Erasmus University Rotterdam

MSc in Maritime Economics and Logistics

2014/1015

Do Tanker Pool Agreements Give a Comparative Advantage to their Members?

By

Peponis Konstantinos

Acknowledgements

In full gratitude I would like to acknowledge all of our university professors who inspired, encouraged, supported us and sacrificed themselves to help us implement our pursuit of a high education degree. They really led us towards a very challenging path and offered us the chance meet our fellow students.

In the committee, I specially wish to thank my thesis supervisor professor Dr. Michael Acciaro for his dedication to assist me, his kind response to my emails, supervision and primary concern about my methodologies, literature and concepts.

I express thanks to all my family for their emotional and unwearied support standing incessantly on my side.

My sincere gratitude goes to my very good friends who really imbued me with their spirit.

Finally, I wish to show appreciation to those who contributed in making this research possible.

Abstract

Pooling has been coming more and more in the limelight within the last few years as a response to both very challenging market conditions, increasing specialization of tonnage and as an alternative to corporate consolidations. This study provides an outline of the challenges shipowners nowadays face in the tanker sector; then explores and highlights the structure and other key issues of tanker pools; finally, it provides some statistical results of testing the simple hypothesis that the pool members have a comparative advantage against their competitors (those who operate their vessels independently). Moreover, Ordinary least-squares (OLS) regression has been used (it is a generalized linear modelling technique), which can apply to single or multiple explanatory variables and also categorical explanatory variables that have been appropriately coded. We proceed on the model building in which we introduced two explanatory variables: the time charter equivalent and the categorical variable which illustrates whether the company participates in a pool agreement or not in a specific period of time. By establishing this dummy variable we expect it will provide us with enough evidence to support our hypothesis or not. The key performance indicator which is going to be used in our model as dependent variable is the stock prices of eight listed tanker shipping companies because is a common method of valuating companies' performance as well as an indicator about the health of the company. The analysis could not detect any significant relationship related to the operating results from participating in a pool agreement with the stock prices and thus we cannot argue that there is enough evidence for supporting our hypothesis.

Table of Contents

List of Tables

List of Figures

Chapter 1. Thesis Introduction

1.1 Introduction to the topic

The market for international seaborne crude oil transportation services is highly fragmented and competitive (Clarkson, 2015). Two main categories of operators who provide seaborne crude oil transportation services can be identified: major oil company captive fleets (both private and state-owned) and independent ship-owner fleets (OSG, 2014). Besides, several owners and operators pool their vessels together on an ongoing basis, and such pools are available to customers to the same extent as independently owned-and-operated fleets.

As a response to challenging market conditions and as an alternative to corporate consolidations, pooling has become common practice the recent years among owners or operators. It has been observed a strong trend towards corporate consolidation in certain sectors and even though the incentives for this present a great range contrast, an ordinary motive is often traced. This is the need to create owners that are of a size (in terms of capital) to be visible and relevant to the capital markets (Nigel Ward, 2015). Such initiative is mainly stimulated by those owners that are already listed, want to be listed or have remarkable private equity providers as shareholders who are looking for either partial or full exit.

Since 2008, a number of major financial institutions have experienced serious financial difficulties. Such kind of troubles have partially emanated from weakening marketplaces for assets held by such institutions, particularly the reduction in the value of their mortgage and asset-backed securities portfolios. These problems have arisen by an overall drop in the willingness by banks and other financial institutions to extend credit due to historically volatile asset values of vessels. Despite the fact that an enhancement has taken place both in the wellbeing of financial institutions and in the willingness of financial institutions to extend credit to companies in the shipping industry, there is no guarantee that credit will be available to shipping companies advancement. As the shipping industry is highly dependent on the availability of credit to finance and expand operations, and this decline may adversely affect their operations.

Shipowners who are not directly interested in seeking public equity, pooling can be viewed as a solution on an operational level to the issue of size and market relevance. Although there have been a number of studies regarding the tanker shipping sector, only few of them have addressed the issue of pool agreements. This study provides an outline of the challenges that nowadays the shipowners face in the tanker sector, then explores and highlights the structure and other key issues of tanker pools, and finally provides some statistical results of testing the simple hypothesis that the pool members have a comparative advantage against their competitors (who operate their vessels independently). It focuses on eight listed companies with substantial VLCC and Suezmax fleet. Some of them have participated in tanker pools for the whole period tested, others have a rotating strategy depending on their expectations, while others have never participated in

such agreements. The statistical tests aim to provide us with enough evidence that the financial performance of those eight companies are influenced by their participation (or not) in tanker pools.

1.2 Literature Review

Many socio-economic changes took place during the previous months. Some of these events have direct impact on the shipping market for instance the current low oil prices while others have indirect impact. In addition, the economic crisis in Russia as a result of the sever sanctions imposed by the USA and European Union; the economic slowdown of major global economies such as China and Japan while at the same time more and more emerging worries regarding the stability and growth of Euro-zone, constitute an completely insecure economic environment. Of course, shipping market could not be an exception of that rule as is closely linked with the global demand and supply. One other think that should also be taken into consideration, is the appreciation of USD over the Euro. This fact has created a mixed picture for the consequences on shipping market. Mr. George Lazaridis, Head of Market Research & Asset Valuations said that *"the biggest fear once again revolves around financing, both for trade in terms of letters of credit by banks, as well as for financing asset purchases and placing new building orders"* (Hellenic Shipping News, 2015).

Taking into account both the depressed freight rates in bulk shipping market and all the previous aspects, we can infer that ship-owners have to tackle with great insecurity into an ever-changing environment. Those who will succeed to adjust their costs and exploit the fleet more efficiently will survive or even will thrive in the market. So the owners have to decide which cost and pricing strategies will follow. The issue when we talk about the pricing is not the price but the profit. Owners are interested about the price because they are interested to make profits from their fleet operation. But profit is a function of two things: price and cost. So in order to increase the profit they can either improve the price or reduce the costs and these are two things that require different practices. Pool agreement is considered such a practice.

The concept of pools is not new. Some pools proved to be very successful while others not; this is a reason why many concerns have been raised about this phenomenon by a number of stakeholders in the business. This study attempts to put the situation in perspective by discussing the significance of the individual groupings. It can be stated that the pooling tonnage concept has certainly not only stimulated shipowners' interest but also academic interest since is a vast topic and one which had earlier been the subject of studies. Some of them constituted the basis and the driving motivation of this research. An overview of the academic literature accessed, is presented at this part.

One of the most important sources of information regarding the shipping pools concept is the book with the title *'Shipping Pools'* by William V. Packard (1995). Many of the fundamental aspects of this concept from the analysis on pool's structure and activities to the description of different layouts of pooling contracts are described in detail in this book. One of the author's key messages is that the objectives of shipowners can be achieved by modern practices. Thus, he suggests

the replacement of old ideas which are no longer capable of contributing effectively to their objectives. For instance the failure of several timecharterers to provide forward financial security led him to the conclusion that the introduction of contracts of affreightment (CoA) has all the potentials to satisfy the interests of both charterers and vessel operators. Although this book is considered as a milestone for the discussed topic, it is mentioned by the author that there is need for more in-deep explanation as regards the structure the practical aspects such as the weighting and distribution system; the commercial operations and marketing. In this direction was the *"Economics Of Bulk Shipping Pools",* a research which conducted by H.E. Haralambides and published in 1996.

This research shed some lights on the topic of pools and provides information for the aspects that just mentioned above from a more practical perspective. This qualitative research was based mainly on three data sources: pools' executives were interviewed for the purposes of this study; previous studies on this topic were also taken into consideration and author's personal experience. Some of the main aspects of Mr. Haralambudes' study which should be highlighted are: the presentation of the most common used pool weighting and distribution system; the identification of the characteristics of the main pool's structure as well as the most common activities of a bulk shipping pool; and also provides an insight into the key factors which have led to the creation of the bulk pools. According to this study, the main objective of shipowners to enter a pool is their ability to attract and undertake large contracts of affreightment (CoAs).

While the existence of smaller independent shipowners in the world shipping is of paramount importance, cooperation between individual owning or operating interest seems to be an attractive option-at least on paper-for them. These co-operations could be either a joint-venture agreement or a pooling tonnage agreement; both can be proved effective options on the step towards improving the current depressed tramp market. Thus their participation in such co-operations can give them the opportunity to obtain access to CoA which otherwise was not possible to be achieved because they lack the required capacity. They can limit their risk in periods of poor market performance (H.E. Haramlambides, 1996).

From the large shipowners' perspective this concept is also attractive even though they have the required capacity to attract CoAs. The main benefits that can potentially be obtained by their participation in pools is the reduction of their risk exposure as all the risk related with the option of purchasing (also taking into consideration the concerns expressed by Mr. Lazaridis on that matter and presented above) or chartering vessels to undertake CoAs has to be assumed individually; also the full evolvement in these contracts is associated with another risk, the one of losing favourable opportunities in an spot freight market; and last but not least, through an improved and more efficient fleet deployment scheduling they can optimize the utilization of their vessels (H.E. Haralambides, 1996). Furthermore, some concerns are placed by the author as regards both the sensitivity issue of trust among the pool partners and the development in competition law and regulations. As we will see later on this thesis, the concerns that had been putted forward were absolutely valid.

In fact, EU's decision to bring the tramp shipping firmly in the sights of its competition rules is effective from 18 October 2006. Since that time, although the rules have always applied to tramp shipping, there were absence of enforcement

powers but from that day on, the enforcement powers under EU competition law were enacted. More specifically, this decision removes tramp shipping's exclusion from the scope of Council Regulation 1/2003 (the common competition implementing rules). As an effect of this EU competition policy, shipping companies should get prepared and ensure that their arrangements are fully complied with the competition law. Where this is not the case, companies can be fined up to 10% of their global turnover if their practices found to be not aligned with the EU competition law (Matthews, 2007).

Another study curried by D.R. Glen and B.T. Martin with the title: *"Do Tanker Pools influence Market Rates? The Case of Tankers International"* aimed to explore some issues within the tanker market. In this study the potential effects of the creation of tanker pools on tanker freight rates has been explored. More specifically, the study focuses on the hypothesis that the Tanker International and Alliance (two of the biggest tanker pools at that time) can potentially influence the market rates as a result of their significant share of tonnage of VLCCs. For that purpose, statistical tests conducted and this hypothesis appears to some extend valid (as the result do not provide enough evidence). One other important observation derived from the examined sample was that every tanker pool was consisted of a specific ship type or size and in some cases even of a very specific age range. From this we can infer therefore that the given tanker pools sample are applied (at least at this respect) in a manner compatible with the principals of the pool's typical model. This is important as in that sample are included two of the most prominent tanker pools. Another interesting result concerns the potentials for the vessels inside the pool to earn higher rates than those of non-pools. Under specific assumptions and limitations of data, and that could explain the case of Frontline. This company member of the Tanker International appears to have earned less than the market average (fact that led the company to leave the Tanker International pool) and maybe that was a critical factor which led the firm to the decision to leave the pool. One issue that was not tested in this study concerns the possibility that a successful pool can improve the financial performances of the pool members as they have a comparative advantage against the independent operators.

Based on the research gap that just mentioned and on the fact that there is no recent study to provide update information on tanker pools, this study aims to identify the current status of the tanker pools and if the members can potentially obtain significant benefits from participating in that kind of agreements.

1.3 Research Question

The research aims to address the economic effects of cost and pricing strategic agreements, such as the pool systems, for the shipowners. More specifically, the main emphasis is given on the nature and purpose of pooling agreements. Since these agreements are implemented, each participant (in this occasion each ship owner) has to comply with specific principals and responsibilities but also has rights that are inherent in them. Furthermore, the research aims at identify participants' main gains, related with the enhancement of their overall earning and the risk mitigation. This can be accomplished by steadily monitoring the performances of prominent companies-members and compare them with the respective fleet performances of competitive companies which operate independently.

Thus, triggered by the problem statement, the research gap of Glens's (2002) study which mentioned previously and related to the scope of the research, the main research question can be formulated as:

"Do the seaborne crude oil transportation services providers have a comparative advantage by participating in pools, in terms of their financial performance, against those who operate independently?"

Some of the previously stated problems concern the necessity for higher utilization of the fleet, the extreme competition as a result of the excess tonnage capacity in the market and of course the volatility and unpredictability of the global economy. So taking into consideration these challenges, the main interest lies behind this research question is to investigate if the pooling agreements could be an attractive option for the ship owners in order to maintain their economic welfare or to improve their performance in the depressed market. The aim of this research is to investigate the contribution of the pooling system to resolve emerging financial difficulties by increasing vessel (or vessels) utilization or by providing a more extended and secured network for its members. Our analysis and interest will be focused on two main aspects; the first concerns the risk mitigation that owners obtain by their participation in this kind of agreements if any, while the second is linked to the possible enhancement of the overall earnings of each vessel.

1.4 Thesis Objectives

Taking into consideration the problem statement and the main research question the research objectives can be represented by the following sub-research questions:

a) *"What are the main advantages and disadvantages of participating in tanker pooling agreements?"*

b) *"Which are the challenges and the main perils that the shipowners face and how do they should deal with these?"*

As previously discussed, tramp shipping sector is in great instability nowadays as happens with almost every sector which is closely linked to the global economy and is directly affected by the fluctuations in the trade flows demand. The ship-owners face many challenges in this ever-changing environment and are willing to implement cost and pricing strategies not only for increase the utilization of their fleet but also for mitigating and spreading their risks. So as far as me is concerned, always taking into consideration the current global economic situation, pool agreements are very recent topic and could be approved as an attractive alternative strategy for the owners with future prospects and potentials in terms of market evolution and efficiency. This research has a clear aim, to present performance results of the most prominent crude oil tanker companies derived from their operations during a specific period of time as these reflect to their stock prices and test their correlation with the time charter equivalent measure. In order to achieve the main goal of this project, initially we have to determine all the internal and external factors which affect pools' performance. Some of them can be proved more

important than others so we have to consider the impacting significance of each one of them.

1.5 Research methodology

The selection of methodology is mainly driven by the characteristics and the nature of the main research question. To that extend and because we wanted to introduce a model with the intention to provide us with enough evidence (and to shed light on the research question), the method which was preferred for our purpose is the ordinary least squared. OLS regression is one of the major techniques used to analyze data and forms the basis of many other techniques (Rutherford, 2001). The usefulness of the technique can be greatly extended with the use of dummy variable coding to include grouped explanatory variables (Hutcheson and Moutinho, 2008) and data transformation methods (Fox, 2002). OLS regression is particularly powerful as it makes relatively easy to also check the model assumption such as linearity, constant variance and the effect of outliers using simple graphical methods (Hutcheson and Sofroniou, 1999). Similarly, in order to illustrate appropriate answers for the two sub-research questions mainly secondary data was used. Thus, previous studies, reports, published documents, and other bibliographic sources are some of the secondary sources which provide us with excellent background information as well as many good leads.

1.6 Thesis overview

In this first chapter a sort introduction to the topic, in careful apposition, is offered as a presentation of the main objectives and the scope of this study. In the second chapter, the structure of tanker market is presented in order to understand under which conditions the companies' running take place. Furthermore, potential solutions are introduced as dealing with core challenges the operators face. Such a solution maybe the formation of alliances and any forms of cooperation. Pool agreements constitute a kind of this cooperation form while the third chapter discusses the benefits that may derive from such an alliance. Withal, a more detailed presentation about tanker pool agreements unfolds, and more precisely: their nature and purpose; a shipowner's obligations under the pooling agreement; a pool operator's obligations under the pooling agreement; and how tanker owners are compensated within pooling agreements. Then and there after building our model, the statistical software is selected. With the purpose of running it, we move on estimating the coefficients and assessing the model. The results are recorded and analyzed whilst and final conclusions are coming to the end of this study.

Chapter 2. Market Analysis

2.1 Introduction

The overwhelming majority of the international trade in terms of value and volume still occurred by shipping industry. The fact that shipping services are derived by the demand for transportation which is a management intensive function and in conjunction with other economic and environmental nature challenges, all these have led the last decades in the evolution of the sector. According to Evans (1994), shipowners seem to operate close to perfect competition, while in the long term, overcapacity and the speculative nature of tramp shipping prevents them from efficiently adapting to demand.

The fleet development during this period of time is remarkable as more and more sophisticated vessels have entered the market (Clarkson ESCA, 2015). This trend was mainly driven by the demand for carriage of specialized commodities (i.e. LNG, LPG, Chemicals etc) as well as by the necessity of building more environmental friendly and safer vessels. In order to have a better idea of how this market works, it is necessary to proceed on the segmentation of this complex market. The segmentation within the shipping industry is determined by the trade patterns of the goods that require ocean transport. This segmentation is mainly based on two features: on the physical characteristics of cargo and on the size of the individual consignment of cargo (Clarkson ESCA, 2015). As a result, three broad segments can be identified and the division is based on the set of cargoes which are carried by the shipping industry. Thus, these three segments could be defined as follows:

Liner shipping. This segment pertains to the scheduled transport of containerized cargo or small cargo parcels which do not fill the hold of a vessel. The services are operated within a schedule and on a regular basis.

Bulk shipping. In contradiction with the liner services, the bulk carriers (both dry bulk and oil tanker are included) are designed to handle homogenous cargoes in relatively huge amounts. Further segmentation within the bulk shipping is determined by the trade patterns of the goods which require sea transport (raw materials such as grain, iron ore, crude or product oil etc.)

Specialized shipping. In this category, specialized vessels are used for the transportation of large quantities of very specific cargoes such as chemicals; refrigerated cargo; liquid gases including LNG, LPG, ammonia; forest products; motor vehicles, trucks and earth moving equipment. Although the vessels operated in this segment have been designed for very specific purposes this is not always the case as there are vessels designed in such a way that they able to carry other cargoes as well.

In this study we concentrate on the tramp/non-liner shipping market which includes the chemical tanker business; the LPG business; the bulk carrier business; the product and crude tanker business (the last sub-market segment will be the research field of this study). The definition of tramp shipping services, which was so well established by Council Regulation (EEC) No. 4056/86,Section 1. Article 1(3a),(since repealed by Council Regulation 1419/2006) is presented below:

"Tramp vessel services means the transport of goods in bulk or in break bulk in a vessel chartered wholly or partly to one or more shippers on the basis of a voyage or time charter or any other form of contract for non-regularly scheduled or non-advertised sailings where the freight rates are freely negotiated case by case in accordance with the conditions of supply and demand".

At this point, it is very important to have an overview of this market structure. As it has been observed, the tramp shipping market may satisfy in a great extend the main characteristics of the perfect competition model. However, the chemical tanker segment as well as the auto transport industry (car carriers) could be viewed as the exception to that as the number of dominant players is rather limited comparatively to the other segments (Clarkson ESCA, 2015). Now, as regards the crude and product tanker sectors, both are characterized by very intense competition and are aligned with the main principles and characteristics of the tramp shipping in general (Glen, 2002).

2.2 Key points for tramp shipping market structure

In this sub-section the accuracy of the statement that the tramp shipping is close to perfect competition model will be examined. Competition refers to a market where the existence of a great number of suppliers gives consumers the opportunity of making choices based on quality, value for money, price and so on. At the extreme end of the competitive scale is a perfectly competitive market. A market like this has the following characteristics (Mankiw, 2011):

- Existence of many buyers and many sellers in the market. No individual firm can influence supply and thus prices. Firms are referred to as being 'price takers'. Each seller can sell all he wants at the given price, there is no reason for him to charge less for his services but in case he charges more he must expect that he will lose remarkable market share.
- Goods provided by various sellers are almost identical. In that case the goods are characterized as being 'homogenous'
- There are no restrictions or alternatively, there are no barriers of entry on firms entering or exiting a market.
- There is high degree of information transparency. All the information is available for both buyers and sellers

Impossible as it may seem that all these assumptions hold at the time, it is believed that there are few examples which are close to the perfectly competitive market model (Mankiw, 2011). Many (Harlaftis and Theotokas, 2002; Clarkson Research Studies, 2004) claim that such examples are some of the tramp shipping sub-segments which can potentially meet all the conditions to be considered as such. After taking into consideration these characteristics of the perfect competition model, as these are presented in Mankiw and Taylor book (2011) of Economics (page 150) we are going to present some of the key features of tramp shipping characteristics to examine if these are aligned with the characteristics of the perfect competitive model.

The main characteristics of the tramp market which are evident in almost all of the segments of this market can be concluded as follows:

Many small and entrepreneurial companies

The majority of shipping companies are relatively small in terms of fleet size, and the great majority of them own less than five vessels. Given that the core business of shipping companies which is not else from facilitating the global transportation of goods and as long as the owner, who in our case is the supplier of the service, takes the necessary actions in order to meet all the statutory requirements to bring his assets into operational readiness, the vessels as a mobile asset can be 'fixed' from geographical scope all over the world. Thus, and except for very specific exceptions, all vessels within a particular type potentially could be in a position to compete. This indicates that tramp shipping is a globally competitive market. The exception to this is that cabotage is governed by rules and regulations which indeed set some limitation to potential operators. Another key exception is the physical limitations that a vessel has to deal with. The dimensions and the characteristics of a vessel are fundamental and indispensable elements when it comes to fix the route planning and schedule. In particular, vessels' dimensions such as draught, length and beam can determine the port of call, the voyage route as for example not all of them can be accommodated by Canals (Panama and Suez Canal) as well as not all of them comply with the enforced IMO regulations (with respect to pollution) which have been established and concern specific areas.

The following Table provides some numerical information of the ship owning companies' size in a selection of tramp shipping segments.

Table 1. Total fleet by company size

Company Size	***World Fleet***				
	# Companies	***# Ships***	***m. Dwt***	***m. GT***	***Avg. Ships***
(# owned vessels)					
300+	8	3,615	184.6	130.3	452
200-299	6	1,452	25.4	21.2	242
100-199	37	4,859	211.7	150.4	131
50-99	134	8,952	368.2	239.1	67
10-49	1,359	25,621	622.8	408.4	19
5-9	1,896	12,256	168.0	110.3	6
0-4	19,034	28,820	167.0	116.0	2
Unknown		4,061	7.7	5.5	
Total	**22,475**	**89,636**	**1,755.5**	**1,181.1**	**4**

Source: Clarkson Research Services, February 2015. Includes both cargo carrying and non-cargo carrying merchant vessels over 100GT in size.

As it can be observed in Table 1, there are at approximately 22,500 companies which own in total 89,636 ships. Tankers, dry bulk, specialized, general cargo and non-cargo vessel types are included in the numbers presented in this Table. Taking into account the actual number of companies as the benchmark to interpret the above figures, it could be inferred that the 22,475 is by itself a figure which illustrates that the likelihood of market manipulation by any individual shipowner is rather

limited. Thus, it is believed that their market share is very small almost negligible and there is no possibility for an individual firm to influence supply and thus prices as well. Given that the shipping companies are “price takers” (freight rates are governed by market forces) we can conclude that the first condition (of perfect competitive market) is fulfilled. However, an interesting feature is the GT and more specifically the fact that 46% of the total gross tonnage (GT) owned by 185 companies with more than 50 vessels each while 20,930 companies own only the 25% of the total GT. This information illustrates the existence of some companies with a very remarkable tonnage capacity (in terms of GT) but how this is reflected in the allocation of market power among them is something difficult to detect.

Easy of entry

Tramp shipping has relatively few barriers to entry (Clarkson, 2015). The most notable restriction that an entrepreneur may face as regards his involvement in this business is the substantial required equity. This market is characterized by capital intensive (Lun, 2008) and the funding contribution of banks or other financial institutions are of paramount importance. The luck of trust among banks and investors in the shipping industry, which derives from the poor financial performance of the majority of shipping companies, result to make them less willing to provide loans (Klink, 2009). In cases where a huge amount of capital has been obtained by banks it is mainly thanks to the company’s turnover and the property available for liquidation which it was able to be placed under a mortgage (German Central Bank, 2011). Consequently, one restrictive factor for an entrepreneurial company is the capital scarcity; however, if the investor is in a position to obtain the requisite equity he can run the business with his minimum contribution (Jung and Will, 2015) in a sense that there is a comprehensive network of support services which facilitate the new investors by providing a wide spectrum of functions, for instance, ship management companies, classification societies, chartering brokers etc. As it can be inferred this evolved and well established system of companies with great expertise in each domain offers the opportunity to any investor, who wants to make business in this industry, to succeed (Clarkson, 2015).

Information Availability

Information provision networks in tanker shipping sector are really open as they offer to purchasers and sellers, operators and brokers or agents continuously update commercial data (Brooks, 2006). Financial data about different market indicators such as inflation, oil prices, vessels’ revenues by type, asset prices etc. is published on every day basis by the shipbroking agencies and other information providers and this information is enormously spread in the industry to vessel operators, shippers as well as to any other interested party. Digital network which are on line are likely to offer the precise point in which the vessel is in every single second. This entire advice support network guarantee transparent running of high quality (Clarkson, 2015). Furthermore function expenditures that various categories of vessels need are available in detail and they are presented in shipping companies’ annual reports (studies are implemented by ship firms in order to add documentation of these

expenses). Therefore prospective investors are facilitated in forecasting dominating earning rates.

Homogeneous

Even though there is some scope for differentiation (based on the age of the ship, the shipyard where it was built at, the reputation of the shipowner, etc.) shipping services per cargo are perceived as homogeneous (Clarkson, 2004). The globally established regulations for safety, security and environmental standards have contributed to nowadays trend where the characteristics of vessels are similar if not identical (Psaraftis, 2006). For instance, after the "Prestige" case and the unfortunate accident of oil spillage, IMO enforced regulations and set stricter safety standard applied to the entire fleet of oil tanker segment by introducing double-hull requirements and a set of other measures (Hussein, 2009).

So far as the main tramp market characteristics are concerned, the following general comments can be made: the commodity is homogeneous; limited barriers for new investors to enter into the tramp shipping market as the costs for that purpose are very low and no one can prevent someone else from entry; the number of companies which compete for business is so high that bulk and tanker shipowners are price takers and the possibility of influencing the rates is negligible; the freight rates are determined by supply and demand; and the information flows create a transparent market environment. Consequently, it can be stated that indeed the tramp shipping industry fulfills the conditions of the perfectly competitive market model almost to full.

However, regarding the specialized shipping markets, it has been observed that both the shippers and shipping companies are rather limited in comparison to the dry bulk and tanker shipping market. The competition is also very high and as a result the carriers are making efforts to differentiate their services to attract more business (for instance more and more carriers of specialized cargo are investing in extending and integrating their facilities by providing also logistic services to their customers). In some cases the competition is becoming even more intense as outside competitors try to get some share from this market as well (i.e. small tankers compete for chemical parcels).

2.3 Tanker Shipping Market

Oil tankers as its title suggests have been designed for the bulk transport of oil. Two broad categories of oil tankers can be identified: the crude tankers and the product tankers (Clarkson, 2004). The former type is specialized in transportation of unrefined crude oil mainly from extraction points to refineries while the latter type is used in transportation of refined products to its final destinations for consumption. A further categorization takes place regarding to vessel size. In that sense there are five main categories, Handymax, Panamax, Aframax, Suezmax, and VLCC/ULCC.

The larger sized vessels such as Suezmaxs and VLCCs with average 120,000-200,000 and 320,000 deadweight tons (dwt) respectively are used for crude oil transportation and not for the delivery of product oil (Clarkson, 2004). It is generally believed that the tanker shipping market is one of the tramp shipping segments which fulfills almost in total the conditions of the perfect competition model as these were described in the previous sub-section.

Tanker shipping industry consists of four unlike but relative enough trade fields (Stopford, 2009). Sea transport servicing is held in the freight market, newly constructed vessels can be ordered and built in the new building market, second-hand vessels are commercialized in the sale and purchase market while old or 'timeworn' vessels are discarded and removed from service in the demolition market. Prices in these four shipping markets are interlinked and are defined by the exchanges and influences between purchasers and sellers of these trades (Grammenos, 2002). These four sea shipping services are classified in and reflect the "first" and "secondary" markets (Strandenes 1984; Lun and Quaddus 2009). Shipping companies put orders for new vessels in the new building market and demolish old out of service boats in the scrapping market. New constructing and discarding markets are "first" market because their operation influences all shipping trades and activities. On the other side, shipping companies offer sea transport service to shippers in the freight markets and vessel owners trade their ships in the buying and selling trade. The "secondary" market includes freight market trades sea transport services and the sale and purchase market trades second-hand vessels (Clarkson, 2015). The latter two markets are titled as "secondary" market because the transactions held do not differentiate the already being shipping capacity. Shipping companies offer sea conveying activities to shippers in the freight markets and shipowners trade their own second hand vessels in the buying and selling market. The focus in our analysis is mainly given on the freight market and more specifically on the different charterparties in order to understand the contractual relationships among the participants.

2.3.1. Seaborne Trade

Maritime companies run world-wide shipping services by carrying cargo in order to satisfy the command of sea transport services (Kendall and Buckley 2001). To a great extent, products' moving is not held if there is no need for cargoes to be consigned from construction to consumption points. Orders placed for tanker shipping service come from the trade between purchasers and venders in energy market sector. Sea transport management is a very important changeable factor in tanker shipping activities because the need for tanker shipping service is a derived one. In past held analyses (e.g., Metaxas 1971; Lun and Quaddus 2009; Stopford 2009), there has remarkably been mentioned a very assertive relation between sea transport service and freight rates. Variation in freight rates is likely to be impacted by seaborne trade quantities. In tanker sea trade, cargo rates are a significant index for maritime companies to run their activities. In case the amount of seaborne trade

up rises, the demand for sea transport services will rise as well. As a consequence, a really high demand for sea transport services will also guide freight rates go upwards. Additionally, freight rates influence tanker shipping companies on deciding to adapt their fleet magnitude. Therefore, they will enhance their services in the tanker trade. Increased cargo rates lead to development in global fleet. This could be seen as a domino effect which explains in a great extent the evolution in this this segment.

Tanker sea transport may be mentioned as a fund strenuous industrial field because highly invested funding in vessels is demanded (Chen and Wang 2004). The return on invested finance in ships relies on seaborne trade volume (Stopford 2009). Cargoes are not able to be consigned to the recipient in case of lack of the sufficiently invested funds in shipping capacity. Provided there is an investment of vessels but we have an inadequate need for shipping transport, the ship lay-up becomes very expensive. Sea transport demand emerges from seaborne trade and maritime companies are not able to manipulate the variation of demand for shipping service (McConville 1999). So as to face an up rise in sea cargo volume, tanker managers attempt to widen the capacity of sea transport. Consequently, seaborne induces the most critical decision in shipping industry concerning the adequate adaptation of shipping tonnage.

Even though commerce volume increased in the near past decades, maritime companies will be able to decide about their investments only in case a future freight rate growth is clearly distinguished in the horizon. Nevertheless, it may pass some years' time for shipping companies to get delivery of newly constructed vessels provided they decide to enhance their shipping tonnage. The freight market is a field where purchasers and sellers meet so as they exchange seaborne services. The need and offer of shipping services reciprocally act among all involved parts so as to define freight rates. Owing to the need nature, the demand for seaborne tanker activities relies on the shipping trade tonnage (Lun and Quaddus 2009). On the other side, offer of shipping activities is not flexible in the short term. Oversupply of shipping tonnage not only leads to decrease in freight rate but also excessive running expenditures to lay-up vessels. Thereunto, insufficiency of vessels will conduct the freight rate to move upwards so as to force maritime companies to adequately adapt their shipping tonnage.

2.3.2 Factors Influence Supply of and Demand for Tanker Shipping

Traditionally, the tanker industry could be characterized as highly cyclical (Stopford, 2009), with unpredictable financial results, freight rates and asset prices determined by the market forces influencing the supply and demand for tanker capacity (Lyridis, 2004). After 2008, when tanker companies were experiencing the golden age with regard to their revenues, crude oil carriers show their revenues be consistently falling. This was of course the negative impact of the global financial crisis on the market but the result was of such a significance that even upon the conclusion of seven years' period the current freight rates still remain at comparatively low levels

especially from those before 2008. As it was previously mentioned, fluctuations of supply and demand for tanker capacity as well as for oil and oil derivatives result in charter rate and asset value volatility (Glen, 2002). Because the revenues of a company are linked in a great extend to the charter rates, the prosperity of this company could be obtained by its ability to re-charter its fleet on the expiration of their current spot or time charter arrangements. Although, this element by itself cannot ensure that each vessel's return is the adequate in order to realize profit because not any of those replacement charters prove to be sufficient enough.

Some of the main factors which are directly or indirectly linked with the fluctuations of demand for tanker capacity except for those mentioned previously are the global and regional economic and political conditions (i.e. industrial slaw down, posed sanctions); regulations regarding safety and environmental requirements; currency exchange rates; prices of and demand for alternative energy sources; development of alternative oil transportation systems between different areas (i.e. oil pipeline systems); and changes in transportation patterns (Glen, 2002).

As for the factors which impact on the supply of tanker capacity could be concluded as follows: expectations for the market's potentials in the future; newbuilding and second-hand tanker prices; scrapping rate; conversion of tankers to other uses; altering the vessel type during the newbuilding contract is running; tanker charter rates; port and canal congestion; physical limitations in various geographical areas; enforcement of stricter regulations and other environmental issues.

The over-supply of tanker capacity has always been a serious problem and has been identified as one of the main reasons why the freight market is still depressed (Glen, 2002). The orderbook of newbuilding tankers is a remarkable number and in case where the introduction of this new tonnage will not be balanced by the scrapped and converted to non-tankers tonnage the problem will be even more severe.

2.4 Type of Charter Arrangement

The hire of a vessel for the transportation of a cargo is one of the most important and at the same time most challenging functions in the maritime industry. It is important because the core business of shipping is accomplished when a ship is chartered to transport a given volume of cargo with an agreed freight rate. Meanwhile, it is also very challenging because the parties are getting involved in negotiations in order to get a ship in a 'fixed' condition. In principal, the parties of these negotiations are three: the shipowners who represent the supply of shipping services; the shippers which have the cargo and they need shipping services for transporting it; and the charterers or brokers which are the intermediates and those who facilitate the trading by matching the demand with the supply. The market power of each participant is so volatile as has been the case in every free market and the main purpose of the free market is that all parties achieve a fair share of benefits.

Charter agreements used in the variety of tramp shipping are mentioned hereinafter. Charterparties or “charters” in brief are titled the agreements for a vessel lease of for transporting merchandise and/or commodities. In tramp shipping marketplace four main categories of agreements are adopted. In case of support of sea trade services, voyage freights, CoAs and time charters are of great importance (Pirrong, 1993). Bareboat charter is chosen for financing new ship capacity with ownership often vesting directly in the financial institution.

When just one vessel is chartered, the great four ranges of charterparty can be followed between the “main” owner and the charterer at the “chain” close part. For instance, a ship can be leased by a bareboat charter from the “main” owners to a “disponent” owner for example for a decade. Afterwards, under the command of the “disponent” owner the vessel could be rehired for four year time charter to another charterer. The period time charterer relets the vessel to another charterer, who hires the ship for some times charter trips. Therefore, one vessel can probably be under a great number of hires and sub-hirers at any time. The main four agreement kinds are belowmentioned in full detail:

Voyage charter contracts (Spot Charter).

This is the charter plainest form. Voyage charter is ideal for a small number of specific cargo that will be transported from a load port to a discharge port. There can also be some precisely mentioned load ports to certain discharge ports on specially mentioned terms and being fixedly priced. This price is more than often defined per tonne of goods and/or merchandise transported.

The charter party is to fully mention provisions in detail about more or less important accorded relative terms of the agreement. For instance, in a case a ship is late in charging and unloading because of a special cause without owner being liable for that, charterer must pay a penalization on a daily or part of a day basis to the owner, according to the charter party accorded provisions. This is the so called “demurrage”. Among the most well-known voyage charterparty forms is the “GENCON” one. There are regular differentiations on the main text in order to be appropriate for each agreement case. Moreover, there can be added some clauses specified for the particular commerce.

Contracts of Affreightment (CoA)

This agreement format can be viewed as many voyage charters, agreed simultaneously and constituting one contract. The main principles are identical to the ones for a voyage charter. There can be mentioned, a specific cargo size of merchandise from port (or ports) A to port (or ports) B, however, the contract of affreightment may refer to a specific number of cargoes at bimonthly intervals for example. In contrast to voyage charter, nevertheless, a special ship for each cargo is not regularly mentioned in the contract. The contract refers to a vessel category,

and parameters within that vessel category, in each cargo undertaking. In that case, it is necessary the owner/operator to provide a vessel for each cargo “parcel” according to the chartering agreement.

A CoA is not a requirements contract. In the frame of a CoA, the cargo quantity and the loading dates for goods and/or commodities will be mentioned in detail in the contract terms. This point differentiates this kind of contract from a requirements one as in the latter a consignee calls for cargo as and whenever he wishes to have it. The owner/operator is benefitted as he can determine an ensured income for fixed future time. In accordance with the charter party contract, he can dispose his vessels or charter other vessels to totally or partly implement the CoA (in this case the pool system, which is analyzed later on in this study, is of paramount importance for those owners/operators). The charterer may prefer contract of affreightments because these types of arrangements offer a high level of certainty which derives by fixed voyages and schedule which can potentially results in more efficient fleet deployment and more precise planning of all cost elements for the operations. Consequently, he diminishes the duration of any ship travel when the vessels are empty of cargo and therefore do not bring any income. From charterer perspective, this contracts are the appropriate ones for those who desire to build certainty and want to invest on a more stable business plan.

The ship owner/operator and the charterer, through the CoA will be able to see the freight rate trend in the marketplace. It is generally observed that the shipowner will try to be engaged in a CoA if the observes the freight rates to be high. A charterer in cases the rates are low. But, sureness in determining future business may overweigh similar temporary market esteems. This means that a CoA may offer the owner ensured income covering his bank satisfaction, or he may use this kind of agreement for various different reasons. The charterer will be sure to fulfill an important customer’s need.

CoAs are likely to follow a voyage charterparty form, even though they mostly present to be unrelated documents, created for the specific situation. Most of the terms resemble or are identical to the ones used in a voyage charterparty. Extra terms may refer to the determined vessel type description while the owners have to follow all parts of the CoA (which means, key characteristics outsetting). Additionally, the date(s) within which the onwers/operators must indicate the ship for each and every leg of the CoA, and the quantity of merchandise and/or goods will be included.

Timecharters (TC)

Counter to a voyage charter or a CoA, in a time chartering the charterer takes the operational control of the ship for a specific time, mainly hiring the ship for using it for his own interest. The hiring time period can last from some days, which is likely to be the same with a short term voyage charter, to months or years.

In time charter, the charterer manages the commercial operations of the vessel, in accordance with the terms agreed in the agreement (the charter party). The owner continues to pay the operating costs and crew. He is rewarded by freight, regularly agreed at a specific level on a daily basis, often paid a fortnight in advance. The ship owner's benefit is, mainly on long lasting time freight, that he will be ensured to have secure revenue for a fixed time period. In contrast to CoA, he doesn't have to find intermediate cargoes. Another benefit is that, especially in long lasting charter time to a big firm, the shipowner would be safer, for coping with a loan for the vessel.

As far as the charterer is concerned, he is given the opportunity to manage the ship for a time period. The charterer may run various businesses in many parts of the world and as a result of management of a ship may use the vessel to accomplish his contracts more sufficiently than by leasing on time charter or fixing on voyage freight some ships. He is ensured the price he pays to lease a vessel.

A charterer can wish to be a ship owner, or have the resources to purchase a vessel, but may think to manage a ship because of the business needs. A charterer or operator may lease a ship on a time charter basis as his expect that the market will rise in future. If his predictions and expectations realized, then by re-chartering the ship to other charterers, or taking in cargoes at higher rates, he will be more profited. The "NYPE" format is perhaps the mostly followed form for a time charterparty, either for a time charter-trip or for a certain time period freight. The main text changes and there are more clauses added so as to fit in the specific business.

Bareboat Charter

Bareboat freight is a time charter altering in the fact that the charterer runs vessel full management. Furthermore, so as to pay the hire of the vessel he also arranges the crew, preservation, insurance and all the necessary fees. Bareboat charters are chiefly used for serious time period. They are generally in closer relation to finance deals (mainly in accordance with the price of a new vessel) than to the freight market. It is very common, under this type of charter agreement, for a financial institution to have the actual ownership rights on the ship. So, the bareboat charterer uses a vessel as if he were the owner, but he does not combine capital in the ship. This means that, if the freight that a bareboat charterer foresees earning is not sufficient to cover the hire that he pays to the owner, the costs of crewing and vessel running, then he will neither lease the ship on a bareboat basis nor he will take a risk in making a loss.

Taking into consideration all the different market segments we could conclude that there is no "one-size-fits-all" model when it comes to determine the type of charter. Even in a specific trade of the same commodity, of the same tonnage and vessel characteristics the terms and provisions of contracts can vary significantly. Every charter party is established on a case by case basis according to participants'

needs. This is also a reason why a statement like “this type of charter is preferable in this market segment” can’t be made. However, while reading the annual financial reports of tanker companies, which mainly operate in the VLCC and Suezmax, it can be observed that large crude oil tankers incline to be fixed on a voyage charter basis. A number of specialized tankers are used on a time charter basis; however, some are still hired on voyage freight trade frame. Additionally, in reference to even more specialized trades, as the car carrier one, longer time lasting charters are regularly preferred.

Furthermore, a closer look to these reports could give us a better insight into the different portfolio of charter contracts of shipping companies, and especially those with remarkable fleet size. The impact of such a movement is to financially spread the risk by committing some ships on long-term time charters (bareboat in and out), some on shorter (time charters) while leaving some vessels to be fixed on the spot market (voyage and CoA) (Berg-Andreassen, 1998). The shipowners apply all available legal options on the basis that they believe will at any time maximize their revenue. In this process they will maximize return on investment, while taking carefully calculated risks. Of course their chartering portfolio is representative of their risk profile and illustrates how they perceive the market signs.

In this face it is beneficial to summarize the advantages and disadvantages of each type of charter arrangement, as well as the cost allocation according to obligations of each participant in these different types. To this end and after taking into consideration all the abovementioned these could be illustrated respectively in Tables 1 and 2.

Table 2. Summarizing the Advantages and Disadvantages of each Charter Type

Type of Charter	***Advantages***	***Disadvantages***
Voyage Charter	• Great flexibility • When the market is good can take the maximum • High degree of asset control	•Risky and vulnerable to losses because of the market volatility •Maximum forecasting problem
Time Charter	• Income for a guaranteed period of time • Kind of hedging risk against low market	•Limited flexibility •Partial loss of control •Fewer chances to get benefited from a good market
Contract of Affreightment	•Considerable flexibility •Guaranteed period of income •Considerable low market protection •High degree of asset control	•Some degree of restriction when it comes to achieve the maximum from the good market
Bareboat	•No operational worries •Secured income for a long period of time.	•Loss of control of asset as well as of flexibility •No chances for taking advantage of good markets

Source: Modified by author

Table 3.Type of Charter Arrangement

Type of Charter Arrangement		
Bareboat	Timecharter	Voyage Charter
Master appointed & directed by: Charterer	Master appointed by: owner Directed by: Charterer	Master appointed & directed by: Owner
Revenue depends on: Hire rate & duration	Revenue depends on: Hire rate & duration	Revenue depends on: Quantity of cargo &rate
Costs paid by owner: • Capital • Brokerage	Costs paid by owner: • Capital • Brokerage • Wages • Provisions • Maintenance • Reports • Stores & supplies • Lube oil • Water • Insurance • Overheads	Costs paid by owner: • Capital • Brokerage • Wages • Provisions • Maintenance • Reports • Stores & supplies • Lube oil • Water • Insurance • Overheads • Port charges • Stevedoring charges • Cleaning holds • Cargo claims • Light dues • Canal dues • Bunker fuel
Contract of Afreightment (CoA): Cost profile same as voyage charter		

Source: Clarkson Research Services

2.5 Shipping Finance Instruments

Although during this year encouraging signals in support of a continuation of a positive attitude towards equity and debt providers have been observed, shipping industry had to deal with capital scarcity for a long period of time (Stamford, 2014). It has already been mentioned that shipping operations are highly capital intensive. The total costs of operating a vessel are consisted by the operational costs (include labor, insurance, maintenance, bunkering costs etc.), which are considered to be 30 to 40% of the total, while the remaining proportion are costs of capital include dividends and interests (Stamford, 2014). Financing the capital needs is a crucial part of shipping and in many cases the capital structure of a company could be proved the key for competitiveness and an instrument to deal with risks (Drobetz, Gounopoulos et al, 2013). In past years, especially before the economic crisis of 2009, shipping was perceived as an entrepreneurial activity with good prospects and with respectively good return on investments (Grelck, 2009). As a result many institutional investors, equity providers, banks and other financial institutions were willing to get involved in this business (for instance, the remarkable success of KGs funds provided by individual investors). The most common ship finance instruments are the loans by banks, the closed-end funds and K/G, derivatives and capital markets (Syriopoulos, 2007).

In particular, banks were and continue to be the most common provider of funds in the shipping industry. From a bank's perspective shipping was used to be a good choice for lending significant amount of money to the companies' projects but nowadays in a situation of capital scarcity is not that attractive (Syriopoulos, 2007). The luck of trust among banks and investors as a result of market's poor financial performance have led banks to be less willing to provide loans (Harlaftis, 2004). So they are more critical to how they put their money in low return projects. For a loan provider the key elements which are taken into consideration are the credit standing of the owner, the quality of the vessel as well as the current position and the expectations of the market and of course their level of security (Albertijn, 2011). As for the level of security, banks in order to ensure their position usually set up a mortgage on the vessel. Another insurance element for the banks is the cash flow statement and less the profit or loss statement (Albertijn, 2011). Especially, when the cash flow derives from long-term contracts the level of banks' security is even higher which means higher possibility for loan providing. For the shipping companies this kind of funding is very attractive as the debt is cheaper than the equity but on the other hand is a considerable expense (interest rate) which should always be paid.

One alternative for the equity part are the K/G funds which for many years had been an important driver for capacity growth in the market (Drobetz, 2013). These funds are raised from private sources mainly from individuals who desired to invest their money on the shipping market. The term closed-ends funds, derives from the fact that these shares cannot be traded (Grelck, 2011). Thus, the participants put their

money on it, in the case where the investment is successful they receive a dividend, and after a pre-arranged period of time when the fund is finished they put them out. The main advantage of this kind of financing is that the shipping companies can operate with minimal equity.

Capital markets channel saving and investments between suppliers of capital such as retail investors and institutional investors to users of capital which in our case are the shipping companies (Mamidaki, 1995). They do this by selling financial products like equity and debt securities (Syriopoulos, 2007). Equity securities, also called stocks, are ownership shares in an organization. Debt securities, known as bonds, are placement of loans in the open market and are mainly used by big corporations such as China Cosco Holdings Ltd. For example, Euronav one of the most prominent players in the VLCC market issued bonds in February 2014 and the proceeds were used to partially finance the acquisition of 15 VLCCs from Maersk Tankers Singapore Pte Ltd (Euronav, 2014). Capital markets include primary and secondary markets. In primary markets new stocks and bond issues are directly allocated to institutions, businesses or individual investors. In secondary markets existing securities are traded in organized and often regulated markets like NYSE, TSX, AMEX, etc.. However, this alternative is not so popular among the shipping companies and comparatively only few of them have listed (although this number has an upward trend the last years). There are two reasons for that: (i) the shipping market is very volatile and as a result companies' financial results are also volatile while stock markets prefer stability, (ii) In shipping there are many small and medium size companies so they are not having the large scale to have a stock market listing. For those companies in order to be attractive for having a listing the solution of consolidation might be their only chance.

Financial securities are traded in one or two ways, either on an exchange such as the New York Stock Exchange (as has been mentioned) or over-the-counter (OTC). Exchanges are centralized and regulated markets where securities are traded in a safe, standardized and publicly transparent manner. Larger established companies usually choose exchanges to list and trade their securities but many other shipping companies do not meet the listing requirements for an exchange or do not want to pay the cost. These companies can have their securities traded OTC. OTC happens to decentralized dealer networks where broker dealer negotiate directly to each other. This system allows smaller companies stocks and no standard quantities to be traded which also mean less public transparency since prices are not disclosed publicly until after the trade is complete. Those stocks which traded on an exchange called listed stocks while those which traded OTC are called unlisted. However, it is also possible that some stocks are traded both on exchange and on OTC. These OTC trades tend to be for smaller companies' stocks and debt securities such as bonds. While OTC transactions often seen more risky and less liquid they help shipping companies promote equity or financial instruments that would not meet the requirements of regulated well established exchanges.

Subsequently the current situation could be described as follows: on the one hand the lack of trust of financial institutions for the shipping companies while from the other hand the need of shipowners to expand their businesses or to maintain their current market position. Thus, finding of alternative capital sources which is not so realistic at the present time or the deployment of the current limited capital in the most efficient way is urgently needed. Many claim that the only feasible solution for such efficiencies to be realized is the joint forces among the shipping companies.

2.6 Cooperation in this Sector

Given the capital scarcity which nowadays represents an important barrier for those operators who want to expand their business in contribution with the low performance in almost all the shipping segments, the option of cooperation among the shipping companies seems more recent than ever. Thus, one common strategic choice among the shipping companies in order to achieve higher performance levels and improve their efficiency is the formation of alliances. The purposes and the principles of such alliances may vary significantly; however, their forms have been identified and could be divided into three main categories according to the kind of accomplishments probably undertaken in each of them (Clarkson, 2015). Thus taking into account coefficients such as capital investment, joint marketing, chartering, cargo contracts, logistics and vessel productivity, operating cost efficiency, administration and training the types of alliances are the pool agreements, the space charter agreements and joint ventures (Heaver, 2000). In order to give an insight in these different forms of alliances, the Table III presents a range of activities which constitutes a common ground for cooperation.

Table 4. Key issues in building shipping alliances

	Joint Venture / Consortia	Pool agreements	Space Charter Arrangements
Capital Investment	Yes		
Marketing & Customer awareness	Yes	Yes	
Chartering Efficiency	Yes	Yes	Yes
Arranging Cargo Contracts	Yes	Yes	
Logistics &Vessel Productivity	Yes	Yes	Yes
Operating Cost Efficiency	Yes	Yes	Yes
Administrative Cost Efficiency	Yes	Yes	
Training	Yes		

Source: Clarkson Research Services

2.6.1 Joint venture agreements

In a typical joint venture of two or more (usually restricted number of participants) businesses agree to contribute capital and resources for a common project, or towards a specific goal. For example in the oil industry developers, drilling

companies and service providers could agree to form a joint venture to drill an oil well. If the oil well is successful those parties split the profit based on the value of their respective contributions to the joint venture. Most often, especially among sophisticated corporations the joint venture is governed by a joint venture agreement. The agreement delineates specifics how much each party will contribute and how the proceeds will be divided.

2.6.2 Pool agreements

The main cooperation mechanism between tramp shipowners is the so-called 'Pool' agreement. It should be mentioned that at present this type of cooperation is widespread among almost the entire tramp shipping segments including products and crude tanker business, the chemical tanker business, the LPG business and the dry bulk carrier business. According to a research which had currently been conducted by Clarkson Research Limited (2015) provide up to date information regarding recently established pools in different tramp sectors. For instance, a recently formed capsize bulker pool of over a hundred vessels, while in the tanker sector, at least 20% of VLCCs are understood to be in a pool, and almost a third of all long and mid-range product tankers (this includes all product tankers larger than 45,000 dwt in size). Areas of potential co-operation are shown in Table 2 and further analysis on this topic is provided in Chapter 3 of this thesis.

2.6.3 Space Charter Arrangements

This type of cooperation is popular mainly among the liner shipping companies because of its nature and for that reason it will be presented only as a concept and now in a descriptive way (Heaver, 2000). Liner firms operated freight pools, mainly in thin commerce, so that they divide their running expenditures. The establishment of consortia (which means division of management and running costs and revenue in all involved members) and alliances (allotment of ship running expenses) as shipping operators have to lower function costs and increase ship size to access scale. Nowadays the most widely known cooperation form, run on the basis of slot swapping between carriers (Midoro, 2000). Moreover, carriers sell slots to third parties, such as other competing liner companies which lack of sufficient capital and market support to expand their tonnage by acquiring vessels; as well as slots selling to container leasing companies is common practice as these companies are interested in relocating their containers in the most cost efficient way. Chartering slots are organized on long lasting inter-line contractual arrangements, with slot prices determined for a fixed period of time, while slot prices for spot arrangements are predetermined ad hoc (Slack, 2002). Transporters like to diminish slot sales to the amount they shall have a sufficient profit of the use. Space is very rarely subcontracted to cargo interests or does not appear at all.

2.7 Chapter Highlights

In this part the most important information as these were presented in this chapter are summarized. First of all, the tanker sector fulfills in full almost all the conditions of the perfectly competitive market model. To that extent there is no space for shipping companies to influence the freight rates (as these are exposed to the free play of market forces) and thus they are considered as "price takers". For that reason, the only way to obtain a comparative advantage against their competitors is to find the appropriate marketing tools in order to reduce their operational costs and achieve higher levels of their fleet utilization. This is becoming even more emerging, as this industry's operations are characterized by capital intensity, in a period were the capital scarcity is in fact a main peril for many companies. Among other alternatives for raising equity by external sources, listing in stock exchange markets is a common practice for those companies which meet the requirements (as we will see later on this will be proved to be very important for our research). Last but not least, the necessity of developing alliances and cooperative security concepts as purely survival mechanisms in depressed markets was realized by shipowners a long period of time ago but are becoming more recent when the circumstances present themselves.

Chapter 3. Pool Agreements

3.1 Background

At a time when shipping in general is suffering, it is no surprise that the fortunes of many of the industry's most prominent players have been haemorrhaging while at the same time appropriate judgements (comprehensive review of the challenges), forward looking approach and a combination of abilities and luck (which is an active determining factor for the economic success) were some of the key factors for companies to maintain their competitiveness.

Nowadays, deep sea shipping still runs a period of enormous challenge and uncertainty. Market saturation in the liner and tanker sectors in combination with the marginal charter rates exacerbated by significant operating costs all contribute to this puzzling aspect of the market. Fleet optimization is a key factor for insulating ship owners' bottom line against external pressures (Christiansen, 2004). Among other alternative strategies this conundrum, however, can be resolved with more and better collaboration, and more and better cooperation on the basis of shared procedures of different operators and basic harmonisation of legal standards. The main objective of this research is to give a better insight into the pressing industry challenges, the emerging trends as well as potential future opportunities in the tanker sector. Additionally, the current and the upcoming regulations are going to be presented and examined to the extent they affect the market.

Thus, under these challenging market conditions it is vital for ship owners to use all available efficiencies. Shipping pools complied with the competition law can offer a chance to ship owners to get profit of those efficiencies. Pools can be viewed as an effective strategy of co-operation among ship owners who share same interests and prospective (Packard, 1995). It is also a way of obtaining efficiencies without creating restrictions on trade while all members have the opportunity to preserve their own independence.

3.2 Definitions

According to Antapases (2009), the legal basis for a shipping pool or a pool agreement is defined in the following way: "*An agreement between a number of persons who have the right (because they are bareboat or time charterers, so disponent owners) to exploit the earning capacity of similar ships to co-operate in the Commercial Management and Commercial Operation of (typically) all such ships controlled by them (whilst each retaining any responsibility which they may have for Technical Operation). Various legal structures may be adopted, including the establishment of a full-function joint venture "Pool Manager" to whom ships may be time chartered, but the most important characteristic is agreement on a formula (a "distribution key") pursuant to which each ship shall earn from the Pool a share theoretical earning capacity, not its actual earnings in the Pool (save insofar as there is provision for any adjustment, e.g. by the way of offhire, in respect of the operational risks retained by the "owners") . The Pool Manager becomes a ship operator or disponent owner and has the right to exploit the earning capacity of the vessel(s). No standard form documents in popular use. No national regulation of detailed terms".*

Similarly, William Packard (1995) in his book "Shipping Pools" gave the following definition: *"A merchant shipping pool is a collection of similar vessel types under various ownerships placed under the care of an administration. This administration markets the vessels as a single, cohesive fleet unit and collects-'pools'-their earnings which, in due course, are distributed to individual owners under a pre-arranged 'weighting' system, by which each entered vessel should receive its fair share."*

It is very interesting to present a definition of shipping pools to illustrate how this concept is viewed by Overseas Shipholding Group Inc. (OSG), which is one of the prominent tanker companies in the world nowadays and participant in a number of pools. According to OSG (2015), the shipping pool is defined as: *"A commercial pool is a group of similar size and quality vessels with different shipowners that are placed under one administration or manager. Pools allow for scheduling and other operating efficiencies such as multi-legged charters and Contracts of Affreightment and other operating efficiencies."*

Taking into consideration these definitions, both the more frequently reported in shipping pools characteristics and the main objectives (which lie in the shipowners' decision to enter a commercial shipping pool) could be deduced and summarized as follows (Haralambides, 1996):

Commercial pool characteristics: (i) vessels of similar quality, type and in some cases even of similar age are placed in the same pool, (ii) these vessels belong to different shipowners, (iii) weighting system which ensures the fair share and distribution of revenues (derived from the collection of freight rates) according to the performance of each vessel in a given period of time, (iv) joint marketing.

Shipowners' objectives: (i) better position in negotiations of freight rates, (ii) centralization of voyage costs, (iii) attract Contracts of Affreightment (CoA) which otherwise would not be accessed if shipowners operated individually, (iv) benefit from the advantages of a large scale operation, (v) management of vessels under a

central administration with the capability (experience and know-how) for achieving better results

3.3 Main Administration 'Forms' of Shipping Pools

In order to explain the nature of the shipping pool systems, although there is great variety of models, the most popular pool system structures will be introduced in this part of the paper. In these standard shipping pool systems carriers get together, they set up an administration under which they put some of their vessels which are subsequently operated and run as a single, cohesive entity under this administration (Packard, 1995).

According to William Packard (page 4) two basic 'forms' of pool's administrations can be identified, and these are the "member controlled" and "administration controlled" pools. Regarding the former type of administration structure is usually formed by a small number of main partners (either one or two) who aim at jointly undertaking existing large CoAs (Haralambides, 1996). In this case, there is a dominant partner who has a long-term contractual relationship with the cargo owners. The selection of smaller partner(s) is made under his careful scrutiny. This pool agreement is very attractive not only for the smaller partners – as they are offered the chance to participate in already established contracts and simultaneously expand their network by interacting with prominent players - but also for the main partner(s), as they can secure tonnage for the handling of the existing contracts. Correspondingly, they avoid potential risks of purchasing additional tonnage for their needs.

As for the latter 'form', although the existence of a prominent partner is also possible it is not the case (Haralambides, 1996). The key characteristic of this 'form' is that the administration of pool's operations is mainly provided by an independent pool management company (Packard, 1995). Under this model, the pools are run by executives and commercial operators who act as agents and they don't have ownership stake. For instance, Heidmar Inc. which is one of the world's most notable commercial tanker operators has been established pools and provides services in the transportation of crude oil and petroleum products. The pools follow the main principles of the shipping pool system as they are categorized according to vessels' size. With more than 20 different partners and a fleet of almost 95 vessels (without having ownership rights on them), Heidmar runs 6 pools: the Seawolf Tankers for VLCCs, the Blue Fin Tankers for Suezmax, the Sigma Tankers for Aframax/LR2, the Star Tankers for Panamax/LR1, the Dorando Tankers Pool for MR, and Marlin Tankers for Handy. Under this form of administration the strategy of pool is different from the previous one in a sense that many shipowners bring their vessels together in order to obtain the necessary scale for attracting contracts as otherwise they wouldn't be sufficiently 'strong' to indicate their ability to support such contracts.

One important issue, which emerges while a pool is designed, concerns the identification of the responsibilities and how these are divided among the members of the pool and the pool management team (Haralambides, 1996). Although the distribution of functions between the participants does depend on the pool's administration 'form', in this study the presented information derive from the most

common administration 'form' in the tanker sector which has been previously described as "administration controlled" pools. Accordingly, the pool's management (or pool's administrator) is responsible for the commercial management of the vessels while some of their core activities are the negotiation of freight rates with prospective customers, aims to strengthening pool's marketing position and centralizing revenues and voyage costs (Haralambides, 1996). Moreover, they should undertake the commercial operations, for example assessing and scheduling the most efficient route planning of each vessel, keep customers properly informed, nominating agents in ports, collect and distribute vessels' earnings based on the weighting point system agreed on in advance (Packard, 1995).

The contribution of the pool manager's activities in order to reach a level of integration is necessary so as to realize the benefits of co-operation that can influence the performance of the whole system. A key factor for achieving this target is the necessity of having functional independence and maintaining responsibility for providing integrated services. Another critical factor for the efficient management of the pool is to establish a management team commensurate with the pool size (Packard, 1995). In general the main issues that a shipping pool's management has to tackle with efficiency are not limited to the chartering responsibilities as they are also responsible for operational and port captaincy tasks, for marketing and publicity (Packard, 1995). As we can infer the role of pool managers is fundamental for the shipping pool's proper functioning and the accomplishment of all these tasks in the most efficient way is the most challenging target. Usually, there is a general executive committee acting on behalf of the carriers-members and is responsible to supervise pool manager's decisions and initiatives.

As for the technical operations of vessels, the members who have put their vessels in the pool are responsible for providing the ships in operational readiness (Haralambides, 1996). Thus, the ship owners are responsible for maintenance, for manning and financing all aspects of operations including repairs and dry-dockings, maintaining required vetting approvals and relevant inspections, and to ensure that their fleet complies with the requirements of classification societies as well as relevant governments, flag states, environmental and other regulations.

The main aim of the function of pools should be the generation of benefits and efficiencies for all the participants which is one of the tricky parts of this system. How these benefits are usually allocated among the pool members is an issue which is introduced in depth in the next sub-clause. However, efficiencies should be enjoyed not only by the ship owners-members but also by their customers (OJ 115, 2008). Especially in case when the market share of the pool members is significant, this market power should not be abused. Instead, the principle that should be applied must be: *"the bigger this power is, the greater the customer benefits must be"*. This mutual sharing of benefits will act as a disincentive for shippers to initiate proceedings against the co-operation system, accuse it on the ground of misuse of power. From Competition law point of view, abuse of market power is considered as something reprehensive and if such a case is proved can entail (trigger) penalties to the involved parties. Some of the most important provisions of the EU competition law are presented later on in that chapter.

3.4 Weighting System and Distribution Formula

The establishment of a weighting system with the potential to meet pool-members expectations for fair sharing of benefits arising out of their participation in that organization is a cornerstone element which ensures the long-term success of this concept. However, it has been proved that every pool has each own way of arriving at an equitable weighting system (OSG, 2014). In any case this part is very challenging and tricky from pool management perspective as the issue of fair distribution of income accumulating in the shipping pools accounts is central to the concerns of its members. Consequently, measurement and testing reliable standards and calculating methods for income distribution are essential to the functioning of the shipping pools (Packard, 1995).

First of all, it should be very beneficial to identify the main sources of pools income. The majority of pool managers operate their fleet in the freight market either under single-voyage charters (and consecutive voyage charters) or under CoAs. Claims, demurrages as well as hire from ships that have chartered-out could potentially be some other sources of pools' revenue. The "portfolio" of different charter types, whose return is closely linked with the total gross revenues, is aligned with the participants or Management Company's risk-profile. The majority of pools been investigated under the scope of this research operate in the spot market and although this might be risky, the pool management usually consists of highly experienced managers. Having the adequate market expertise, their attention is turning to maximize the utilization of the fleet through, for instance, triangulation of voyages between specific trading routes or geographically spreading of pooled ships.

It goes without saying that by achieving higher levels of fleet utilization, enhancement on income could by realized which then will be distributed among the members (Packard, 1995). The distribution process of income within the pool members takes place only after deducting the operating expenses such as bunkers, administration fees and brokerage, agency fees etc. In case where the pool management is conducted by commercial operators, management fees are also expenses that have to be deducted from the net income. These management fees can be either a standard amount or a commission fee on net pool income. The selection of management fees payment policy, as well as the frequency of the payments is mainly determined from the very beginning of pool establishment and all the participants are well aware of that.

Pools tend to be created around a particular trade or type of vessel (Packard, 1995). Conversely, the existence of vessels with remarkable cargo-carrying capacity differences as well as technical characteristics differences such as speed and consumption are not unusual among the pool fleet. These differences must be reflected in any weighting system. Commercial attractiveness of each ship must be evaluated and quantified as accurately as possible by the established weighing system. Thus, for the assessment of each pool vessel's income generating potential weights or points should be introduced, according to which the vessel's share will be determined (Haralambides, 1996). However, even in the simplest case where a pool's fleet consists of vessels identical in all respects problems emerge (as will be discussed in the following paragraph).

There are different ways of arriving at an equitable weighting assessment for each of a pooled fleet of ships (Packard, 1995). Over a reasonable period of time, for instance, the actual net daily vessels' returns could be viewed as a useful indicator. For vessels operating in commercial pools, revenues and voyage expenses are pooled and the resulting net pool revenues, calculated on a time charter equivalent basis, are allocated to the pool participants according to an agreed formula. Formula used to allocate net pool revenues to participants is on the basis of the number of days a vessel operates in the pool with weighting adjustments made to reflect differing capacities and performance capabilities.

However, many concerns arise about this as it is believed that the distribution should mainly be linked to the vessels' earning potential rather than to the actual earnings (Haralambides, 1996). This belief is based on the fact that pool management's main objective is to utilize their fleet in such a way as to achieve the maximum pool income. In order to accomplish high levels of performance, meaning higher utilization of the fleet i.e. by minimizing the ballast legs (always taking into consideration that the vessels are operated in the tramp sector), some of pool's vessels may contribute more in the net freight income than others in a specific period of time. More specifically, when the on-hire period of vessel "A" in the pool was comparatively greater of the respective on-hire period of vessel "B" over the same period of time because the manager wanted to make use of arisen opportunities which resulted in the better fleet deployment, this should not indicates that the vessel "A" must be awarded with her actual earnings contribution. That's because the pool manager for achieving his goal preferred to differentiate the utilization levels of individual ships and some partners maybe don't view such a practice very favorably. On the other hand, in such a case if an equally distribution of income takes place, it couldn't be characterized as fair too. For that reason, the pool management should avoid or limit such imbalances which may lead to major conflicts.

Another possible way of arriving at a fair weighting system could be by conducting a series of typical voyage estimates and then using the results to evaluate the advantages and disadvantages of one vessel against another. However, this also means that weighting vessels assessment can generate many conflicts among the members and this is a reason why is not considered as an attractive option (Packard, 1995). Therefore, it is believed that the only equitable means of arriving at a fair and balanced weighting factor is by comparing each pooled vessel with a standard design vessel. This is a commonly used method among the pool management companies as a weighting system and is known as "reference model" assessment. Based on this technique, a set of design features, trading features and operational features is established respectively, in comparison with which each pooled vessel will be assessed for identifying if there is positive or adverse relation. So, an "ideal" vessel in terms of performance is set, for the purposes of a specific trade (in accordance with the market that the shipping pool operates), which acts as a benchmark and every pool vessel is compared with that.

The set of design features, which was previously mentioned, involves elements such as length overall, deadweight, draught etc. The set of trading features includes special cargo-carrying facilities a ship might have while elements such as the age of the vessel, the vessel's flag etc are categorized as operational features (Packard, 1995). The most positive relation a pooled vessel has with the "reference ship" the more pool points will score (or higher weighting assessment) and vice versa.

Thus, taking everything into consideration the best way of establishing a fair distribution system is a combination of all the abovementioned practices. More specifically, a “reference ship” should be set by the pool management according to which the weighting assessment of each vessel has to be made. This illustrates the earning potentials of each vessel. Then the distribution should be adjusted to the actual contribution of each vessel to pool’s revenue. This can be conducted by taking into account the on-hire days, bunker consumption and other trading factors. For instance, assuming that a pool consists of five vessels, after the allocation of pool points, the weighting factor is estimated in Table 3.

Table 5. Example of Weighting Factor Estimation

Vessel	*Pool Points/Weighting Assessment*	*Weighting Factor*
A	92	18.63%
B	95	19.27%
C	107	21.66%
D	101	20.44%
E	99	20.00%
Total	**494**	**100%**

Source: Modified by the author

Once the pool points have been allocated to each pooled vessel, and the net pool income (gross income minus pool operating expenses and management fees) has been assessed, this income has to be subjected to adjustments before its distribution. For example one factor that should be taken into account id the on-hire days of each vessel. As we discussed earlier the pool management make efforts to eliminate such imbalances among pooled vessels although sometimes appear that their efforts are reaching their intended effect. For that reason, on-hire days, bunker prices and consumption as well as other trading factors have to be included in the calculations before the distribution of the final amounts. An example of this is presented in the Table 3, however, for simplification reasons only the *‘Days in Operation’* factor was taken into consideration.

Table 6.Example of Adjusted Distribution

Vessel	*Theoretical Distribution*	*Weighting Factor*	*On-hire days*	*Weighting factor x On-hire days*	*Adjusted Distribution*
A	186,300.00	18.63%	25	465.75	179,815.84
B	192,700.00	19.27%	29	558.83	215,751.98
C	216,600.00	21.66%	21	454.86	175,611.45
D	204,400.00	20.44%	27	551.88	213,068.74
E	200,000.00	20.00%	29	558.83	215,751.98
Total	**1,000,000.00**	**100%**	**131**	**2590.15**	**1,000,000.00**

Source: Modified by author

After determining the factors and the weighting system, pool managers are obliged to review in prescheduled periods the voyage results as well as the vessel performances in order to make sure that the allocated points is a fair reflection of vessels' relative earning capacity. This reviewing process is of paramount importance and has to occur on a regular basis, because changes in bunker costs, introduction of new regulations, changes of trading patterns can potentially create great imbalances if they haven't been monitored. However, we should keep in mind that each vessel performance is mainly affected by the chartering philosophy of the respective chartering groups under which the vessels were operating.

In conclusion, all pools will be featured their particular traits depending on commercial acting and/or the type and mix of tonnage. In that case it should be hard to depict a unique and integrated weighting (and distribution) system as every pool uses the one which best fits to its operations. Nevertheless, it is possible to indicate a number of important coefficients in order to be taken into account by the relating pool managements. The founded formula in all aspects is or at least should be indicated in the greatest precision of every ship operation during the pre-defined time term. As a consequence, at first every participator has to accord with all operation indices together with exterior agents or coefficients with a not straightforward influence on functioning. Once coefficients and weighting method are agreed, pool administrators are compelled so as to ensure that distributed points are a fair mirroring of ship's relevant gaining ability. The revising method mentioned in here is notably noteworthy and must often take place, as i.e. volatility in bunker prices, application of new directives (or regulations), differentiation in trading patterns are likely to cause considerable instability in case they are not inspected.

3.5. Tramp Shipping Pools under EU Competition Law

Competition law is complex and varies between jurisdictions. Whether a pool is compatible with local legislation will depend on a range of factors including market share (concentration), market structure and turnover together with other regulatory provisions in the country of destination and origin. In this study particular emphasis is given to EU competition law as especially during the last decade European Commission has shown particular interest in any incident of market consolidation which can potentially generate imbalances between the participants. More specifically, in September 2006, the Council agree to abolish the exemption from the Treaty's ban on restrictive business practices (Article 81) which profited price fixing liner shipping conferences on routes to and from the EU and to follow the identical ritual rules to cabotage and tramp shipping services (the non-regular, maritime transport of bulk cargo that is not containerised). This marks the start of a new competitive regime in the maritime sector.

The most widespread co-operation agreements between tramp shipping operators, so-called pool agreements, have been the object of many arising concerns during that period. These concerns regard whether the existing tanker pools are problematic for competition. Given the variation in pools' characteristics in the diverse tramp shipping markets, no general statement can be made whether pools are in conformity with the EU competition rules. Since there is not such a universal

model which could describe all the existing pool agreements, each and every pool should be examined on a case-by-case basis in accordance with the respective Commission Guidelines. However, there are some common features that are found in the majority of this type of agreements. Thus, at this point it is very important to highlight these most common features regarding the nature of pool agreements which they do have a great interest from a competition law perspective. For instance, some of the key features of the "most-common" pool model are the joint selling as well as the joint production. Given that both joint selling and joint production are variances of a joint commercialization which potentially could be considered as horizontal cooperation agreement, and the Guidelines on the applicability of Art. 101 (and former 81) of the Treaty are therefore relevant. Additionally, the existence or not of clauses either these are no-compete clauses or exit clauses which can potentially have impacts on the pools or its participants competitive behavior in the market have to be taken into consideration. The former clauses may determine the activity of the pool members in the same market outside the pool system while the latter clauses are regulating lock-in periods and notice periods. Finally, clauses related to commercially sensitive information exchange could also be viewed with skepticism under the competition law rules.

3.5.1 Application of Articles 101(1), (3) and 102 TFEU

Before proceeding further in the assessment of pool agreements under the Article 101(1), (3) and 102 of the TFEU, it is very practical for the deeper understanding of these issues examined, to present the Articles which will be used in our analysis later on. In particular, according to Article 101 of the Treaty (former Article 81) cases where the agreements among independent operators result in limitation of the market competition are prohibited. This provision is valid for both horizontal agreements (i.e. pool agreements and joint venture agreements between shipping companies) and vertical agreements (these take place among operators at different levels of the supply chain, i.e. cooperation agreements between the drilling company and the independent carrier). The most fragrant violation of Article 101 is the setting-up of a cartel among two or more competitors, under which they can arrange prices and market sharing or sources of supply (OJ 115, 2008). This is one of the reasons why liner conferences were finally shut down.

The liner shipping conference system was not the only one case which subjected to the scrutiny of EU competition law. All agreements among competitors leading to the fixing of prices necessitate cautious reflection under the competition rules. Price based agreements or ones which share markets between competitors are severe limitations of competition obviously banned by Article 101(1) of the TFEU. They ordinarily impact to upper prices without producing proportional value to consumers. Nevertheless, these agreements may be attuned with EU competition law if there are countervailing competences satisfying all four accumulative conditions registered in Article 101(3) TFEU (OJ 115, 2008).

The first condition for exemption under Article 101(3) TFEU (ex-Article 81(3) TEC) is that shipping pool agreements improve the production of goods and produce

efficiency gains. The second condition for exemption under the same article was that the shippers (customers) have to be compensated for the negative effects as these have been identified to be direct linked to the restrictive competition. That means, fair sharing of benefits to consumers. According to the third condition for exemption, it must be proved that there is no alternative and less restrictive way to obtain these efficiencies. Finally, the last condition that the pool should comply with in order to satisfy the Article 101(3) is the avoidance of practices which eliminate the competition and this is linked with the market share and the number of participants of each pool (OJ, 2006).

Regarding the Article 102 of the Treaty (former Article 82), no direct or indirect abuse of market power by companies with dominant market position is allowed (OJ 115, 2008). Practices such as limitation of production; unfair price charging; application of dissimilar conditions to equivalent transactions with other trading parties and generally any practice which affects trade between Member States are not compatible with this Article (OJ115, 2008). Those found guilty of implementing such practices which resulted in violation of the EU antitrust rules, they have to cope with penalties and monetary fines imposed by the Commission. The Commission is entitled by the Treaty to apply these competition rules and has the right to make use of its investigative powers for limiting the likelihood of such unfortunate practices to take place.

3.5.2 Fines Assessment in Case of Violations

Pool system was considered as the tramp equivalent of the liner shipping's consortia and since that time (September 2006), they had not attracted the attention of the various authorities which should have supervise the activities of the involved members and ensure compliance with the implementing competition rules. Unlike the liner trades, tramp trades are harder to police. A simplistic explanation why this happens is the fact that liners run to set trades and schedule while the tramp services can be compared to the taxi services where the ship goes where the charterer indicates (this of course depends on the nature of the contract between the ship owner and the charterer) (Lloyd's, 2001). Many identify this as a key issue to pooling system success.

Pool agreement is an expression which illustrates the operational cooperation agreements among tramp operators, and is the most popular form of horizontal cooperation in this sector (EC, 2008). The horizontal nature of this kind of cooperation is based on the fact that these agreements are set by actual or potential competitors. As such, these agreements should be assessed under the European Union (EU) competition rules on horizontal co-operation agreements. Subsequently, the participants of these agreements should determine whether their cooperation agreement comply with the competition rules or not.

Given the high degree of differentiation of pool agreements' structure, they have to be analyzed on a case-by-case basis which is something complex and there is always the likelihood of confusion. A step in this direction was the designation of the Guidelines on horizontal cooperation agreements provided by the European

Commission (Official Journal C 11 of 14.1.2011]). These guidelines offer a framework assessment of cooperation agreements under the Art. 101(1) and 101(3) of the Treaty on the Functioning of the European Union (TFEU).

Objectives

The Commission's efforts are directed towards the creation of fairer market conditions that would benefit everyone involved. Its main focus lies primarily on preventing unfortunate circumstances and violations of market rules and this is the reason why extensive guidance is provided to make it easier for the companies to carry out the provisions of the EU competition law. Subsequently, we can infer that Commission's responsibilities go further than just imposing fines and punishing companies for committing infringements. However the existence and application in practice of penalties (in this case with the form of fines) proportionate to the gravity of infringements can in fact deter from further infringements of the same type. Now the issue that arises regarding the fines is actually how the gravity of infringement can be identified so as the fines to be assessed.

Principles and Fines Assessment

Before defining how the fines are imposed, we should identify under which principals the Commission fining policy is assessed. The main principal is that there are infringements more harmful for the economy than others and the fines should be assessed in a case-by-case basis. According to European Commission, fining policy relies on the value that breaches resulting in a high value of sales are considered more harmful than those breaches resulting in low value sales as long lasting infractions cause more damage than short-lived ones. Thus, we can infer that in penalty strategy there are high importance factors such as the extent of economy harming violations, the impact on high or low rate sales and last but not least breaches duration.

In this content, the starting point for the determination of fine's normal value in respect to the seriousness of the infringement is the percentage of the value of relevant sales multiplied by the number of years and months this breach lasted. However, there are a number of cases where exemptions may be granted. For instance, companies are likely to receive a special treatment if they voluntarily contribute to Commission's investigations to detect market violations in which they were involved by providing efficient evidence. They could even succeed total immunity from any charges and fines.

In general, company's found to abuse a dominant position can be fined up to 10% of their overall annual turnover. For all these aspects the owners participating in pools should be very aware of their arrangements and take legal advice so that they will not be presented with a fait accompli. In many cases the value of the imposed fine can endanger company's economic viability. In very specific cases for instance when the undertaking is not in a position to fulfill its payment obligation, exceptions could be made. In that particular circumstance, there is the flexibility of reducing the fine but first should be proved that the company's economic viability is under threat by this. For that purpose the company has to provide the Commission with realistic assumptions and valid evidences constituting proof of company's economic weakness to meet its fixed and operational costs. In the table below, a summary about the key features of fines assessment is presented.

Table 7: Fine Assessment Summary

Basic fine	Percentage of value of relevant sales (0-30%) x Duration (years or periods less than one year) + 15-25% of value of relevant sales: additional deterrence for cartels
Increased by	**Aggravating factors** e.g. ring leader, repeat offender or obstructing investigation
Decreased by	**Mitigating factors** e.g. limited role or conduct encouraged by legislation
Subject to overall cap	10% of turnover (per infringement)
Possibly further decreased by	**Leniency:** 100% for first applicant, Up to 50% for next, 20-30% for third and up to 20% for others
	Settlement: 10%
	Inability to pay reduction

Source: European Commission, Fines for breaking EU Competition Law. Available at: http://ec.europa.eu/competition/cartels/overview/factsheet_fines_en.pdf

The key issue: There are various structures including tonnage sharing and revenue sharing, cross charters and vessel sharing. It is therefore difficult to draw general conclusions about how pools operate and whether each one may or may not comply with EU rules.

To conclude, the reason why pools could be vulnerable is that they can be regarded as horizontal agreements between competitors that could potentially influence the market and impose barriers to entry. So, one of the emerging issues at that moment, was whether they will need to undertake any significant changes to the way they are structured on conducting their business.

After taking into consideration the main characteristics of the tanker sector, as these have been described in the chapter 2, and in conjunction with the main purposes and nature of the pool agreements as well as the main provisions of EU competition law and Articles 101 and 102 TFEU, it can be inferred that the shipping pools in the tramp sector do not per se violate the EU competition law. This conclusion is mainly based on the fact that the largest tanker pool has a market share of approximately 10% (more specifically the case of VLCC Chartering Ltd. It is a joint 50/50 venture between Tankers International ("TI"), which is one of the most prominent pools in the sector and Frontline Ltd., which is another big player in this market, operates 67 ships our of a global VLCC fleet of 629 units). It is generally accepted that the degree of market concentration can be an indicator of potential market violations. Furthermore, as it has already been stated that the tanker shipping sector is highly fragmented and competitive, and as a result it is not very likely that the market can be influenced by shipping pools of that market share. Shipping pools could not concern as "price-fixing" mechanisms but rather joint production agreements aimed

at meeting customers' needs. Additionally, it is believed that the shipping pools can potentially viewed as protection for the small shipowners who want to enter (or to stay) into the market and for that reason they cannot be accused as mechanisms of excluding market entrants. Another aspect which is of paramount importance is the statement from European Commission staff that till now there is no some serious incident or complain regarding the function of tramp shipping pools.

3.6 Discussion of controversy

The concept of shipping pools has both advocates and critics. As it has already been mentioned, there are many cases of pools which never proved to be as successful as they were supposed to. However, several other pools achieved their goals and found to be consistent with the objective nature of the results sought. In this chapter of the study, we will provide some of the main advantages and disadvantages of being a member of a pool.

Arguments in favor

According to managers of successful pools, a company can realize improvement in her cashflow by committing the vessel(s) to a pool. Additionally, there are many cases where the pool system has acted as a countermeasure during volatile market conditions and ensured the revenue stability to its members. Thus, income instability and volatility can be tackled more efficiently by pooling tonnage than by operating individually a small fleet size. This can be achieved by gathering together a fleet size with certain capacity in order to create a portfolio of different charter contract types which will be aligned with pool's profile. As it has been noted by Mr. Haralambides: *"(…) income stabilization will be mainly the result of a careful "mix" of contracts of affreighhtment, spot, medium and long-term charters (…)."(p.225).* All abovementioned can be realized on the basis of the principle that the pool's operations are governed by a transparent accounting system.

It is also believed that the members can be benefitted from the volume discount of pool's negotiations. Consequently and apart from the revenue sharing aspect, the benefits on the cost side can be significant and should therefore not be neglected. These benefits can be realized by managers or larger ship owners with the increased buying power economies of scale. By negotiating, the pools can obtain more favorable terms for bunkers, agency fees, towage and pilotage expenses (Lloyd's, 2001). Another advantage according to the same source is the consolidation of the customers of carriers operating in the tanker market. In the last decades, there have been mergers of the world's largest oil companies, such as mergers of BP, Amoco and Arco; Exxon and Mobil etc. Thus, pooling resources and consolidation of shipowners seems to be a sensible solution for balancing the market power and improving their competitive position on the market over the shippers.

Another argument in favor of shipping pools is the direct results and the economies of scope that may be obtained by the enhancement of scheduling performance when a large pool is created. Pools under efficient management are able to enhance

vessel earnings by improving utilization (increased proportion of laden days versus ballast days) through the use of the combination voyages. Specifically, the result of a better scheduling is derived from the fact that the waiting days are reduced per ship per voyage and ballast legs (cargo-empty trips) can be minimized. As we can infer the pool system can potentially generate better time charter equivalent rates and better net result per ship comparing to the respective results attained in the market. All these contribute to the increase of vessels' actual performance. In addition, being part of a pool allows a wider international coverage and this enables the firm to attract and serve a greater range of customers. Thus, both the access to more customers and the more efficient scheduling contribute to higher laden versus ballast ratio for the vessels. The reducing need to finance the ballast legs is also very beneficial from charterer's perspective (Tankers International, 2015).

Another advantage of pooling system mainly from the owners' perspective is the fact that unlike the liner trades the tramp trades (and in our case the tanker trade) are more difficult to be supervised by the EU and US commissions. Thus, one benefit that can be obtained by the owners and their participation in a pool is the sharing of knowledge with their potential competitors. For instance, the pooling system can be proved as a strategy which offers protection to those who are making their first steps in a specific shipping market.

Last but not least, as far as entry barriers are concerned, the market volatility itself can act as such. As it was mentioned previously the barriers to entry in the tramp shipping are not as significant as in other sectors. However, it is believed that the participation of a new comer operator to a shipping pool minimize his exposure to risk related to the market. This could be achieved as the pool can offer to its members a long term time charter considered to be a stable source of revenue.

Arguments against

On the other hand there are many arguments against vessel pooling system, concerns which arise either by independent shipowners or charterers and cargo owners. The main argument from both charterers and governmental bodies/authorities responsible of ensuring the principles of the competition law, is on the basis of the general belief that markets which display a high degree of concentration of the industry, impeding the development of effective competition. For instance, the case of Tankers International back to 2000 created many concerns in the tanker market since this pool controlled slightly less than 35% of the double hull VLCC fleet. It goes without saying that in such consolidation of market share, the bargaining position of this pool was greatly strengthened and this could easily be used in favor of the pool members as the commercial manager was in the position to exercise influence over the freight rates. Thus, possible issues with regulatory agencies may arise which is something that shipowners should definitely take into consideration before joining a shipping pool.

Many analysts until now have expressed their doubts about pools' cohesion in a good market. The life cycle of each vessel is determined from its day of delivery, and being aware of that, owners want to seize the opportunity offered by the good market conditions (high freight rates in the spot market) to greatly improve their profits as long as it is possible. Although there may be some truth in that, there are some convincing examples that prove the opposite. For instance, the Tankers

International VLCC pool evolved during one of the best periods of the market (from the freight rates perspective) that have ever been realized. In addition to that, many observers express a critical view over the potentials of the pools to succeed. Their argument is based on the fact that the owners are subjected to a restriction on their rights to deduct commercial control, which is something not in line with their attitude and temperament. In addition, that type of shipping pool structure where the management is carried out by third parties could raise questions about the devotion and reliability of those independent commercial operators.

Furthermore, as a result of the nature of this market, which makes even more difficult for the authorities to exercise a monitoring function, many concerns have arisen regarding the sharing of confidentially and commercially sensitive information among the pool members. According to the same sources, this information exchange can act as a domino effect in many sub-segments and sub-markets as the majority of prominent shipowners usually operate in more than one market.

3.7 Chapter Highlights

The most popular horizontal cooperation agreement between tanker shipping companies is the shipping pool agreements. However, the members of such agreements have to deal with many challenges which are linked to some pools' specific functions such as the establishment of a fair weighting and distribution system and the necessity to ensure that all of the pool practices comply with various jurisdictions and competition law. It is generally believed that companies participating in such agreements enjoy a number of benefits. However, the existence of persuasive arguments on the contrary generates a great debate (both arguments were presented in this Chapter). That debate was the main trigger and inspiration for the conduction of this study. Thus, our attempts are heading in the direction of providing enough evidence to support whether pool agreements contribute in financial performance of companies significantly.

Chapter 4. Model Specification and Data Selection

4.1 Introduction

In this section, we present the procedure of building the model, from the identification of the dependent variable and the data collection to the selection of the statistical software (in order to estimate our model) and the presentation of outputs. Furthermore, we define under which criteria the selection of companies held in order to be included in our sample. In the last sub-section of this chapter we cite the results from the estimation of the model for each company separately. The main conclusions of this study are quoted in the next Chapter.

4.2 Building the Model

First of all, the main challenge was to identify the key performance indicator which is going to be used in our model as dependent variable. By the expression "key performance indicator" we mean a factor by reference to which the development, performance or position of the business of the company can be measured effectively.

The companies of our sample are publically traded companies (as they are listed) and are required to use a set of official rules, standards and procedures in preparing their financial statements-known as Generally Accepted Accounting Principles (GAAP). GAAP standards dictate how companies record and report their financial data and are used to ensure consistency and accuracy in accounting practices. GAAP principles are supposed to give investors confidence and the accuracy of companies' financial statements and help investors accurately compare one company's financial statements to another especially when those companies are in the same industry. In addition, many companies report non-GAAP earning measures such as operating earnings, EBITDA etc. However, despite GAAP's (and non-GAAP's) good intensions, companies often have discretion to use varying methods for valuating assets and recognizing costs and revenue. This means that there is still room for companies to fetch the numbers. For that reason and in order to avoid the use of static statements which can be potentially calculated in different ways and could lead us to misleading conclusions, the final decision was to choose a more dynamic feature. This on one hand is a good indicator of the companies' financial performance and on the other hand its values are determined from market forces.

Weighting the abovementioned, stock prices were finally preferred, among other features, because is a common method of valuating the company as well as an indicator about the health of the company. For instance, increased profits will drive the stock price up; the exact opposite result will be fact whether the company realizes an excessive debt. One of the advantages of using this feature as dependent variable is the availability of information from notable financial resources and the easily accessible data. Likewise, because of the dynamic nature of this

measure, stock prices reflect the actual variations in the market on a daily basis and they are mirroring not only the past and the current position of each company but also their future potentials. However, there are also some drawbacks by using this indicator. One is the fact that the stock prices of the companies in the same industry have the tendency to move in tandem with each other because the market conditions generally affect the companies in the same industry the same way. Another disadvantage related to this choice, is that no small tanker companies could be included in our sample as only the most prominent companies of this segment meet all the requirements to get listed (thus the number of listed companies is limited). Although these disadvantages may prove significantly important for our final assessment the researcher believes that the pros outweigh the cons and thus believes that the stock prices are one of the most representative features of companies' financial performance.

After identifying the dependent variable, the next step of building our model is to list the potential predictors which may be related to the dependent variable. Although we cannot establish a causal relationship from statistics alone as an inference about the cause of the changes in the dependent variable which must be justified by a reasonable theoretical relationship (Keller, 2009), we should attempt to include predictor variables that cause changes in the dependent variable. A great range of factors can potentially influence the price of a stock, from news regarding a company's earnings to a change in how investors feel about the stock market in general while some of the indicators maybe are linked to each other in one or another way. Thus, multicollinearity is one of the problems which may have to deal with during our modelling assessment. Multicollinearity is a condition that exists when the independent variables are correlated one another. There are two consequences of multicollinearity. First, as a result of the coefficients' large variability, the sample coefficient may be far from the actual population parameter and second, the t-statistics will be small which leads to the inference that there is no linear relationship between the affected independent variables and the dependent variable (Keller, 2009).

To eliminate the possibilities of this kind of problem, using the fewest independent variables that produce a satisfactory model is our main target. Thus, and in accordance with Syriopoulos (2007) *"Key factors for stock performance include attractive valuation, efficient management, modern corporate governance, robust organic growth prospects and successful acquisition plans. Focusing on shipping valuation, the following critical factors should be evaluated: cash flows, net asset value (NAV), revenue and operational earnings, total enterprise value and book value."*

In our study we wish to concentrate mainly on factors which affect the stock prices in the operational perspective as other economic factors-such as interest rates; economic outlook and GDP growth; inflation/deflation; currency fluctuations (Healy Paul, 2001); and other economic and political shocks- have not taken into consideration. However, their importance cannot in any case be neglected. Given that fact, the time charter equivalent was preferred to be included in our model although it is a non-GAAP measure. The TCE Rate is a standard shipping industry

performance measure used primarily to present the actual daily earnings generated by vessels of various types of charter contracts for the number of available days of the fleet. TCE is calculated by dividing the Net Freight amount by the number of days the voyage took to perform. The Net Freight is usually estimated by deducting variable voyage costs (i.e. bunker costs, port costs, canal fees, towage and pilotage) from the Freight lump sum (paid by the cargo owner). Time Chartered Equivalent is usually expressed in USD/day. The TCE/day formula can be expressed in the following way:

$$TCE/day = \frac{Net\ Freight\ (i.e. Freight\ lump\ sum - variable\ costs)}{number\ of\ days^{*}}$$

*from ship leaving port after discharge previous cargo until discharge current cargo

The core target of this study is to identify possible benefits and comparative advantages as these illustrated in the financial performances of those companies which participate in tanker pool agreements. For that reason, we want to introduce a variable which can potentially give us enough evidence in order to arrive at our conclusions. Conversely, participating or not in a shipping pool is clearly a nominal value and in order to include nominal variables in our regression model the indicator variable-also called dummy variable has introduced. An indicator variable can assume either one of only two values (usually 0 and 1), where 1 represents the existence of a certain condition and 0 indicates that the condition does not hold. In this illustration, we would create one indicator variable to represent the participation or not of tanker companies in shipping pools as follows:

$$d = \begin{cases} 1 (If\ the\ Company\ Participates\ in\ a\ Tanker\ Shipping\ Pool \\ 0 \quad (If\ the\ Company\ Does\ NOT\ Participate) \end{cases}$$

Now as we have identified the dependent variable as well as the two independent variables which will be used in our model, the model can be formulated as follows:

$$ADJSP_{it} = a_0 + a_1 * d_{it} + b * TCE_t + \varepsilon$$

where
$ADJSP = is\ stock\ price\ (after\ dividents) of\ company\ i (i = 1,2, \dots, n) in\ time\ t,$
$d = dummy\ variable,$
$TCE = independent\ variable,$
$a_0 = ADJSP - intercept,$
$a_1, b = coefficients\ of\ determination\ for\ d\ and\ TCE, respectively, and$
$\varepsilon = error\ variable$

The logic of this model: When the company i at the time t has its vessels in a shipping pool, then the d_{it} is 1. Thus, the function will have an intercept of $a_0 + 1$, while alternatively the intercept will be a_0. We will try to see whether the dummy

variable and adjusted stock prices (SP) are linearly related while at the same time there is enough evidence that the dummy variable is statistically significant. If that is the case, this could be an indicator that these companies have some comparative advantage affecting their earnings against the others who operate their fleet independently.

In addition, it is important to mention that the gathered data was transformed in their logarithm form so as to eliminate the different measurement units (almost all of the stock prices were given in USD while one of the companies is listed in Brussels and the stock price is given in EURO) and include all the prolific characteristics of the time series. Last but not least, the logarithm form was introduced in order to eliminate any potential heteroscedasticity problems.

4.2 Data Selection

After concluding which variables should be used in our model, explaining why they have been chosen as appropriate ones for our research, and formulating our model we move on to the data collection. This part comprises a collection of the variables data from notable shipping and economic databases. The dataset for the dependent variable is composed by the adjusted stock prices (which are the prices after the dividend payment) as these are available in online finance sources such as Yahoo Finance and the Wall Street Journal. As for the average TCE $/day(independent variable), the Clarkson Research Services Limited (CRSL) database, which is one of the most notable providers of data for the global shipping, was used. Finally, annual and quarterly financial statements (as these are provided in 20-F and 10-K forms) of the selected shipping companies for identifying whether these companies had vessels in shipping pools or not were examined thoroughly. The selection of these shipping companies was undertaken under some specific criteria.

It goes without saying that the first criterion is that the companies should be listed on the major exchanges (such as NYSE, Nasdaq, OSLO etc.). Secondly, companies included in our sample were thoroughly examined regarding their portfolio of activities. Thus, companies with similar portfolio of activities, and more specifically those companies which are specialized in the crude oil transportation, were preferred in order to obtain a more cohesive sample of observations. Some of the listed companies/corporations although they may have significant tanker fleet they are activated in a number of various markets (such as offshore and oil drilling activities, diversified fleet from tankers to containerships etc.) and this could potentially lead us to wrong estimations. The third criterion has to do with their fleet characteristics. Whether they were in pools or not their vessels characteristics were very similar. There are five different categories of crude oil tanker carriers based on size: Long Range 1 (LR1) with capacity of 45-80 dwt; Aframax, a tanker size range between 80,000 and 120,000 dwt; Suezmax with size range of 120,000 to 200,000 dwt; Very Large Crude Carrier (VLCC) with carrying capacity between 200,000 and 320,000 dwt; Ultra Large Crude Carrier (ULCC) with carrying capacity of more than 320,000 dwt. In an attempt to restrict the scope of this study, for obvious reasons, our focus was mainly given to the Suezmax and VLCC market and on this basis the

respective average TCE $/day were selected. Thus, and after considering all the abovementioned criteria our sample consists of eight companies and they are presented in the Table below.

Table 8.Selected Companies

Company	***Ticker***	***Stock Market***	***Listing Year***
DHT Holdings Inc	DHT	NYSE	2005
Euronav NV*	EURN.BR	Brussels	2004
Frontline Ltd	FRO	NYSE/OSLO	2001
Navios Maritime Acq.	NNA	NYSE	2008
Nordic American Tanker	NAT	NYSE	2000
Overseas Shipholding	OSGB	NYSE	2007
Teekay Tankers Ltd	TNK	NYSE	2007
Tsakos Energy Nav.	TNP	NYSE/OSLO	2002

Source: Modified by author

Another important issue is the selection of the time period as well as the frequency of data. As in this research we wish to capture the dynamics of pool agreements and avoid substantial statistical limitations from variables frequencies, weekly data was preferred as an optimal frequency. Also the period covered in this research, which includes a depressed period for the crude oil tanker sector and in general for the global economic environment, give us the opportunity to examine the function of pool systems as a defensive instrument against these challenging market conditions.

All stock prices of these companies as well as the average TCE were extracted for the period 1^{st} January 2000 to end July 2015.This yielded 2,312 fixtures in total, 1,414 involved observations while companies were in pools while the remaining observations were involved non-pool companies. A correlation analysis has been conducted in order to identify to what extent these variables are associated with each other. The values of correlation coefficient are always between -1 and +1. A correlation coefficient of +1 indicates that the variables tested are perfectly related in a positive linear sense (and vice versa when the value is close to -1) while values close to 0 indicate that linear relationship between the variables does not exist. The tested variables of our model indicate that there is neither perfect relation nor linear relationship between them.

More specifically, all three variables were introduced in this analysis, when possible (because zero values of dummy variable result in undetermined ratios). The outcome illustrates that the higher relation is between Adjusted Stock Prices and Average TCE of TNP dataset while the weaker relation is between Adj. Close Prices and Dummy variable of NNA dataset where the correlation coefficient is -0.1025. All the other correlation coefficients lie within this range (this can clearly be seen in Figures 3 to 11 in Appendices).

4.3 Methodology

4.3.1 Selection of Method

OLS regression with multiple explanatory variables

Ordinary least-squares (OLS) regression is a generalized linear modelling technique which may apply to single or multiple explanatory variables and also categorical explanatory variables that have been appropriately coded. In our case we are using two explanatory (independent) variables. The first is an interval variable while the second one is a dummy variable. Our main purpose by using this modelling technique is to test whether there is enough evidence to support that indeed the pool systems give a comparative advantage to those companies which participate in that system.

4.3.2 Diagnose violations of required conditions

An important part of the regression analysis comprises several statistical techniques that evaluate how well fits the data. One fundamental condition that these techniques require is that the errors are independent (Keller, 2009).

Autocorrelation Testing

One of the fundamental requirements when we construct the model is that the errors should be independent to each other. Especially when the data constitute a time series, as happens in our case, in order to check whether the errors are independent when the data constitute a time series we augment the procedure with the Durbin-Watson test (Wooldridge, 2009). The Durbin-Watson test statistic tests the null hypothesis that the residuals from an ordinary least-squares regression are not autocorrelated against the alternative that the residuals follow an AR1 process. The Durbin-Watson test allows us to determine whether there is evidence of autocorrelation. This is a condition where a relationship exists between consecutive residuals e_i and e_{i-1} where i is the time period. The Durbin-Watson statistic is defined as:

$$d = \frac{\sum_{i=2}^{n}(e_i - e_{i-1})^2}{\sum_{i=1}^{n} {e_i}^2}$$

The range of the values of d is: $0 \leq d \leq 4$, where small values of $d(d < 2)$ indicate a positive first-order autocorrelation and large values of $d(d > 2)$ imply a negative first-order autocorrelation. A value near 2 indicates non-autocorrelation. Positive first-order autocorrelation is a common occurrence in business and economic time series. It occurs when consecutive residuals tend to be similar.

Now, in our case and after having conducted the ordinary least square method, a representative result is depicted in Figure 1. As it is observed, the Durbin-Watson Statistic is 0.0821 which constitutes an indication that there is a strong (positive)

relationship between consecutive values of the residuals. This indicates that the requirement the errors are independent has been violated. Autocorrelation usually indicates that the model needs to include an independent variable that has a time-ordered effect on the dependent variable. This can be corrected in several ways. Here we choose the Auto-Regressive model (AR 1) and more specifically the Cochrane-Orcutt (Johnston, 1997). The Cochrane-Orcutt procedure for correcting autocorrelation uses the OLS residuals $\hat{e}$ to calculate the autoregressive parameter ρ from the regression:

$$\widehat{e_t} = \rho \widehat{e_{t-1}} + v_t \quad for\ t = 2, .., N$$

The estimate of ρ is then used to transform the observations of the dependent and independent variables. These new variables are used in a reestimation of the model. The residuals from the new model are used to transform the transformed variables. The process continues until estimates of ρ differ by less than 0.001. The results can be seen in Figure 16(in Appendices). Thus in that Figure we can see that the Durbin-Watson value changed from 0.082096 to 2.157446 which is a value close to 2. That means that the autocorrelation problem after the conduction of this method has been solved.

Figure 1. OLS result for Navios Acquisition (NNA)

Dependent Variable: LOG_ADJ_CLOSE_
Method: Least Squares
Date: 08/11/15 Time: 23:07
Sample: 1/04/2010 7/27/2015
Included observations: 289

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_AVERAGE_TCE_$_DAY...	0.032209	0.005162	6.239118	0.0000
DUMMY_VARIABLE	-0.010339	0.016906	-0.611555	0.5413
C	0.401972	0.018563	21.65497	0.0000

R-squared	0.126077	Mean dependent var	0.511757
Adjusted R-squared	0.119966	S.D. dependent var	0.130886
S.E. of regression	0.122785	Akaike info criterion	-1.346443
Sum squared resid	4.311757	Schwarz criterion	-1.308383
Log likelihood	197.5610	Hannan-Quinn criter.	-1.331193
F-statistic	20.62999	Durbin-Watson stat	0.082096
Prob(F-statistic)	0.000000		

Source: Modified by author

In the Table 9, the Durbin-Watson statistic values for each model (per company) before and after the conduction of the Cochrane-Orcutt method (before and after the correction for autocorrelation) are presented.

Table 9. Consolidated Durbin-Watson statistic values

Company	*Durbin-Watson statistic*	*Improved Durbin-Watson statistic*
DHT	*0.072977*	*1.970530*
EURN.BR	*0.139313*	*2.141491*
FRO	*0.028871*	*2.061865*
NNA	*0.082096*	*2.157446*
NAT	*0.065856*	*2.147398*
OSGB	*0.050940*	*1.947685*
TNK	*0.090069*	*2.049768*
TNP	*0.142678*	*2.040153*

Source: Modified by author.

4.3.3 Assess the model's fit

Three statistics that perform this function are the standard error of estimate ($S.E.of\ regression$), the coefficient of determination ($R-squared$), and the F-test of the analysis of variance ($F-statistic$).

More specifically:

- When the value of "$S.E.of\ regression$" is small (close to 0) the fit is relatively good and indicates that the linear model is likely to be an effective analytical tool. In order to determine whether this value is small or not, it is compared with the sample mean ($\overline{SP}$, in our case). However this statistic cannot be used as an absolute measure of the model's utility.
- The"$R-squared$" statistic is also commonly quoted and provides a measure that indicates the percentage of variation in the response variable that is 'explained' by the model. R-square, which is also known as the coefficient of multiple determination is defined as:

$$"R\text{-}squared" = 1 - \frac{SSE^*}{\sum(SP_I - \overline{SP})^2}$$

*where SSE is the unexplained variation

Basically, it gives the percentage of the deviance in the response variable that can be accounted for adding the explanatory variable into the model. Although "$R-squared$" is widely used, it will always increase as variables are added to the model. One solution to this problem is to calculate an adjusted R-square statistic ("$Adjusted\ R-square$") which takes into account the number of terms entered into the model and does not necessarily increase as more terms are added. Also named as coefficient of determination adjusted for degrees of freedom, it has been adjusted to take into account the sample size and the number of independent variable. The rationale for this statistic is that, if the number of independent variables k is large relative to the sample size n, the unadjusted R-square value may be unrealistically high. If n is considerably larger than k (as it happens in our

case), the adjusted and unadjusted R-square values will be similar. "$Adjusted\ R-square$" can be derived using the following equation:

$$"Adjusted\ R\text{-}squared" = 1 - \frac{SSE/(n-k-1)}{\sum(SP_I - \overline{SP})^2/(n-1)}$$

Where n is the number of cases used to construct the model and k is the number of terms in the model excluding the intercept.

- Another way to test the validity of the regression model is by building the the following hypothesis:

$H_0: a_1 = b = 0$

$H_1: At\ least\ one\ of\ this\ two\ coefficients\ of\ our\ model\ is\ not\ equal\ to\ 0$

Whether the null hypothesis is true, none of dummy and TCE is linearly related to SP, and therefore the model is not valid. If at least one of b and a_1 is not equal to 0, the model has some validity. As for F-test, a large value of "$F-statistic$" indicates that most of the variation in SP is explained by the regression equation and that the model is valid (and vice-versa). The rejection region allows us to determine whether F is large enough to justify rejecting the null hypothesis. For our test the rejection region is:

$F > F_{a,k,n-k-1} = F_{.05,2,286}$

Table 10 illustrates all the values of these three statistics in order to conclude whether the model fits or not.

Table 10. Consolidated values of R-squared, F-statistic and S.E. statistics

	R-Squared	Adjusted R-squared	S.E.	F-statistic and Prob(F-statistic)	
DHT	0.208301	0.202765	0.339439	37.62423	0.0000
EURN.BR	0.260983	0.258408	0.184280	101.3538	0.0000
FRO	0.293012	0.288068	0.366901	59.26652	0.0000
NNA	0.126077	0.119966	0.122785	20.62999	0.0000
NAT	0.153965	0.147243	0.147243	26.02379	0.0000
OSGB	0.082794	0.079598	0.427039	25.90668	0.0000
TNK	0.198105	0.195311	0.169693	70.90240	0.0000
TNP	0.265558	0.262999	0.132177	103.7727	0.0000

Source: Modified by the author, these values is the result of regression analysis outcome before correcting the autocorrelation problem

The values of the main three statistics as these were presented in Table 10 and 11, give us the impression that the model's fit has been dramatically improved. After conducting this analysis, the next step is to interpret the coefficients of the model

Table 11. Consolidated values of R-squared, F-statistic and S.E. statistics

	R-Squared	Adjusted R-squared	S.E.	F-statistic and Prob(F-statistic)	
DHT	0.994373	0.994313	0.028532	16728.44	0.0000
EURN.BR	0.982981	0.982862	0.027953	8230.624	0.0000
FRO	0.987883	0.987755	0.047970	7718.243	0.0000
NNA	0.964851	0.964479	0.024394	2598.607	0.0000
NAT	0.981340	0.981143	0.021815	4978.595	0.0000
OSGB	0.982162	0.982037	0.059506	7846.285	0.0000
TNK	0.978560	0.978409	0.027820	6503.821	0.0000
TNP	0.970472	0.970265	0.026430	4683.459	0.0000

Source: Modified by the author, these values is the result of introducing Cochrane-Orcutt and more specifically AR(1) for correcting the autocorrelation problem

4.4 Interpret the Coefficients

Ensuring that the required conditions are met, we can move on to interpret the coefficients. Although we are satisfied with the model's fit as well as with the fact that the independent variables are not correlated with each other, and the model's statistics improved to a great extent, the p-values of the t-tests, which are used to determine whether there are enough evidence of a linear relationship between Adjusted Stock Prices and each of Average TCE and dummy variable, are rather weak.

The table below provides the data from the simple linear model without any correction in any potential autocorrelation effect. The constant term of companies not participating in any pool range is 0.622, of companies participating 0.42 to 0.64 and companies with entry-exit policies in pools range from 0.38 to 0.88. If we add the dummy variable in the constant term then the companies with entry-exit policies in pools range is from 0.39 to 0.86. We would expect the values of the companies participating in pools to have significant higher constant term. I n reality only one company OSG has a comparative advantage over TNP. On the other hand entry-exit policies prove to be more fruitful in term of higher constant terms, but unfortunately this happens only for one company NAT. NAT maintains the lead after we add the dummy variable effect and FRO elevates in the second place with a constant term of 0.86, in the third place follows DHT with a constant term of 0.75 and finally NNA constant term remains on low levels of 0.39. Dummy variable of NNA is statistically significant only for the 10%, where in other cases the dummy variable is significant for 5% and for DHT the dummy variable is statistically significant for 1%.

.

Table 12. Statistic values before the autocorrelation correction

Status	*Company*	*Variable*	*Coefficient*	*t-Statistic*	*p-value*
0	TNP	LOG_AVERAGE_TCE	0.053456	10.18689	0.000*
		C	0.622064	31.18469	0.000*
1	TNK	LOG_AVERAGE_TCE	0.056727	8.420356	0.000*
		C	0.422963	18.07778	0.000*
	EURN	LOG_AVERAGE_TCE	0.073654	10.06746	0.000*
		C	0.625669	22.49720	0.000*
	OSG	LOG_AVERAGE_TCE	0.086293	5.089870	0.000*
		C	0.640305	9.935295	0.000*
1/0	NNA	LOG_AVERAGE_TCE	0.032209	6.239228	0.000*
		DUMMY	-0.010339	-0.611555	0.541
		C	0.401972	21.65497	0.000*
	DHT	LOG_AVERAGE_TCE	0.103765	7.323478	0.000*
		DUMMY	0.365290	6.683912	0.000*
		C	0.383590	4.855592	0.000*
	FRO	LOG_AVERAGE_TCE	0.018981	1.240288	0.216
		DUMMY	0.467444	9.914984	0.000*
		C	0.387469	6.795969	0.000*
	NAT	LOG_AVERAGE_TCE	0.040965	6.963755	0.000*
		DUMMY	-0.026787	-1.093714	0.275
		C	0.887493	38.57989	0.000*

Where: (*) for 1%,(**) for 5% and (***) for 10% significance level. Furthermore,0 indicate out of pools while 1 indicates in the pools for the whole tested period. The 1/0 feature indicates companies who had rotated strategy.

We would expect the constant term plus the dummy effect on the constant to be higher in vessels staying more days in the pool, but the results are rather frustrating (Table 12). We cannot argue in a significant outcome, neither can we trace a characteristic that supports the comparative advantage of these companies. However, we cannot neglect the significance of the dummy variable in all these cases, which provides strong support that the pool agreements have an overall effect in stock price.

Table 13. Constant Term plus the Dummy Variable

Company	Constant Term + Dummy	% Pool Weeks	% No Pool Weeks
NAT	0.86	14.88%	85.12%
FRO	0.85	63.67%	36.33%
DHT	0.75	82.01%	17.99%
NNA	0.39	28.72%	71.28%

Source: Modified by author

TCE in all cases is statistically significant for a=1% and positive. The impact of TCE is very low on the stock price and in many cases lower than one percent. This might be a consequence of the high frequency data, which fail to illustrate the impact of freight on revenue and consequently on stock prices. It might be more substantial to

check lagged values of TCE with stock prices, but this is not in the content of this research. Constant term remains significant for all companies, except for DHT and FRO.

Although, we have noticed that there is a strong possibility of autocorrelation in data, which might bias the above results, we cannot reject our research outcome that there is no comparative advantage for the companies which participate in pools. However, the fit of this model is very low on the data and this signals to be cautious about our results.

In order to eliminate the autocorrelation effect, we integrated an Autoregressive model of order one. Results suggest that the model fits very well on data, but at the same time the majority of the coefficients of TCE and dummy variable is not statistic significant. However, we cannot draw any rational outcome from the results (Consolidated Table 2 in Appendices) and it is likely that specification errors exist in our model. This kind of specification errors could be derived either by omitting a relevant variable or by including an irrelevant variable. In practice, it is not possible to know beforehand which model is the appropriate one. For that reason we tried to include only the variables based on the economic theory which affect the dependent variable.

Chapter 5. Conclusions

The tanker sector fulfills in full almost all the conditions of the perfectly competitive market model. To that extent there is no space for shipping companies to influence the freight rates (as these are exposed to the free play of market forces) and thus they are considered as “price takers”. For that reason, one realistic way to obtain a comparative advantage against their competitors is to find the appropriate marketing tools in order to reduce their operational costs and achieve higher levels of their fleet utilization. The most popular horizontal cooperation agreement among tanker shipping companies is the shipping pool agreements. It is generally believed that companies participating in such agreements enjoy a number of benefits. However, the existence of persuasive arguments on the contrary generates a great debate. That debate was the main trigger and inspiration for the conduction of this study. Thus, our attempts are heading in the direction of providing enough evidence to support whether pool agreements contribute in financial performance of companies significantly. For that purpose, we proceed on the model building in which we introduced an explanatory variable by establishing a dummy variable.

Therefore, OLS regression considered as one of the major techniques of analyzing data was used. The usefulness of the technique can be greatly extended with the use of dummy variable coding to include explanatory variables. After conducting the required tests for diagnosing violations, corrections were undertaken where it was necessary. However, the model estimated outputs didn’t provide us with the adequate grounding for these research arguments. Two main clauses could be described for explaining why the model didn’t work properly. The first lies to the fact that specification errors may exist and this can be solved by making a similar hypothesis with different variables (by adding or omitting variables). The second problem is maybe linked to the combination of the nature of the data and the choice of the applied methodology. Volatility is a common characteristic of shipping and stock market observations, which is caused by the pertaining changes over a time. On theoretical base, simple linear models fail to capture the volatility and trend. This type of models works only on stationary data. Therefore, we might assume that several researches relying on shipping data and linear models might be considered cautiously. For instance, ARCH methodologies on shipping data can potentially deal with the problem of volatility in a more effective manner.

One critical limitation, which was proved to be a suspensive factor during the research, was the scarcity of information for operational data as the companies do not provide in detail information about these features. And even in case they do so, the great variety of methods for valuating assets and recognizing costs and revenue can generate multiple problems from inconsistent data to misleading results.

The necessity of developing alliances and cooperative security concepts as purely survival mechanisms in depressed markets was realized by shipowners a long period of time ago but are becoming more recent when the circumstances present themselves. Thus, I strongly believe that this topic will become more and more popular the coming years and there is still scope for further discussion on some aspects. Future studies – given they manage to deal with the abovementioned problems – it is possible that they will offer very interesting results about this topic.

Bibliography

Albertijn, S., Bessler, W., & Drobetz, W. (2011). Financing Shipping Companies and Shipping Operations: A Risk-Management Perspective. *Journal of Applied Corporate Finance*, *23*(4), 70-82.

Antapasēs, Antōnios M., Lia I. Athanassiou, and Erik Røsæg, eds. *Competition and regulation in shipping and shipping related industries*. Martinus Nijhoff Publishers, 2009. pp 122

Berg-Andreassen, J. A. (1998). A portfolio approach to strategic chartering decisions. *Maritime Policy & Management*, *25*(4), 375-389.

Brooks, M. R., & Button, K. J. (2006). Market structures and shipping security.*Maritime Economics & Logistics*, *8*(1), 100-120.

Chen, Y.S., Wang, S.T., (2004). The empirical evidence of the leverage effect on volatility in international bulk shipping market. Maritime Policy Management. pp.110-120.

Christiansen, M., Fagerholt, K., & Ronen, D. (2004). Ship routing and scheduling: Status and perspectives. *Transportation science*, *38*(1), 1-18.

Clarkson Research Services, (2015). *The Tramp Shipping Market*. pp.2, 27-28.

Clarkson Research Studies (2004) *The Tramp Shipping Market*, produced by Clarkson Research Studies.

DHT HOLDINGS, INC, *Annual Report on Form 20-F (from 2010 to 2015(2Q)).* [online] Available at: http://www.dhtankers.com/index.php?name=Investor_Relations%2FFinancial_Reports.html [Accessed 02 Aug. 2015].

Drobetz, W., Gounopoulos, D., Merikas, A., & Schröder, H. (2013). Capital structure decisions of globally-listed shipping companies. *Transportation Research Part E: Logistics and Transportation Review*, *52*, 49-76.

Drobetz, W., & Tegtmeier, L. (2013). The development of a performance index for KG funds and a comparison with other shipping-related indices. *Maritime Economics & Logistics*, *15*(1), 32-71.

Euronav NV, *Annual Report on Form 20-F (from 2010 to 2015(2Q))*. [online] Available at: http://investors.euronav.com/company-news-and-reports/annual-reports/archive.aspx?sc_lang=en [Accessed 02 Aug. 2015].

European Commission, 2008, “Guidelines on the application of Article 81EC Treaty to maritime transport services”, Official Journal of European Union, C 245/11, para. 60

Evans J.J., (1994) "An analysis of efficiency of the bulk shipping markets", Maritime Policy and Management Vol 21, issue 4, pages 311-329. [online] Available at: http://dx.doi.org/10.1080/03088839400000055 [Accessed 07 July 2015]

Fearnley Consultants AS, (2007). LEGAL AND ECONOMIC ANALYSIS OF TRAMP MARITIME SERVICES. EU Report COMP/2006/D2/002. pp.186-187.

Fox, J. (2002). An R and S-Plus Companion to Applied Regression. London: Sage Publications.

Frontline Ltd., *Annual Report on Form 20-F (from 2010 to 2015(2Q))*. [online] Available at: http://www.annualreports.com/Company/frontline-ltd [Accessed 01 Aug. 2015].

German Central Bank (2011): German Central Bank (Hg.), Basel III – *Guidelines to the new equity and liquidity rules for banks*, Frankfurt, May 2011

Glen, D. & Martin, B. (2015). Do Tanker Pools influnce Market Rates? The Case of Tankers International.

Glen, D., & Martin, B. (2002). The tanker market: current structure and economic analysis. *The handbook of maritime economics and business*, 251-279.

Grammenos, C. (2002). The handbook of maritime economics and business. London: LLP.

Grelck, M. B., Prigge, S., Tegtmeier, L., & Topalov, M. (2009). Diversification properties of investments in shipping. *The Journal of Alternative Investments*,*12*(1), 55-74.

Grelck, M. B., Prigge, S., Tegtmeier, L., Topalov, M., & Torpan, I. (2011). Investing in Times of Inflation Fears: Diversification Properties of Investments in Liquid Real Assets. *The Journal of Wealth Management*, *14*(3), 44-57.

Haralambides, H. (1996). The economics of bulk shipping pools. *Maritime Policy & Management*, 23(3), pp.221-237.

Harlaftis, G., & Theotokas, J. (2002). Maritime business during the 20th century: continuity and change. *The handbook of maritime economics and business*.

Harlaftis, G., & Theotokas, J. (2004). European family firms in international business: British and Greek tramp-shipping firms. *Business History*, *46*(2), 219-255.

Heaver, T., Meersman, H., Moglia, F., & Van de Voorde, E. (2000). Do mergers and alliances influence European shipping and port competition?. *Maritime Policy & Management*, *27*(4), 363-373.

Healy, P. M., & Palepu, K. G. (2001). Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature. *Journal of accounting and economics*, *31*(1), 405-440.

Hellenic Shipping News, (2015). Financing issues could returns to “haunt” European ship owners after resurgence of US dollar. [online] Available at: http://Hellenic Shipping News [Accessed 03 July 2015].

Hussein, A. W., & Soares, C. G. (2009). Reliability and residual strength of double hull tankers designed according to the new IACS common structural rules. *Ocean Engineering*, *36*(17), 1446-1459.

Hutcheson, G. D. and Moutinho, L. (2008). Statistical Modeling for Management. Sage Publications.

Hutcheson, G. D. and Sofroniou, N. (1999). The Multivariate Social Scientist. London: Sage Publications.

Johnston, J., & DiNardo, J. (1997). *Econometric methods*. McGraw-Hill: New York.

Jung, M. and Will, M. (2015). Principles of Corporate Finance.

Keller, G. (2009). *Managerial statistics*. Australia: South-Western /Cengage Learning.

Klin, H. (2009). *Ship finance in distress*. [online] bunkerspot. Available at: http://www.google.nl/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&ved=0CCEQFjAA&url=http%3A%2F%2Fwww.kpmg.com%2FCa%2Ffr%2FIssuesAndInsights%2FArticlesPublications%2FDocuments%2Fship-financing-in-flux.pdf&ei=D9IPVc2-NIP9UKLWgvgB&usg=AFQjCNEF-8IF3YHg2cImSzx2kunp9-IrQg [Accessed 1 Aug. 2015].

Lloyd's Shipping Economist, (2001). *The secret of success? Pooling*. pp.29-32.

Lun Y.H.V., Quaddus M.A. (2009), An empirical model for the bulk shipping market. Int J Shipping Transp Logist 1(1): 39-50

Lyridis, D. V., Zacharioudakis, P., Mitrou, P., & Mylonas, A. (2004). Forecasting tanker market using artificial neural networks. *Maritime Economics & Logistics*, *6*(2), 93-108.

Mankiw, N. G., & Taylor, M. P. (2011). Economics, 2nd Edition. South Western, Cengange Learning.

Matthews, S. (2007). Watered-down pools?. *Lloyds Shipping Economist*, pp.33-35.

Mamidaki, E. (1995). *The capital markets as a source of finance for shipping and the feasibility of a merchant shipping company listing in the Athens Stock Exchange* (Doctoral dissertation, Massachusetts Institute of Technology).

McConville, J. (1999). *Economics of maritime transport: theory and practice*. Witherby.

Metaxas, B.N., (1971). *The economics of tramp shipping*. The Athlone Press of the University of London, London.

Midoro, R., & Pitto, A. (2000). A critical evaluation of strategic alliances in liner shipping. *Maritime Policy & Management*, *27*(1), 31-40.

Navios Maritime Acquitision Corporation, *Annual Report on Form 20-F* (from 2010 to 2015(2Q)). [online] Available at: http://ir.navios-acquisition.com/phoenix.zhtml?c=222706&p=irol-news&nyo=0 [Accessed 01 Aug. 2015].

Nordic American Tankers Ltd. (NAT), *Annual Report on Form 20-F (from 2010 to 2015(2Q))*. [online] Available at: http://nat.bm/IR/ [Accessed 03 Aug. 2015].

Official Journal of the European Union, (2006). COUNCIL REGULATION (EC) No 1419/2006 of 25 September 2006. [online] pp.L 269/2. Available at: http://eur-Rutherford, A. (2001). Introducing ANOVA and ANCOVA: a GLM approach. London: Sage Publications.

Official Journal of European Union, (2006). [online] pdf. Available at: lex.europa.eu/LexUriServ/LexUriServ.do?uri, [Accessed 7 Jul. 2015].

Official Journal of the European Union 115 , (2008), Consolidated version of the Treaty on the Functioning of the European Union - Part Three: *Union Policies And Internal Actions - TITLE VII: Common Rules on Competition*, *Taxation and Approximation Of Laws*, Chapter 1: Rules on competition - Section 1: Rules applying to undertakings - Article 101 (ex Article 81 TEC), **pp.** 0088 – 0089

Official Journal of the European Union 115 , (2008), Consolidated version of the Treaty on the Functioning of the European Union - Part Three: *Union Policies And Internal Actions - TITLE VII: Common Rules on Competition*, *Taxation and Approximation Of Laws*, Chapter 1: Rules on competition - Section 1: Rules applying to undertakings - Article 102 (ex Article 82 TEC), **pp.** 0089 – 0089

Official Journal of the European Union, (2006), Guidelines on the method of setting fines imposed pursuant to Article 23(2)(a) of Regulation No 1/2003, (2006/C 210/02)

Osg.com, (2015). *Glossary*. [online] Available at: http://www.osg.com/about-osg/glossary.aspx [Accessed 12 Jul. 2015].

Overseas Shipholding Group, INC. (OSGB), *Annual Report on Form 10-K (from 2013 to 2015(2Q))*. [online] Available at: http://ir.osg.com/phoenix.zhtml?c=82053&p=irol-reportsannual [Accessed 01 Aug. 2015].

Overseas Shipholding Group,INC. (OSG), *Annual Report on Form 10-K (from 2010 to 2012)*. [online] Available at: http://quote.morningstar.com/stock-filing/Annual-Report/2011/12/31/t.aspx?t=:OSG&ft=10-K&d=e8f9dce2ce6444490b41f4d21a17d2cc [Accessed 01 Aug. 2015].

Packard, W. (1995). Shipping pools. London: Lloyd's of London Press.

Pirrong, S. C. (1993). Contracting practices in bulk shipping markets: a transactions cost explanation. *Journal of Law and Economics*, 939-940.

Psaraftis, H. N. (2006). Maritime safety in the post-Prestige era. *Marine Technology*, *43*(2), 85-90.

Quotes.wsj.com, (2015). U.S. Stocks Home - Markets Data Center - WSJ.com. [online] Available at: http://quotes.wsj.com [Accessed 07 Aug. 2015].

Slack, B., Comtois, C., & McCalla, R. (2002). Strategic alliances in the container shipping industry: a global perspective. *Maritime Policy & Management*, *29*(1), 65-76.

Stamford, J. (2014). Tradewindsnews.com. [online] Tradewindsnews.com. Available at: http://www.tradewindsnews.com/weekly/332759/holth-sets-sights-on-strengthening-dnbs-market-reach [Accessed 11 Jul. 2015].

Stopford, M. (2009). Maritime economics. Routledge, New York

Strandenes, S. (1984). Price determination in the time charter and second hand markets. Bergen.

Syriopoulos, T. C. (2007). Financing Greek shipping: Modern instruments, methods and markets. *Research in Transportation Economics*, *21*, 171-219.

Tankersinternational.com, (2015). *Tankers International - Why commit vessels to the pool?*. [online] Available at: http://www.tankersinternational.com/why_commit.php [Accessed 5 Jul. 2015].

Teekay Tankers Ltd., *Annual Report on Form 20-F (from 2010 to 2015(2Q)).* [online] Available at: http://teekay.com/investors/teekay-tankers-ltd/financials-presentations/ [Accessed 02 Aug. 2015].

Thalassinos, E.J., Politis, E.D., (2011), ''International Stock Market-A co-integration Analysis'', European Research Studies Journal Vol XIV,(4). [online] Available at: http://www.ersj.eu/index.php?option=com_content&task=view&id=420 [Accessed at 01 August 2015].

Tsakos Energy Navigation (TEN) Ltd., *Annual Report on Form 20-F (from 2010 to 2015(2Q))*. [online] Available at: http://www.tenn.gr/en/annual_reports/TEN_ANNUAL_REPORT_2014.pdf [Accessed 01 Aug. 2015].

Ward, N., Toime, M., Spells, S. and Leung, R. (2015). Pooling agreements-an acceptable employment arrangement?. [online] Berlin Leighton Paisner (BLP). Available at: http://www.blplaw.com/international/beijing?view=expert-insights&tag=pooling-agreements [Accessed 18 Aug. 2015].

Woolich, A. (2015). Shipping pools: a competition law perspective – sink or swim?.

Wooldridge, J. (2009). Introductory econometrics. Mason, OH: South Western, Cengage Learning.

Yahoo Finance, (2015). Yahoo Finance - Business Finance, Stock Market, Quotes, News. [online] Available at: http://finance.yahoo.com [Accessed 06 Aug. 2015].

Appendices

Appendix 1 Information about Listed Companies in the Tanker Sector

Table 1. Listed Companies

Tankers	Ticker	Stock Market	Listing Year
Aegean Marine Petrol	ANW	NYSE	2006
Capital Product Ptns	CPLP	NASDAQ	2007
Crude Carriers Corp	CRU	NYSE	2010
DHT Holdings Inc	DHT	NYSE	2005
Euronav NV*	EURN.BR	Brussels	2004
Frontline Ltd	FRO	NYSE/OSLO	2001
Gener8 Maritime Inc.**	GNRT	NYSE	2015
Kawasaki Kaisen Kaisha Ltd. ADR	KAIKY	OTC	2012
Mitsui O.S.K. Lines Ltd. ADR	MSLOY	OTC	2010
Navios Maritime Acq.	NNA	NYSE	2008
Nordic American Tanker	NAT	NYSE	2000
Nippon Yusen K.K. ADR	NPNYY	OTC	2008
Omega Navigation Ent.	ONAV	NASDAQ	2006
Overseas Shipholding	OSGB***	NYSE	2007
Scorpio Tankers Inc	STNG	NYSE	2010
Teekay Corp	TK	NYSE	2007
Teekay Offshore Ptns	TOO	NYSE	2006
Teekay Tankers Ltd	TNK	NYSE	2007
Torm A/S	TRMD	NASDAQ	2004
Tsakos Energy Nav.	TNP	NYSE/OSLO	2002

**In 2015, Euronav NV obtained a secondary listing on NYSE with the ticker EURN*
***In May, 2015, Maritime Corporation ("General Maritme") and Navig8 Crude Tankers completed the merger to create Gener8 Maritime, a U.S based provider of international seaborne oil transportation services.*
*****

Appendix 2 Consolidated Table of Statistic Coefficients

Table 2. Statistic values after the autocorrelation correction

Status	Company	Variable	Coefficient	t-Statistic	p-value
0	TNP	LOG_AVERAGE_TCE	0.001110	0.568993	0.57
		C	0.779931	9.636357	0.000*
		AR(1)	0.980430	96.22404	0.000*
1	TNK	LOG_AVERAGE_TCE	0.003888	1.901361	0.058***
		C	0.667607	4.097344	0.000*
		AR(1)	0.989871	112.4558	0.000*
	EURN	LOG_AVERAGE_TCE	-0.004175	-2.032958	0.043**
		C	0.875180	5.078831	0.000*
		AR(1)	0.990383	130.2447	0.000*
	OSG	LOG_AVERAGE_TCE	-0.007502	-1.713342	0.088***
		C	0.653661	1.805653	0.072***
		AR(1)	0.988119	126.1400	0.000*
1/0	NNA	LOG_AVERAGE_TCE	0.001202	0.664222	0.507
		DUMMY	-0.000300	-0.012461	0.990
		C	0.476134	9.382359	0.000*
		AR(1)	0.970203	87.62749	0.000*
	DHT	LOG_AVERAGE_TCE	-0.000219	-0.104531	0.917
		DUMMY	-0.004494	-0.156451	0.876
		C	0.644579	1.445599	0.149
		AR(1)	0.994458	224.0415	0.000*
	FRO	LOG_AVERAGE_TCE	-0.000127	-0.035923	0.971
		DUMMY	0.033177	0.974558	0.331
		C	0.403840	1.171930	0.242
		AR(1)	0.989607	149.1180	0.000*
	NAT	LOG_AVERAGE_TCE	0.003226	2.008970	0.046**
		DUMMY	0.022549	1.454213	0.147
		C	0.975704	10.22589	0.000*
		AR(1)	0.986151	121.5516	0.000*

Where: (*) for 1%,(**) for 5% and (***) for 10% significance level. Furthermore,0 indicate out of pools while 1 indicates in the pools for the whole tested period. The 1/0 feature indicates companies who had rotated strategy

Appendix 3 Correlation Testing

Figure 1. Testing of correlation for OSG dataset

	Log(Adj Close_osg)	*Log(Average TCE $/day)*
Log(Adj Close_osg)	1	
Log(Average TCE $/day	0,287739323	1

Figure 2. Testing of correlation for NNA dataset

	Log(Adj Close_nna)	*Log(Average TCE $/day)*
Log(Adj Close_nna)	1	
Log(Average TCE $/day)	0,353460427	1

Figure 3. Testing of correlation for DHT dataset

	Dummy Variable(DHT)	*Log(Adj Close_dht)*	*Log(Average TCE)*
Dummy Variable(DHT)	1		
Log(Adj Close_dht)	0,244610979	1	
Log(Average TCE)	-0,308874777	0,290918701	1

Figure 4. Testing of correlation for NAT dataset

	Dummy Variable(NAT)	*Log(Adj Close_nat)*	*log(Average TCE $/day)*
Dummy Variable(NAT)	1		
Log(Adj Close_nat)	-0,102530098	1	
log(Average TCE $/day)	-0,11194565	0,387848767	1

Figure 5. Testing of correlation for TNP dataset

	Log(Adj Close_tsakos)	*Log(Average TCE $/day)*
Log(Adj Close_tsakos)	1	
Log(Average TCE $/day)	0,515322819	1

Figure 6. Testing of correlation for TNK dataset

	Log(Adj Close_tnk)	*Log(Average TCE $/day)*
Log(Adj Close_tnk)	1	
Log(Average TCE $/day)	0,44509034	1

Figure 7. Testing of correlation for FRO dataset

	Dummy Variable(FRO)	*Log(Adj Close_fro)*	*Log(Average TCE $/day)*
Dummy Variable(FRO)	1		
Log(Adj Close_fro)	0,537781836	1	
Log(Average TCE $/day)	0,306646113	0,223603855	1

Figure 8. Testing of correlation for EURN dataset

	Log(Adj Close_eurn)	*Log(Average TCE $/day)*
Log(Adj Close_eurn)	1	
Log(Average TCE $/day)	0,510865134	1

**Those figures which do not include the Dummy Variable in the correlation testing is for technical reasons as this variable includes zero values and the ratio cannot be difined.*

Appendix 4 OLS Model Outcomes

Figure 9. DHT - OLS Outcome before correcting the autocorrelation problem

Dependent Variable: LOG_ADJ_CLOSE_
Method: Least Squares
Date: 08/11/15 Time: 23:10
Sample: 1/04/2010 7/27/2015
Included observations: 289

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_AVERAGE_TCE...	0.103765	0.014169	7.323478	0.0000
DUMMY_VARIABLE	0.365290	0.054652	6.683912	0.0000
C	0.383590	0.079000	4.855592	0.0000

R-squared	0.208301	Mean dependent var	1.046405
Adjusted R-squared	0.202765	S.D. dependent var	0.380162
S.E. of regression	0.339439	Akaike info criterion	0.687283
Sum squared resid	32.95263	Schwarz criterion	0.725342
Log likelihood	-96.31233	Hannan-Quinn criter.	0.702533
F-statistic	37.62423	Durbin-Watson stat	0.072977
Prob(F-statistic)	0.000000		

Source: Modified by author

Figure 10. DHT - OLS Outcome after the correction took place

Dependent Variable: LOG_ADJ_CLOSE_
Method: Least Squares
Date: 08/11/15 Time: 23:10
Sample (adjusted): 1/11/2010 7/27/2015
Included observations: 288 after adjustments
Convergence achieved after 7 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_AVERAGE_TCE...	-0.000219	0.002099	-0.104531	0.9168
DUMMY_VARIABLE	-0.004494	0.028726	-0.156451	0.8758
C	0.644579	0.445891	1.445599	0.1494
AR(1)	0.994458	0.004439	224.0415	0.0000

R-squared	0.994373	Mean dependent var	1.044673
Adjusted R-squared	0.994313	S.D. dependent var	0.379680
S.E. of regression	0.028632	Akaike info criterion	-4.254823
Sum squared resid	0.232814	Schwarz criterion	-4.203949
Log likelihood	616.6945	Hannan-Quinn criter.	-4.234436
F-statistic	16728.44	Durbin-Watson stat	1.970530
Prob(F-statistic)	0.000000		

Inverted AR Roots	.99

Source: Modified by author

Figure 11. EURN.BR - OLS Outcome before correcting the autocorrelation problem

Dependent Variable: LOG_ADJ_CLOSE_
Method: Least Squares
Date: 08/11/15 Time: 23:06
Sample: 1/04/2010 7/27/2015
Included observations: 289

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_AVERAGE_TCE_$_DAY...	0.073654	0.007316	10.06746	0.0000
C	0.625669	0.027811	22.49720	0.0000

R-squared	0.260983	Mean dependent var	0.883511
Adjusted R-squared	0.258408	S.D. dependent var	0.213991
S.E. of regression	0.184280	Akaike info criterion	-0.537824
Sum squared resid	9.746269	Schwarz criterion	-0.512451
Log likelihood	79.71561	Hannan-Quinn criter.	-0.527657
F-statistic	101.3538	Durbin-Watson stat	0.139313
Prob(F-statistic)	0.000000		

Source: Modified by author

Figure 12. EURN.BR OLS Outcome after the correction took place

Dependent Variable: LOG_ADJ_CLOSE_
Method: Least Squares
Date: 08/11/15 Time: 23:07
Sample (adjusted): 1/11/2010 7/27/2015
Included observations: 288 after adjustments
Convergence achieved after 6 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_AVERAGE_TCE_$_DAY...	-0.004175	0.002054	-2.032958	0.0430
C	0.875180	0.172319	5.078831	0.0000
AR(1)	0.990383	0.007604	130.2447	0.0000

R-squared	0.982981	Mean dependent var	0.882397
Adjusted R-squared	0.982862	S.D. dependent var	0.213522
S.E. of regression	0.027953	Akaike info criterion	-4.306237
Sum squared resid	0.222687	Schwarz criterion	-4.268081
Log likelihood	623.0981	Hannan-Quinn criter.	-4.290946
F-statistic	8230.624	Durbin-Watson stat	2.141491
Prob(F-statistic)	0.000000		

Inverted AR Roots	.99

Figure 13. FRO - OLS Outcome before correcting the autocorrelation problem

Dependent Variable: LOG_ADJ_CLOSE_
Method: Least Squares
Date: 08/11/15 Time: 23:05
Sample: 1/04/2010 7/27/2015
Included observations: 289

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_AVERAGE_TCE_$_DAY...	0.018981	0.015304	1.240288	0.2159
DUMMY_VARIABLE	0.467444	0.047145	9.914984	0.0000
C	0.387469	0.057014	6.795969	0.0000

R-squared	0.293012	Mean dependent var	0.751526
Adjusted R-squared	0.288068	S.D. dependent var	0.434840
S.E. of regression	0.366901	Akaike info criterion	0.842876
Sum squared resid	38.50023	Schwarz criterion	0.880936
Log likelihood	-118.7956	Hannan-Quinn criter.	0.858126
F-statistic	59.26652	Durbin-Watson stat	0.028871
Prob(F-statistic)	0.000000		

Source: Modified by author

Figure 14. FRO - OLS Outcome after the correction took place

Dependent Variable: LOG_ADJ_CLOSE_
Method: Least Squares
Date: 08/11/15 Time: 23:05
Sample (adjusted): 1/11/2010 7/27/2015
Included observations: 288 after adjustments
Convergence achieved after 6 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_AVERAGE_TCE_$_DAY...	-0.000127	0.003527	-0.035923	0.9714
DUMMY_VARIABLE	0.033177	0.034043	0.974558	0.3306
C	0.403840	0.344594	1.171930	0.2422
AR(1)	0.989607	0.006636	149.1180	0.0000

R-squared	0.987883	Mean dependent var	0.749026
Adjusted R-squared	0.987755	S.D. dependent var	0.433511
S.E. of regression	0.047970	Akaike info criterion	-3.222671
Sum squared resid	0.653531	Schwarz criterion	-3.171796
Log likelihood	468.0646	Hannan-Quinn criter.	-3.202283
F-statistic	7718.243	Durbin-Watson stat	2.061865
Prob(F-statistic)	0.000000		

Inverted AR Roots	.99

Source: Modified by author

Figure 15. NNA - OLS Outcome before correcting the autocorrelation problem

Dependent Variable: LOG_ADJ_CLOSE_
Method: Least Squares
Date: 08/11/15 Time: 23:07
Sample: 1/04/2010 7/27/2015
Included observations: 289

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_AVERAGE_TCE_$_DAY...	0.032209	0.005162	6.239118	0.0000
DUMMY_VARIABLE	-0.010339	0.016906	-0.611555	0.5413
C	0.401972	0.018563	21.65497	0.0000

R-squared	0.126077	Mean dependent var	0.511757
Adjusted R-squared	0.119966	S.D. dependent var	0.130886
S.E. of regression	0.122785	Akaike info criterion	-1.346443
Sum squared resid	4.311757	Schwarz criterion	-1.308383
Log likelihood	197.5610	Hannan-Quinn criter.	-1.331193
F-statistic	20.62999	Durbin-Watson stat	0.082096
Prob(F-statistic)	0.000000		

Source: Modified by author

Figure 16. NNA - OLS Outcome after the correction took place

Dependent Variable: LOG_ADJ_CLOSE_
Method: Least Squares
Date: 08/11/15 Time: 23:08
Sample (adjusted): 1/11/2010 7/27/2015
Included observations: 288 after adjustments
Convergence achieved after 6 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_AVERAGE_TCE_$_DAY...	0.001202	0.001809	0.664222	0.5071
DUMMY_VARIABLE	-0.000300	0.024064	-0.012461	0.9901
C	0.476134	0.050748	9.382359	0.0000
AR(1)	0.970203	0.011072	87.62749	0.0000

R-squared	0.964851	Mean dependent var	0.510528
Adjusted R-squared	0.964479	S.D. dependent var	0.129433
S.E. of regression	0.024394	Akaike info criterion	-4.575157
Sum squared resid	0.169001	Schwarz criterion	-4.524283
Log likelihood	662.8226	Hannan-Quinn criter.	-4.554770
F-statistic	2598.607	Durbin-Watson stat	2.157446
Prob(F-statistic)	0.000000		

Inverted AR Roots	.97

Source: Modified by author

Figure 17. NAT - OLS Outcome before correcting the autocorrelation problem

Dependent Variable: LOG_ADJ_CLOSE_
Method: Least Squares
Date: 08/11/15 Time: 23:11
Sample: 1/04/2010 7/27/2015
Included observations: 289

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_AVERAGE_TCE_$_DAY...	0.040965	0.005883	6.963755	0.0000
DUMMY_VARIABLE	-0.026787	0.024492	-1.093714	0.2750
C	0.887493	0.023004	38.57989	0.0000

R-squared	0.153965	Mean dependent var	1.026915
Adjusted R-squared	0.148049	S.D. dependent var	0.159524
S.E. of regression	0.147243	Akaike info criterion	-0.983145
Sum squared resid	6.200583	Schwarz criterion	-0.945085
Log likelihood	145.0644	Hannan-Quinn criter.	-0.967895
F-statistic	26.02379	Durbin-Watson stat	0.065856
Prob(F-statistic)	0.000000		

Source: Modified by author

Figure 18. NAT - OLS Outcome after the correction took place

Dependent Variable: LOG_ADJ_CLOSE_
Method: Least Squares
Date: 08/11/15 Time: 23:11
Sample (adjusted): 1/11/2010 7/27/2015
Included observations: 288 after adjustments
Convergence achieved after 6 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_AVERAGE_TCE_$_DAY...	0.003226	0.001606	2.008970	0.0455
DUMMY_VARIABLE	0.022549	0.015506	1.454213	0.1470
C	0.975704	0.095415	10.22589	0.0000
AR(1)	0.986151	0.008113	121.5516	0.0000

R-squared	0.981340	Mean dependent var	1.025897
Adjusted R-squared	0.981143	S.D. dependent var	0.158858
S.E. of regression	0.021815	Akaike info criterion	-4.798687
Sum squared resid	0.135148	Schwarz criterion	-4.747813
Log likelihood	695.0110	Hannan-Quinn criter.	-4.778300
F-statistic	4978.595	Durbin-Watson stat	2.147398
Prob(F-statistic)	0.000000		

Inverted AR Roots	.99

Source: Modified by the author

Figure 19. OSG - OLS Outcome before correcting the autocorrelation problem

Dependent Variable: LOG_ADJ_CLOSE_
Method: Least Squares
Date: 08/11/15 Time: 23:09
Sample: 1/04/2010 7/27/2015
Included observations: 289

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_AVERAGE_TCE_$_DAY...	0.086293	0.016954	5.089870	0.0000
C	0.640305	0.064447	9.935295	0.0000

R-squared	0.082794	Mean dependent var	0.942390
Adjusted R-squared	0.079598	S.D. dependent var	0.445122
S.E. of regression	0.427039	Akaike info criterion	1.143015
Sum squared resid	52.33804	Schwarz criterion	1.168388
Log likelihood	-163.1656	Hannan-Quinn criter.	1.153182
F-statistic	25.90678	Durbin-Watson stat	0.050940
Prob(F-statistic)	0.000001		

Source: Modified by the author

Figure 20. OSG - OLS Outcome after the correction took place

Dependent Variable: LOG_ADJ_CLOSE_
Method: Least Squares
Date: 08/11/15 Time: 23:09
Sample (adjusted): 1/11/2010 7/27/2015
Included observations: 288 after adjustments
Convergence achieved after 6 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_AVERAGE_TCE_$_DAY...	-0.007502	0.004378	-1.713342	0.0877
C	0.653661	0.362008	1.805653	0.0720
AR(1)	0.988119	0.007834	126.1400	0.0000

R-squared	0.982162	Mean dependent var	0.939970
Adjusted R-squared	0.982037	S.D. dependent var	0.443989
S.E. of regression	0.059506	Akaike info criterion	-2.795133
Sum squared resid	1.009159	Schwarz criterion	-2.756977
Log likelihood	405.4991	Hannan-Quinn criter.	-2.779842
F-statistic	7846.285	Durbin-Watson stat	1.947685
Prob(F-statistic)	0.000000		

Inverted AR Roots	.99

Source: Modified by the author

Figure 21. OSG - OLS Outcome before correcting the autocorrelation problem

Dependent Variable: LOG_ADJ_CLOSE_
Method: Least Squares
Date: 08/11/15 Time: 23:13
Sample: 1/04/2010 7/27/2015
Included observations: 289

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_AVERAGE_TCE_$_DAY...	0.056727	0.006737	8.420356	0.0000
C	0.462963	0.025610	18.07778	0.0000

R-squared	0.198105	Mean dependent var	0.661549
Adjusted R-squared	0.195311	S.D. dependent var	0.189169
S.E. of regression	0.169693	Akaike info criterion	-0.702759
Sum squared resid	8.264336	Schwarz criterion	-0.677386
Log likelihood	103.5487	Hannan-Quinn criter.	-0.692592
F-statistic	70.90240	Durbin-Watson stat	0.090069
Prob(F-statistic)	0.000000		

Source: Modified by author

Figure 22. TNK - OLS Outcome after the correction took place

Dependent Variable: LOG_ADJ_CLOSE_
Method: Least Squares
Date: 08/11/15 Time: 23:04
Sample (adjusted): 1/11/2010 7/27/2015
Included observations: 288 after adjustments
Convergence achieved after 6 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_AVERAGE_TCE_$_DAY...	0.003888	0.002045	1.901361	0.0583
C	0.667607	0.162937	4.097344	0.0001
AR(1)	0.989871	0.008802	112.4558	0.0000

R-squared	0.978560	Mean dependent var	0.661083
Adjusted R-squared	0.978409	S.D. dependent var	0.189331
S.E. of regression	0.027820	Akaike info criterion	-4.315758
Sum squared resid	0.220577	Schwarz criterion	-4.277602
Log likelihood	624.4691	Hannan-Quinn criter.	-4.300467
F-statistic	6503.821	Durbin-Watson stat	2.049768
Prob(F-statistic)	0.000000		

Inverted AR Roots	.99

Source: Modified by author

Figure 23. OSG - OLS Outcome before correcting the autocorrelation problem

Dependent Variable: LOG_ADJ_CLOSE_
Method: Least Squares
Date: 08/11/15 Time: 23:12
Sample: 1/04/2010 7/27/2015
Included observations: 289

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_AVERAGE_TCE_$_DAY...	0.053456	0.005248	10.18689	0.0000
C	0.622064	0.019948	31.18469	0.0000

R-squared	0.265558	Mean dependent var	0.809198
Adjusted R-squared	0.262999	S.D. dependent var	0.153965
S.E. of regression	0.132177	Akaike info criterion	-1.202454
Sum squared resid	5.014103	Schwarz criterion	-1.177081
Log likelihood	175.7547	Hannan-Quinn criter.	-1.192287
F-statistic	103.7727	Durbin-Watson stat	0.142678
Prob(F-statistic)	0.000000		

Source: Modified by author

Figure 24. TNP - OLS Outcome after the correction took place

Dependent Variable: LOG_ADJ_CLOSE_
Method: Least Squares
Date: 08/11/15 Time: 23:03
Sample (adjusted): 1/11/2010 7/27/2015
Included observations: 288 after adjustments
Convergence achieved after 6 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_AVERAGE_TCE_$_DAY...	0.001110	0.001950	0.568993	0.5698
C	0.779931	0.080935	9.636457	0.0000
AR(1)	0.980430	0.010189	96.22404	0.0000

R-squared	0.970472	Mean dependent var	0.808188
Adjusted R-squared	0.970265	S.D. dependent var	0.153271
S.E. of regression	0.026430	Akaike info criterion	-4.418285
Sum squared resid	0.199083	Schwarz criterion	-4.380129
Log likelihood	639.2330	Hannan-Quinn criter.	-4.402994
F-statistic	4683.459	Durbin-Watson stat	2.040153
Prob(F-statistic)	0.000000		

Inverted AR Roots	.98

Source: Modified by author