
'Buyers_Clients of Grammy Marine'	-0.007	0.006	-1.036	0.305
'Buyers_Clients of Grampus Marine'	-0.008	0.006	-1.244	0.219
'Buyers_Clients of Grieg Star Shipping'	-0.003	0.007	-0.437	0.664
'Buyers_Clients of Gurita Lintas'	-0.012	0.006	-1.961	0.055
'Buyers_Clients of HNA Tech'	-0.002	0.005	-0.454	0.652
'Buyers_Clients of HTK Shipping'	-0.006	0.008	-0.796	0.430
'Buyers_Clients of Hai Phuong Shipping'	0.005	0.009	0.537	0.594
'Buyers_Clients of Hainan Bofeng'	-0.008	0.009	-0.940	0.351

'Buyers_Clients of Hainan Kuaibanhai'	-0.016	0.009	-1.917	0.061
'Buyers_Clients of Haitongda Shpg'	0.000	0.000	NaN	NaN
'Buyers_Clients of Handal Corp'	-0.007	0.009	-0.859	0.394
'Buyers_Clients of Hanif Mrtm'	-0.001	0.006	-0.200	0.842
'Buyers_Clients of Hera Shipping (HK)'	-0.003	0.006	-0.568	0.572
'Buyers_Clients of Hong Kong Shunxinda'	-0.006	0.005	-1.178	0.244
'Buyers_Clients of Hongyuan Marine'	-0.003	0.009	-0.279	0.781
'Buyers_Clients of Hua Jin Shpg'	-0.014	0.007	-2.137	0.037
'Buyers_Clients of Hubei Qin Tai Ltd'	0.000	0.006	0.034	0.973
'Buyers_Clients of Iseaco Holdings Pte'	-0.003	0.006	-0.577	0.566
'Buyers_Clients of Jiangsu Ocean Shpg'	-0.012	0.006	-1.874	0.066
'Buyers_Clients of Jinhui Shipping'	-0.004	0.006	-0.648	0.520
'Buyers_Clients of Jinhui Shpg & Trans'	-0.005	0.004	-1.362	0.179
'Buyers_Clients of KC Maritime HK'	-0.009	0.007	-1.373	0.175
'Buyers_Clients of Kimura Kisen'	-0.004	0.006	-0.585	0.561
'Buyers_Clients of La Maritime'	-0.026	0.011	-2.427	0.019
'Buyers_Clients of Lamda Maritime SA'	0.005	0.006	0.867	0.390
'Buyers_Clients of Livanos N.G.'	-0.001	0.007	-0.115	0.909
'Buyers_Clients of Manta Denizcilik'	-0.023	0.006	-3.599	0.001
'Buyers_Clients of Meghna'	-0.013	0.006	-2.050	0.045
'Buyers_Clients of Meghna Marine'	-0.009	0.005	-1.831	0.073
'Buyers_Clients of Melissa Shpg HK'	-0.005	0.006	-0.930	0.356
'Buyers_Clients of Merle Marine'	-0.025	0.010	-2.411	0.019
'Buyers_Clients of Moral Bright Int.'	-0.007	0.007	-0.958	0.342
'Buyers_Clients of Veritas Ship Mgmt'	-0.014	0.006	-2.312	0.025
'Buyers_Clients of Virono Shipping'	-0.007	0.005	-1.245	0.218
'Buyers_Clients of WYW Shpmngt'	-0.003	0.007	-0.455	0.651

'Buyers_Clients of Weifang Jiaquan'	-0.010	0.006	-1.491	0.142
'Buyers_Clients of Weihai Hongtong'	-0.001	0.009	-0.107	0.915
'Buyers_Clients of Woori Shipping'	0.000	0.006	-0.017	0.987
'Buyers_Clients of Xiamen ITG'	-0.003	0.004	-0.789	0.434
'Buyers_Clients of Xiamen Xinfeng'	-0.005	0.006	-0.766	0.447
'Buyers_Clients of Xin Feng Shipping'	0.001	0.006	0.183	0.855
'Buyers_Clients of Yuanzhi Shpg'	0.002	0.006	0.355	0.724
'Buyers_Clients of ZX Shipping'	0.000	0.000	NaN	NaN
'Buyers_Clients of Zhangzhou Shipping'	-0.005	0.006	-0.795	0.430
'Buyers_Clients of Zhuhai Jiehongda'	0.021	0.008	2.787	0.007
'Buyers_Far Eastern interests'	-0.008	0.005	-1.529	0.132
'Buyers_Greek interests'	-0.006	0.003	-2.048	0.046
'Buyers_Hong Kong interests'	0.001	0.004	0.262	0.795
'Buyers_Indonesian interests'	-0.004	0.003	-1.307	0.197
'Buyers_Japanese interests'	-0.014	0.007	-2.104	0.040
'Buyers_Middle Eastern interests'	-0.004	0.004	-0.825	0.413
'Buyers_Norwegian interests'	-0.001	0.006	-0.190	0.850
'Buyers_Singaporean interests'	0.002	0.006	0.283	0.778
'Buyers_Turkish interests'	-0.004	0.004	-1.010	0.317
'Buyers_U.A.E. interests'	-0.029	0.009	-3.374	0.001
'Buyers_Ukrainian interests'	-0.002	0.005	-0.404	0.688
'Buyers_Undisclosed interests'	-0.003	0.002	-1.539	0.130
'Buyers_Vietnamese Interests'	0.001	0.007	0.173	0.863
'Buyers_Vietnamese interests'	-0.006	0.006	-1.148	0.256
'PV_earnings'	0.000	0.000	0.358	0.722
'PV_scrap'	0.000	0.000	NaN	NaN
'NBP'	0.000	0.003	-0.055	0.956
'FleetDevelopment'	0.001	0.002	0.736	0.465
'Demolition'	0.000	0.000	-0.379	0.706
'Fleet_AverageAge'	-0.030	0.044	-0.681	0.499
'SHP_AVE'	0.001	0.002	0.335	0.739
'LIBOR'	0.000	0.004	0.025	0.980
'HSFO'	0.000	0.000	0.006	0.996

4.3.2.3.OLS regression result (Panamax)

Four regression analyses have been performed on Panamax bulk carriers to determine the factors that may affect the bargaining ability of the players in the S & P shipping market. During those regressions, dependent and independent variables were swapped to get the bigger view. Particularly, in the first regression analysis buyer's surplus was taken as the dependent variable. Next, we analyze how the seller's surplus has been affected by the independent variables. The third dependent variable was considered to be the buyer's minimum discount factor and finally, we took the seller's minimum discount factor as the Y variable in the regression.

Model for buyer surplus (Panamax bulk carrier)

Regression analysis was performed using MATLAB software (Table 13) to analyze the effect of different variables on buyers' surplus. In the regression Y or the dependent variable, was the buyer's surplus. In comparison, the present value of earnings, the present value of scrap, new build price, fleet development, demolition number, LIBOR, bunker price, size, seller's surplus, a minimum discount factor of the buyer, minimum trade price, buyer name, and builder are considered as independent variables. Analyses revealed that when the "Clients of Polembros Shipping" act as a buyer, then it has a negative correlation with the Buyers' surplus. As the surplus of the player highly depends on the characteristics of the players, hence the buyer who has more patience to finish the deal achieves more surplus compared with the less patient buyer. In this case, the buyer "Clients of Polembros Shipping" is a less patient buyer. Hence the estimated coefficient is -0.001. On the other hand, the demolition number affects the buyer's surplus positively. An effect is less than a percent but still needs to be taken into consideration when estimating the buyer's surplus.

Table 13: Model for buyer surplus
Linear regression model:

buyer's surplus ~ [Linear formula with 16 terms in 15 predictors]

Estimated Coefficients:	Estimate	SE	tStat	pValue
'(Intercept)'	1.309	0.037	35.117	0.392
'Buyers_Clients of Alassia Newships'	0.002	0.001	1.837	0.013

'Buyers_Clients of Anglo International'	-0.001	0.001	-1.837	0.163
'Buyers_Clients of Castor Maritime'	-0.001	0.000	-5.120	0.014
'Buyers_Clients of Centrofin'	0.091	0.001	80.940	0.000
'Buyers_Clients of Hoanh Son Group'	-0.002	0.000	-5.278	0.013
'Buyers_Clients of Neda Maritime'	0.000	0.001	0.427	0.698
'Buyers_Clients of Oldendorff Carriers'	0.000	0.000	NaN	NaN
'Buyers_Clients of Polembros Shipping'	-0.001	0.002	-2.950	0.060
'Buyers_Clients of Primerose Shipping'	0.002	0.000	5.017	0.015
'Buyers_Clients of Xiamen ITG'	0.000	0.000	NaN	NaN
'Buyers_Greek interests'	-0.001	0.000	-5.047	0.015
'Buyers_Japanese interests'	0.000	0.000	NaN	NaN
'Buyers_Undisclosed interests'	-0.001	0.000	-4.358	0.022
'Buyers_Vietnamese interests'	-0.001	0.000	-2.928	0.061
'Builder_Daewoo (DSME)'	-0.151	0.002	-88.318	0.000
'Builder_Hudong Zhonghua'	-0.151	0.002	-83.101	0.000
'Builder_Imabari SB Marugame'	-0.151	0.002	-82.429	0.000
'Builder_JMU Maizuru Shipyard'	-0.142	0.002	-73.543	0.000
'Builder_JMU Tsu Shipyard'	-0.142	0.002	-73.106	0.000
'Builder_Mitsui SB (Chiba)'	-0.152	0.002	-86.932	0.000
'Builder_Namura Shipbuilding'	-0.132	0.002	-87.760	0.000
'Builder_Oshima Shipbuilding'	-0.152	0.002	-84.277	0.000
'Builder_Sanoyas'	-0.151	0.002	-83.286	0.000
'Builder_Sanoyas Shipbuilding'	-0.152	0.002	-83.767	0.000
'Builder_Sasebo HI'	-0.150	0.002	-83.649	0.000
'Builder_Tsuneishi Tadotsu SB'	-0.149	0.002	-81.745	0.000
'Builder_Tsuneishi Zhoushan'	-0.150	0.002	-83.404	0.000
'Builder_Tsuneishi Zosen'	-0.150	0.002	-84.427	0.000
'Builder_Universal SB Maizuru'	-0.152	0.002	-83.064	0.000
'Size'	0.000	0.000	1.072	0.362
'PV_earnings'	0.000	0.000	80145.365	0.000
'PV_scrap'	1.000	0.000	3814.474	0.000
'sellers_surplus'	-1.002	0.000	-2915.907	0.000
'min_DF_buyer'	-1.121	0.013	-88.793	0.000
min_trade_price'	-1.000	0.000	-27523.569	0.000
'NBP'	0.000	0.001	-0.107	0.921
'FleetDevelopment'	0.000	0.000	-1.783	0.173
'Demolition'	0.001	0.013	3.117	0.053

'LIBOR'	-0.001	0.001	-0.797	0.484
'HSFO'	0.000	0.000	-1.454	0.242

Model for seller surplus (Panamax bulk carrier)

In the second regression, we have analysed the relationship between the Seller's surplus and various independent variables such as the present value of earnings (PV-earning), the present value of scrap (PV scrap), new build price (NBP), fleet development, demolition number, LIBOR, bunker price, size, buyer's surplus, a minimum discount factor of the buyer, minimum trade price, buyer name, and builder name of Seller's surplus (Table-14). Similar to the buyer's surplus, it was discovered that the most significant factors are demolition and buyers' names. Particularly if the buyer is of Vietnamese interest, it has a negative correlation with the seller surplus. This indicates that this buyer has more bargaining power than the Seller for the specific trade. Demolition numbers have a positive correlation with the Seller's surplus; because when the volume of scrap increases, that ultimately increases the demand for the vessel, leading to an increase in the freight rate, which increased the bargaining ability of the Seller and gained more surplus.

Table 14: Model for seller surplus
Linear regression model:
seller's surplus ~ [Linear formula with 16 terms in 15 predictors]

Estimated Coefficients:	**Estimate**	**SE**	**tStat**	**pValue**
'(Intercept)'	1.307	0.037	35.481	0.352
'Buyers_Clients of Alassia Newships'	0.000	0.000	NaN	NaN
'Buyers_Clients of Anglo International'	-0.001	0.001	-1.838	0.163
'Buyers_Clients of Castor Maritime'	-0.001	0.000	-5.121	0.014
'Buyers_Clients of Centrofin'	0.091	0.001	82.448	0.609
'Buyers_Clients of Hoanh Son Group'	-0.002	0.000	-5.282	0.013
'Buyers_Clients of Neda Maritime'	0.000	0.001	0.425	0.699
'Buyers_Clients of Oldendorff Carriers'	0.000	0.000	NaN	NaN
'Buyers_Clients of Polembros Shipping'	-0.001	0.000	-2.951	0.060
'Buyers_Clients of Primerose Shipping'	0.002	0.000	5.013	0.015

'Buyers_Clients of Xiamen ITG'	0.000	0.000	NaN	NaN
'Buyers_Greek interests'	-0.001	0.000	-5.049	0.015
'Buyers_Japanese interests'	0.000	0.000	NaN	NaN
'Buyers_Undisclosed interests'	-0.001	0.000	-4.360	0.022
'Buyers_Vietnamese interests'	-0.001	0.002	-2.927	0.061
'Builder_Daewoo (DSME)'	-0.150	0.002	-86.943	0.000
'Builder_Hudong Zhonghua'	-0.150	0.002	-81.822	0.000
'Builder_Imabari SB Marugame'	-0.150	0.002	-81.178	0.099
'Builder_JMU Maizuru Shipyard'	-0.141	0.002	-72.244	0.000
'Builder_JMU Tsu Shipyard'	-0.142	0.002	-71.821	0.000
'Builder_Mitsui SB (Chiba)'	-0.152	0.002	-85.671	0.087
'Builder_Namura Shipbuilding'	-0.132	0.002	-86.384	0.000
'Builder_Oshima Shipbuilding'	-0.152	0.002	-83.069	0.000
'Builder_Sanoyas'	-0.150	0.002	-82.005	0.000
'Builder_Sanoyas Shipbuilding'	-0.152	0.002	-82.603	0.000
'Builder_Sasebo HI'	-0.150	0.002	-82.300	0.000
'Builder_Tsuneishi Tadotsu SB'	-0.148	0.002	-80.281	0.65
'Builder_Tsuneishi Zhoushan'	-0.150	0.002	-82.089	0.000
'Builder_Tsuneishi Zosen'	-0.150	0.002	-83.084	0.154
'Builder_Universal SB Maizuru'	-0.152	0.002	-81.890	0.254
'Size'	0.000	0.000	1.072	0.362
'PV_earnings'	0.000	0.000	2994.583	0.75
'PV_scrap'	0.998	0.000	4054.686	0.000
'buyers_surplus'	-0.998	0.000	-2915.425	0.009
'min_DF_buyer'	-1.118	0.012	-91.512	0.65
'min_trade_price'	-0.998	0.000	-2765.747	0.01
'NBP'	0.000	0.001	-0.109	0.920
'FleetDevelopment'	0.000	0.000	-1.785	0.172
'Demolition'	0.031	0.012	3.117	0.053
'LIBOR'	-0.001	0.001	-0.797	0.484
'HSFO'	0.000	0.000	-1.455	0.242

Model for buyer minimum discount factor (Panamax bulk carrier)

Regression analyses were performed (Table 15) to understand the factors that can affect the buyer's discount factor in a bargaining process. Variable were respectively Y - The minimum discount factor of a buyer and X- the present value of earnings, the present value of scrap, new build price, fleet development, demolition number, LIBOR, bunker price, size, seller's surplus, buyers' surplus, minimum trade price, buyer name, and builder's name. It was discovered that the minimum discount factor

is affected by the buyer and the demolition number. If the buyer is Vietnamese Interests or Clients of Polembros Shipping, it might negatively affect the minimum discount factor of a buyer. Similarly, to previous results, the demolition number is supposed to increase the minimum discount factor of a buyer.

Table 15: Model for buyer minimum discount factor
Linear regression model:
min_DF_buyer ~ [Linear formula with 16 terms in 15 predictors]

Estimated Coefficients:	**Estimate**	**SE**	**tStat**	**pValue**
'(Intercept)'	1.169	0.023	50.505	0.452
'Buyers_Clients of Alassia Newships'	-0.136	0.003	-47.259	0.342
'Buyers_Clients of Anglo International'	-0.001	0.000	-1.850	0.161
'Buyers_Clients of Castor Maritime'	-0.001	0.000	-5.127	0.014
'Buyers_Clients of Centrofin'	0.081	0.001	86.384	0.000
'Buyers_Clients of Hoanh Son Group'	-0.001	0.000	-5.406	0.012
'Buyers_Clients of Neda Maritime'	0.000	0.001	0.357	0.745
'Buyers_Clients of Oldendorff Carriers'	0.000	0.000	NaN	NaN
'Buyers_Clients of Polembros Shipping'	-0.001	0.000	-3.004	0.057
'Buyers_Clients of Primerose Shipping'	0.002	0.000	4.891	0.016
'Buyers_Clients of Xiamen ITG'	0.000	0.000	NaN	NaN
'Buyers_Greek interests'	-0.001	0.000	-5.100	0.015
'Buyers_Japanese interests'	-0.136	0.003	-47.616	0.000
'Buyers_Undisclosed interests'	-0.001	0.000	-4.413	0.022
'Buyers_Vietnamese interests'	-0.001	0.003	-2.898	0.063
'Builder_Daewoo (DSME)'	-0.134	0.003	-48.631	0.000
'Builder_Hudong Zhonghua'	-0.134	0.003	-46.748	0.000
'Builder_Imabari SB Marugame'	-0.134	0.003	-46.575	0.000
'Builder_JMU Maizuru Shipyard'	-0.126	0.003	-42.091	0.002
'Builder_JMU Tsu Shipyard'	-0.127	0.003	-41.958	0.769
'Builder_Mitsui SB (Chiba)'	-0.136	0.003	-48.533	0.000
'Builder_Namura Shipbuilding'	-0.118	0.002	-48.281	0.000
'Builder_Oshima Shipbuilding'	-0.135	0.003	-47.598	0.654
'Builder_Sanoyas'	-0.134	0.003	-46.827	0.000
'Builder_Sanoyas Shipbuilding'	0.000	0.000	NaN	NaN

'Builder_Sasebo HI'	-0.134	0.003	-46.702	0.000
'Builder_Tsuneishi Tadotsu SB'	-0.132	0.003	-45.201	0.000
'Builder_Tsuneishi Zhoushan'	-0.134	0.003	-46.732	0.000
'Builder_Tsuneishi Zosen'	-0.134	0.003	-47.035	0.876
'Builder_Universal SB Maizuru'	0.000	0.000	NaN	NaN
'Size'	0.000	0.000	1.077	0.360
'PV_earnings'	0.000	0.000	88.857	0.000
'PV_scrap'	0.891	0.010	90.337	0.000
'buyers_surplus'	-0.892	0.010	-88.779	0.000
'sellers_surplus'	-0.893	0.010	-91.512	0.000
'min_trade_price'	-0.892	0.010	-88.654	0.000
'NBP'	0.000	0.000	-0.157	0.885
'FleetDevelopment'	0.000	0.000	-1.852	0.161
'Demolition'	0.001	0.002	3.106	0.053
'LIBOR'	0.000	0.001	-0.798	0.483
'HSFO'	0.000	0.000	-1.482	0.235

Model for seller minimum discount factor (Panamax bulk carrier)

The regression analyses were run to obtain information about the minimum discount factor of the seller as well. In this case, the dependent variable was a minimum discount factor of a seller (table-16). Independent variables are the present value of earnings, the present value of scrap, new build price, fleet development, demolition number, LIBOR, bunker price, maximum buyer price, seller's surplus, buyers' surplus, minimum trade price, buyer name, and builder name. From the result, we can see that buyer Clients of Polembros Shipping have a positive effect on the discount factor of the seller. On the other hand, demolition numbers can decrease the discount factor of the seller.

Table 16: Model for seller minimum discount factor
Linear regression model:
min_DF_seller ~ [Linear formula with 16 terms in 15 predictors]

Estimated Coefficients:	**Estimate**	**SE**	**tStat**	**pValue**
'(Intercept)'	-0.169	0.023	-7.318	0.018
'Buyers_Clients of Alassia Newships'	0.000	0.000	NaN	NaN
'Buyers_Clients of Anglo International'	0.001	0.000	1.850	0.206
'Buyers_Clients of Castor Maritime'	0.001	0.000	5.127	0.036
'Buyers_Clients of Centrofin'	-0.081	0.001	-86.384	0.607

'Buyers_Clients of Hoanh Son Group'	0.001	0.000	5.406	0.033
'Buyers_Clients of Neda Maritime'	0.000	0.001	-0.357	0.755
'Buyers_Clients of Oldendorff Carriers'	0.000	0.000	NaN	NaN
'Buyers_Clients of Polembros Shipping'	0.001	0.003	3.004	0.095
'Buyers_Clients of Primerose Shipping'	-0.002	0.000	-4.891	0.039
'Buyers_Clients of Xiamen ITG'	0.000	0.000	NaN	NaN
'Buyers_Greek interests'	0.001	0.000	5.100	0.036
'Buyers_Japanese interests'	0.136	0.003	47.616	0.001
'Buyers_Undisclosed interests'	0.001	0.000	4.413	0.048
'Buyers_Vietnamese interests'	0.001	0.000	2.898	0.101
'Builder_Daewoo (DSME)'	0.134	0.003	48.631	0.000
'Builder_Hudong Zhonghua'	0.134	0.003	46.748	0.000
'Builder_Imabari SB Marugame'	0.134	0.003	46.575	0.000
'Builder_JMU Maizuru Shipyard'	0.126	0.003	42.091	0.001
'Builder_JMU Tsu Shipyard'	0.127	0.003	41.958	0.001
'Builder_Mitsui SB (Chiba)'	0.136	0.003	48.533	0.000
'Builder_Namura Shipbuilding'	0.118	0.002	48.281	0.000
'Builder_Oshima Shipbuilding'	0.135	0.003	47.598	0.000
'Builder_Sanoyas'	0.134	0.003	46.827	0.000
'Builder_Sanoyas Shipbuilding'	0.000	0.000	NaN	NaN
'Builder_Sasebo HI'	0.134	0.003	46.702	0.000
'Builder_Tsuneishi Tadotsu SB'	0.132	0.003	45.201	0.000
'Builder_Tsuneishi Zhoushan'	0.134	0.003	46.732	0.494
'Builder_Tsuneishi Zosen'	0.134	0.003	47.035	0.000
'Builder_Universal SB Maizuru'	0.136	0.003	47.259	0.000
'Size'	0.000	0.000	-1.077	0.394
'PV_earnings'	0.000	0.000	-88.857	0.000
'PV_scrap'	-0.891	0.010	-90.337	0.000
'max_price_buyer'	0.000	0.000	NaN	NaN
'buyers_surplus'	0.892	0.010	88.779	0.875
'sellers_surplus'	0.893	0.010	91.512	0.000
'min_trade_price'	0.892	0.010	88.654	0.690
'NBP'	0.000	0.000	0.157	0.890
'FleetDevelopment'	0.000	0.000	1.852	0.205
'Demolition'	0.001	0.010	-3.106	0.090
'LIBOR'	0.000	0.001	0.798	0.509
'HSFO'	0.000	0.000	1.482	0.277

Chapter 5: Discussion, Implication and Limitation

In real life, millions of commodities (either in the form of tangible physical products or intangible services) are traded between the seller and the buyers every moment; these transactions are completed mainly through two formats. One is called the fixed or set price format without any bargaining opportunity. For example, buying a can of Coca-Cola from the nearest shop, we have to pay the listed price that is already set by the seller. In this situation, there is no scope for bargaining; usually, the fixed price term is commonly used for less-cost commodities. On the other hand, when the price of a good or service is determined by the multiple bargaining process, it is considered a bargained price. For example, amongst the others, the price of a second-hand ship (with similar technical specifications) in the sale and purchase (S & P) market could vary significantly in line with the age, operational history, characteristics of the market, earnings, size, and the characteristics of the players involved in a particular transaction. Hence, price bargaining is the crucial determinant of the valuation of ships in the S & P shipping market. Keeping these in mind, this chapter is structured as follows. The next section presents the detailed discussion and implication of the bargaining concept in the S & P shipping market, followed by limitations of research and recommendations for future studies, and finally, ends with the concluding remarks.

5.1. Discussion and implication

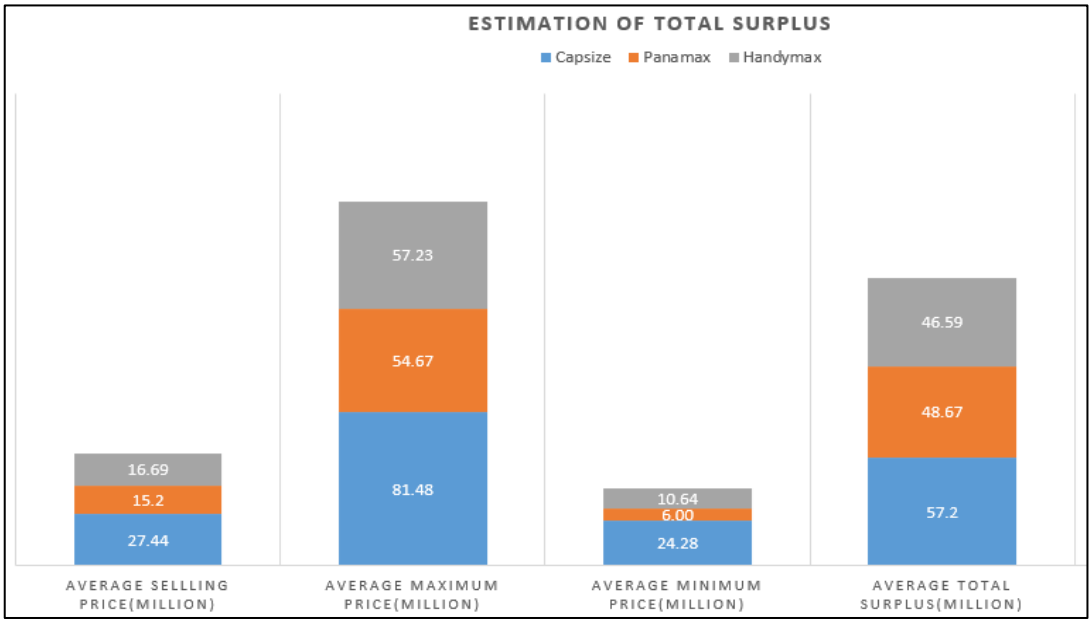
As we discussed in the previous chapter that price bargaining is the most important determinant for pricing the shipping asset in the sale and purchase market, but there is no standard format for applying the bargaining concept in this market (Kuester Simic & Prigge 2016). Keeping this in mind, this study has identified four individual characteristics that may affect the bargaining power of the players in the S&P shipping market. According to the study conducted by Zhang et al., (2018), the trading price is affected by the four characteristics; such as buyer's and seller's characteristics, market information, and product-related factors. For the estimation of the bargaining surplus of an individual trade, we investigated the discount factor of the buyers and sellers as an indicator of bargaining power. This may be helpful for the players to understand the basic characteristics of the parties for making an investment decision.

This research identified the relationship between the discount factor and the four individual characteristics, such as buyer's (seller's), market, and vessel characteristics, which affect the minimum discount factor of the players in the S&P market. This study critically analysed each individual trade of bulk carriers (Capesize, Panamax and Handymax) from 01-09-2019 to 01-06-2022 and found that in almost all transactions, there is a huge space for bargaining[8] (figure-16) for all three sizes of the bulk carrier. So, there is no doubt that price bargaining is the most important element for determining the vessel price in the S & P market.

According to figure 16, the average trading price between 01-09-2019 to 01-06-2022 for Capesize bulk carrier was USD 27.44 million, and the average maximum and minimum price was USD 81.48 and 24.28 million. The difference between the highest and lowest price (total bargaining surplus) was USD 57.2 million. Like the Capesize bulk carrier, the Panamax and Handymax also have the same characteristics (average total surplus was USD48.67 and 46.59 million). This is also to be noted that the average minimum price (seller's minimum price willing to sell) is very close to the actual trading price. This indicates that although the seller of the vessel had an opportunity to gain a huge surplus but due to the lack of bargaining power, the seller was deprived of gaining adequate surplus from the individual trade throughout the whole study period. On the other hand, there is a big space between the buyer's maximum price and the actual trade price, which suggests that the buyer had more bargaining ability and gained more surplus in the S&P shipping market compared to the seller (figure 16). As such, knowledge gained from the study may be beneficial for the sellers to determine the minimum selling price and estimate the trading range for individual transactions, which may help to push the buyer to increase the final trading price. Similarly, the buyers also understand the maximum and minimum trading price for individual transactions, which is also beneficial to make an investment decision in the S & P shipping market.

[8] Huge space for bargaining means big gap between minimum and maximum trading price.

Figure 16: Estimation of bargaining surplus for all types of bulk carriers[9].



Source: Data collected from Clarkson's SIN (created by the author).

For a better understanding of the bargaining model and proper implication of the price bargaining concept in the S&P market, the seller and buyer may gain knowledge on the following issues by studying this paper.

Minimum and maximum trading price:

For a successful transaction in the S & P shipping market, it is essential to properly estimate the seller's minimum price willing to sell and the buyer's maximum price willing to buy the ship. If the seller's minimum price is higher than the buyer's maximum price, there is no chance of trade (Song, 1995). Throughout the study period, we discussed how a seller could estimate the minimum trading price by analyzing the characteristics of the market. For instance, to identify the characteristics of the market, the seller should compare the present price of the vessel with the last 12 month's price. If the present value of the vessel is greater than the last 12 month's average price, then it provides a signal of the blooming characteristics of the market.

[9] According to figure 16, bargaining surplus is the difference between the average maximum price and average minimum price.

In that case, the minimum trade price should be the last 12 month's average price. In contrast, if today's price is lower than the last 12 month's average price, then it may be considered a bearish market. In the bearish market, the seller's minimum price has been estimated as follows. {(price today– (average one year price - price today)}. Thus, the seller may gain knowledge to understand the characteristics of the market, which might be helpful in estimating the minimum trading price and preparing him/her for the bargaining situation. Similar to the seller, the buyer can also determine the maximum trading price by estimating the total income of the vessel for her next operational life. For doing this, he/she should consider the per day income, remaining operational life of the vessel, operational day in a year, the scrap value, and the discounting factor. For the valuation of a ship, the study conducted by (Alizadeh & Nomikos, 2007) also applied the same techniques. This information may be beneficial for the buyer in making investment decisions. According to figure 16, the seller had a better opportunity to push the buyer to gain more price in an individual trade, but due to a lack of knowledge and poor bargaining ability, the seller failed to push the buyer properly.

Surplus and discounting factors:

This study identified the positive relationship between the surplus and the discounting factor. We applied Rubinstein's (1982) basic bargaining model for dividing the surplus between the players by using their discount factor, which means the payoff of the buyers and sellers is discounted by their individual discount factor. By analyzing the minimum discounting factor, the players might get some important information about his/her counterpart. Before starting the bargaining game, the players usually collect various information related to the characteristics of the product and the counterpart (Gillison et al., 2014); which may actually be helpful for them to gain some benefit in the bargaining process. By gaining knowledge from this study, the players will be able to analyse the minimum discount factor of the counterpart; this may provide some interesting information about the characteristics of the counterpart. For instance, If the minimum discount factor of the counterpart is lower than an individual, it implies that the counterpart has more urgency to finish the deal. Due to the impatience of the counterpart, the other party may achieve more benefits from the trade. In the S&P market, it was observed that the minimum discount factor of the buyer is higher than

the seller throughout the study period, which indicates the seller is more impatient than the buyer. Hence, this study identified that the buyer gained more surplus compared to the seller. Knight (2005), also analysed the discount factor of the players and identified that the player who has a discount factor that is lower than 1 can be expressed as an impatience player.

Factors affecting the bargaining power of the players

As this study considered the minimum discount factor of the player as an indicator of bargaining power, hence the minimum discount factor of the players is considered a dependent variable (Y). In addition, the bargaining surplus is the main output of a successful bargaining game between the buyers and sellers. So, for the purpose of the research, this variable is also considered a dependent variable(Y). According to Zhang et al., (2018), the characteristics of the seller (buyer), market and product affect the bargaining power of the players. Similar to the study of Zhang et al., (2018), this study also identified the relationship between the bargaining power and the four different characteristics, i.e., market characteristics, product characteristics, and buyer/ seller characteristics; which may affect the discounting factor and bargaining surplus of the players in the S&P shipping market. By analysing the characteristics of the four major factors, the buyers and the sellers might be well prepared for the bargaining situation, which may be supportive of making a successful transaction in the S & P shipping market.

Characteristics of the market

The bargaining power of the players may change in accordance with the characteristics of the market. In the bullish market, the demand for the vessel becomes higher than in the bearish market. So, the bargaining power of the seller increases in the bullish market. However, the buyer's bargaining power decreases in the bullish market (Stopford, 2008). According to our study, around 646 Handymax bulk carriers were traded in the S&P market due to high demand. On the other hand, due to the low demand for the bigger vessel, only 187 Capesize bulk carriers were traded from 01-09-2019 to 01-06-2022 (study period). In line with the demand of the market, the seller of the Handymax bulk carrier gained more surplus than the seller

of the Capsize bulk carrier. For instance, the average surplus of the seller for the Handymax bulk carrier was USD 7 million, whereas it was only USD 4.12 million for Capesize bulk carrier seller. So, it is to be claimed that the bargaining power of the player varies in line with the demand and supply of the market. In addition, this study identified that the new building price (NBP), the present value of earning (PV earning), High-sulfur fuel oil (HSFO), London interbank offer rate (LIBOR), and Present value of scrap (PV scrap) also affect the bargaining power of the players. Among the variables, the new building price (NBP) has a negative correlation with the buyer's discount factor. This indicates that when the price of the new building vessel increases, then the price of the second-hand ship also expands because all four shipping markets are highly correlated. So, the price of the new building vessels affects the second-hand vessel price (Beenstock,1985). Hence due to the higher price of the vessel, the bargaining power of the seller increase, which negatively affects the bargaining power and the minimum discount factor of the buyer. Further, LIBOR also affects the price of the vessels and the bargaining ability of the players. Due to the higher interest rate, the cost of the capital increase, and the liquidity of the shipowner decrease, which also decrease the seller's bargaining ability (Tsolakis et al., 2003). Further, the bunker price is also correlated with the bargaining power of the players. The higher bunker rate means the volume of trade decreases, which also negatively affects the bargaining power of the seller. According to Fan et al., (2021) the number of second-hand vessel trading decrease during the pick bunker market because bunker constitutes the major portion of the operating cost of a vessel.

Characteristics of the vessel

One of the important characteristics of the vessel that may influence the bargaining power of the players in the S & P market is the vessel size. In line with the characteristics and the root of the cargo, the Handymax vessel is more demandable in the S&P shipping market. However, for constructing a new vessel, the investor usually prefers the larger vessel (Fan & Luo, 2013). So, the bargaining power, including the surplus of the buyer and seller, may change in line with the size of the vessel. According to this study, there was a negative correlation between the size and the discount factor of the players, which indicates that the seller of a bigger vessel gains less surplus compared to the seller of a small vessel. This study also identified

that the average discount factor of the seller is .10 for the Capesize bulk carrier. On the other hand, the average discount factor of the seller for the Panamax bulk carrier is .20 between 01-09-2019 to 01-06-2022, which proved that the size of the vessel affects the discount factor and bargaining power of the players in the sale and purchase shipping market. Moreover, the bargaining power of the players are also influenced by the age of the vessel. According to a study conducted by Fan and Yin (2021), vessels that have an average age of 10.2 years are the most demandable ship in the sale and purchase market. So, the bargaining power of the buyer is comparatively decreased for buying this vessel due to high demand. On the other hand, vessels more than 20 years old are less demandable vessels in the S & P market. Hence the buyer may get more surplus by trading this vessel. Further, present value (PV) earnings also affect the discount factor of the players. According to the study conducted by Alizadeh & Nomikos (2007), the price of a vessel is highly correlated with its earnings, so during the bearish market, the seller becomes worried about selling the vessel to minimize the loss. Because during the bearish market, the freight rate goes down. However, the operating cost of the vessel remains the same, which indicates the lower discount factor of the seller compared to the buyer.

Characteristics of the buyer/seller/builder

Characteristics of the buyer/ seller and the builders also affect the bargaining power of the player in the S&P shipping market. According to our study, some of the buyers/sellers and builders had a positive correlation, and some had a negative relationship with the bargaining power of the parties involved in a specific transaction. For instance, the estimated coefficient between the seller's surplus (Y) and the buyers (Clients of Castor Maritime -X) is -0.012546 (negative correlation); which indicates this buyer has more bargaining power than the seller. On the other hand, the buyer (Clients of Polembros Shipping- X) has a positive effect on the discount factor (Y) of the seller. So, it is to be claimed that due to differences in the characteristics (age, education, experience, patience) of the players the bargaining power may vary in each transaction. According to Kousser and Phillips (2009), the patience of the player can play an important role in gaining the bargaining surplus in an individual transaction. The player who has more patience can be able to gain more surplus compared to the counterpart.

5.2. Limitation

Collecting quality data is the most difficult task for research. One of the crucial problems encountered throughout the study was the lack of the vessel price in accordance with the age of the vessel. Since there is a negative correlation between the price and the age of the vessel, hence bargaining power of the player also varies in accordance with the age of the vessel. So, for the purpose of our study, mostly for estimating the seller's minimum price, this study has required a year-wise vessel price. However, there was a shortage of year-wise vessel price data. For instance, Clarkson's (SIN) did not provide the vessel prices, which are 1-4 years old, 6-9 years old,11-14 years old, 16-19 years old, and 21-24 years old. As this study analysed the individual trade price, it was a bigger problem to estimate vessel price in accordance with her age. Another problem was the lack of the vessel's previous history. As we discussed in the previous chapter that the price of the vessel and the bargaining power of the players are correlated with the operational history of the vessel; if the vessel is well maintained and has a good operating history (no audit objection history due to lack of proper maintenance or no detention history), then the price of the vessel and the bargaining power of the seller is higher than the vessel with lack of proper maintenance even the specification of the vessel is same. However, for estimating the bargaining power, it is essential to analyse the past history of a vessel, but due to the lack of data, it was not possible for us to analyze the relationship between the bargaining surplus and the operational history of an individual vessel. In addition, data regarding technical specifications of the vessel, speed, fuel consumption, and other characteristics of the vessel were not available for proper analysis of the bargaining surplus. Further, there was a lack of broker information and broker commission data. Since the broker plays an important role in trading in the S&P market, it is essential to analyse the broker's role and broker commission to estimate the actual surplus of the players. However, due to the lack of data, this study could not consider these issues. Further, the offer price of the seller and the counter offer price of the buyer are not available on the website to analyze the individual trading history in the sale and purchase market.

5.3. Future research

This study focused on applying the price bargaining concept for determining the vessel price and the individual surplus on a per-trade basis in the sale and purchase shipping market. However, price bargaining also plays an important role in the freight market because freight rate is also determined by several negotiation processes between the ship operator and the charterer. Therefore, this study suggests applying the price bargaining model in the freight market for all three major shipping sectors i.e., dry bulk, tanker, and container vessel. Further, the brokers act as a mediator between buyers and sellers in the second-hand market, so the characteristic of the broker also needs to be analysed for a better understanding of how the bargaining power and the surplus of the player change in line with the characteristics of the broker. Finally, due to the lack of data, this study did not examine the relationship between the technical specification of a vessel and the bargaining power of the players, so this study suggests focusing on this area for a better understanding of how bargaining surplus is affected by the characteristics of the vessel.

Chapter 6: Conclusion and Recommendation

Among the four shipping markets, the concept of price bargaining is widely used in the sale and purchase market due to the heterogeneous characteristics and asymmetric information of this market. Since all the trades are conducted through physical interaction between the buyer and the seller with intense bilateral negotiation, hence price bargaining is considered the crucial detriment for the valuation of a ship in the S & P market.

Having the aforementioned in mind, this paper mainly focused on the application of the price bargaining model in the sale and purchase (S & P) shipping market and identified the factors that affect the individual bargaining power in each transaction. To do this, this paper examined the relationship between the price of a second-hand vessel and the bargaining power of the players (buyers/sellers) for individual trade in the sale and purchase (S&P) shipping market. As this research did not consider the outside option or incomplete information for the bargaining situation, so the basic bargaining model (Rubinstein's dynamic bargaining game model) has been applied to split the surplus and determine the outcome of the bargaining process on a per trade basis for the 3 sizes of bulk carriers (Capesize, Panamax, and Handymax).

For estimating the bargaining surplus, this study examined the minimum discount factor of the players and claimed that the player who has a higher discounting factor gained more surplus due to higher bargaining power and having more patience compared with the counterpart. This study has identified that the minimum discount factor of the buyer is higher than the minimum discount factor of the seller, which means the buyers are comparatively more patient than the sellers in the S&P market between 01-09-2019 to 01-06-2022 (study period). This paper also analysed the buyer's maximum and seller's minimum trading price of the individual transaction and identified that there is a big space between the maximum and minimum trading price compared to the actual trading price. This is to be noted that the actual trading price is very close to the seller's minimum price and very far from the buyer's maximum price. This implies that the buyer gained more surplus due to more patience in finishing the deal.

It has been noticed that the surplus and bargaining power of the players may vary in accordance with the characteristics of the market, characteristics of the vessel, and the characteristics of the players (buyer/seller). Regarding the characteristics of the market, this is to be noted that the bargaining power of the players may vary in accordance with the demand and supply of the market. For instance, around 646 Handymax bulk carriers were traded in the S&P market from 01-09-2019 to 01-06-2022 due to high demand and the average surplus of the seller was USD 7 million. On the other hand, due to the low demand for the bigger vessel, only 187 Capesize bulk carriers were traded and the average surplus of the seller was USD 4.12 million in the same period. In line with the demand of the market, the seller of the Handymax bulk carrier gained more surplus than the seller of Capesize vessels. In addition, other market characteristics such as the new building price (NBP), the present value of earning (PV earning), High-sulfur fuel oil (HSFO), London interbank offer rate (LIBOR), and Present value of scrap (PV scrap) also affect the bargaining power of the players; which also identified by this research.

The characteristics of the vessel such as size and age may also influence the bargaining power of the players in the S & P market. For instance, this study identified a negative correlation between the size of the vessel and the discount factor of the players; which indicates that the seller of a bigger vessel gains less surplus compared to the seller of a small vessel. Further, the bargaining power of the players is also influenced by the age of the vessel. The vessels having an average age of 10.2 years are the most demandable ships in the sale and purchase market. So, due to high demand, the seller had higher bargaining power compared to the buyer. On the other hand, vessels more than 20 years old are in less demand in the S & P market, hence the seller may gain less surplus by trading these vessels.

Characteristics of the buyer/ seller and the builders also affect the bargaining power of the player in the S&P shipping market. According to this study, some of the buyers (sellers) and builders had a positive correlation and some had a negative relationship with the bargaining power of the parties involved in an individual transaction. So, it is to be claimed that due to differences in the characteristics of the players the bargaining power may vary in each transaction. The players who had more patience may gain more surplus compared to their counterparts.

Although bargaining is widely used in the sales and purchase shipping market, there is still a lack of research for applying the bargaining model in the S & P shipping market with a standardized format. This study aims to motivate scholars, researchers, industrial practitioners, and maritime market analysts to analyze the concept of bargaining in a new way applicable to pricing the shipping asset in the sale and purchase shipping market.

Recommendation

Since bargaining power varies in accordance with the characteristics of players, it is recommended for the players to analyze the characteristics (patience, business profile, experience, country of origin) of the counterpart before sitting at the negotiation table. This might be beneficial for the buyers and sellers for their good preparation in the bargaining process to make a successful transaction in the S & P shipping market.

For a successful transaction in the S & P market, it is recommended that both players analyse the reservation price (seller's minimum price willing to sell and buyer's maximum price willing to buy) for the individual trade. This may provide some basic information about the expectation of both parties involved in a specific trade.

This study has identified four factors that affect the bargaining power of the players in the sale and purchase market, so the players involved in the trade in this market may critically study these factors for better preparation of the bargaining process and a successful transaction in the s & P market.

As there was a huge gap between the maximum and minimum trading price and the actual trading price is very close to the seller's minimum price. It is to be recommended that the seller should force the buyer to increase the price of the vessel to gain more surplus in each transaction.

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Appendices-1

Calculation of Seller's reservation price (minimum price seller willing to sell)
Size of the vessel: 179,656 DWT (Capesize bulk carrier).
Selling date: 10-June-2022.
Selling price: USD 45.00 Million.
Seller: H-line shipping (a Korean shipping company).
Year of build: 2016 (by Dalian shipbuilding company).

Date of sale	5yers price	10 years price	6 years price	Average price (Last 12 months)	Bullish/ Bearish	Seller's maximum price	Remark
Jun-2021	43.50	30.50	40.9	34.1125	6.7875	44.31666	
Jul-2021	44.00	30.50	41.3	34.8458	6.45416		
Aug-2021	45.00	33.75	42.75	35.6208	7.12916		
Sep-2021	46.00	33.75	43.55	36.5166	7.03333		
Oct-2021	48.50	36.00	46	37.4791	8.52083		
Nov-2021	47.00	33.00	44.2	38.6541	5.54583		
Dec-2021	47.00	33.00	44.2	39.6458	4.55416		
Jan-2022	46.00	31.50	43.1	40.6375	2.4625		
Feb-2022	47.00	31.50	43.9	41.4458	2.454166		
Mar-2022	47.00	31.50	43.9	42.3125	1.5875		
Apr-2022	51.50	35.00	48.2	42.7833	5.416666		
May-2022	53.00	37.00	49.8	43.525	6.275		
Jun-2022	53.00	37.00	49.8	44.3166	5.483333		Bullish market
Jul-2022	53.00	35.00	49.4	45.0583	4.341666		

Source: Data collected from Clarkson's Shipping Intelligence Network (SIN), 2022, created by the author.

Appendices-2

Calculation of buyer's reservation price (maximum price buyer's willing to pay)
Size of the vessel: 179,656 DWT (Capesize bulk carrier).
Selling date: 10-June-2022.
Selling price: USD 45.00 Million.
Buyer: European interests
Year of build: 2016 (by Dalian shipbuilding company).
Earning per day: USD. 14,062 9 (Operational day per year = 350 days).

Years	Yearly earning USD (Without scrap value)	Scrap value (USD)	Yearly earning (with scrap value)	Discount factor	Buyer's reservation price
2022	4921700		4921700	6%	
2023	4921700		4921700		
2024	4921700		4921700		$63,179,757.52
2025	4921700		4921700		
2026	4921700		4921700		
2027	4921700		4921700		
2028	4921700		4921700		
2029	4921700		4921700		
2030	4921700		4921700		
2031	4921700		4921700		
2032	4921700		4921700		
2033	4921700		4921700		
2034	4921700		4921700		
2035	4921700		4921700		
2036	4921700		4921700		
2037	4921700		4921700		
2038	4921700		4921700		
2039	4921700		4921700		
2040	4921700		4921700		
2041	4921700	12731810	17653510		

Source: Data collected from Clarkson's Shipping Intelligence Network (SIN), 2022, created by the author.