

The importance of timing in energy shipping: a case from Cyprus

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Abstract:

Aim: Investment decisions in shipping are notoriously difficult. The key reason is that freight rates are highly volatile and often unpredictable. The energy shipping sector is most challenging. The paper formulates an investment decision rationale in energy shipping and provides insights as to the ability of experts to predict market trends when it comes to the oil tanker supply and demand and the resulting freight rates. Moreover, we focus on the timing of such investment decisions and ways to identify when the timing thereof is right. This paper aims to develop an investment decision framework in energy shipping, specifically investigating the importance of timing when making investment decisions in this sector, and to test the suggested rationale by applying it to a specific oil tanker purchase case.

Design / Research methods: The research process started with a Delphi study to gather expert opinions on the changes taking place in the shipping market. We continued our research process with a concise economic analysis of the 2018 shipping market, and we then applied the findings to a feasibility study for purchasing a specific type of small-scale (Aframax) oil tanker by a company based in Cyprus.

Conclusions / findings: Our main findings were that the opinions of the selected commercial experts supported the results of the secondary data analysis, and all the respondents found the year 2018 an attractive time for investing in ships. The results of an investment appraisal financial modelling exercise for the above-mentioned specific purchase case were satisfactory for accepting the project. Due to low purchase prices and high residual value, the initial required investment was lower while the return and other results would be better for a 15-year-old ship than for a 10-year-old unit. However, the risks were to increase together with age. Considering that the prices of Aframaxes were hitting their historically low levels in 2018, and that within the next five years the demand for modern tonnage was anticipated to be firm and thus raise their values up to 35% above the 2018 levels, the purchase of a more modern unit was recommended as it could give an opportunity of a beneficial resale at the end of the project or earlier. In view of the latest market developments, we can now conclude that overall, despite the unprecedented turbulence during the pandemic years, the 2018 investment recommendation proved correct and insightful.

Originality / value of the article: The current paper's intended contribution is an investment analysis based on the primary data from a relatively small shipping company. The disclosed primary data for the intended 2018 purchase of an Aframax oil tanker is unique. Thus, the current paper provides useful practical guidance for potential investors and other professionals who follow the energy shipping market as well as contribute to academic research in shipping finance by providing a framework that is applicable well beyond the described case study. Considering the upward move in the crude oil freight rates and anticipating investment interest in energy shipping, following the Covid-19 pandemic and the war between Russia and Ukraine, we believe that this research paper has a good timing.

Keywords: energy shipping, investment appraisal, oil freight market, shipping cycles, decision framework, decision timing

JEL: F44, G31, L22, L91, R42

1. Introduction

Investment decisions in shipping are notoriously difficult. The key reason is that freight rates are highly volatile and often unpredictable. The energy shipping sector is even more challenging. Recent events are another illustration. In 2022 there was a record boom in oil tanker freight rates. The war between Russia and Ukraine and the corresponding global tensions reshaped the macroeconomic scene, and the market entered a new era of changed seaborne oil trade flows. To be precise, it was on December 5, 2022, when the new era began with the enforcement of the EU ban on Russian oil trade. At the same time, the G7 price cap for crude oil and petroleum originating in or exported from Russia of \$60 per barrel went into effect. The year 2022 ended with critical macroeconomic challenges for the future of crude carriers and crude oil freight rates. As stated in a recent report (Bertzeletou 2022), there was uncertainty about how oil supply would evolve given current oil demand growth and the impact on trade flows. A year before that, pandemic concerns were at the top of the agenda due to the negative impact on freight rates, demand and supply of vessels, while the next year showed critical geopolitical challenges in the oil sector leading to an increasing change in demand for tonne-miles and days for crude oil transportation. The Signal Group report noted that the "IMO regulations and the net-zero emissions target for the next decade require major investments in improved green technologies to adapt ships to cleaner fuels. Fleet growth is slowing as more ships are scrapped and fewer new ships are ordered. Currently, more investment is flowing into the second-hand ship market as European shipowners will no longer be

able to meet the needs of the Russian oil trade destined for Asian buyers. (...) While uncertainties remain, all signs point to a solid increase in crude oil freight rates in 2023 and higher vessel speeds due to slower net fleet growth and higher growth in demand (tonne-days).”

This paper aims to develop an investment decision framework in energy shipping, specifically investigating the importance of timing when making investment decisions in this sector, and to test the suggested rationale by applying it to a specific oil tanker purchase case. The research process started with a Delphi study to gather expert opinions on the changes taking place in the shipping market. We continued our research process with a concise economic analysis of the 2018 shipping market, and we then applied the findings to a feasibility study for purchasing a specific type of small-scale (Aframax) oil tanker by a company based in Cyprus. Now, five years afterwards, we can draw conclusions on the usability of the particular investment decision framework and the critical role of timing in this case. In light of the current upward trend in the crude oil freight rates and anticipating investment interest in energy shipping, following the Covid-19 pandemic and the war between Russia and Ukraine, we believe that this research paper has a good timing.

Niels Bohr famously wrote: “Prediction is very difficult, especially if it is about the future.” Having noted this, the current analysis gives interesting insights into the investment decision rationale in energy shipping and the ability of experts to predict market trends when it comes to the oil tankers supply and demand and the resulting freight rates. Moreover, we focus on the timing of such investment decisions and ways to identify when the timing is right.

Our main findings were that the opinions of the selected commercial experts supported the results of the secondary data analysis, and all the respondents found the year 2018 an attractive time for investing in ships. Sentiments about the busy shipping market were high. Cash problems, massive aging, and new industry regulations were named as the main reasons for tighter supply in the next years. The demand was expected to increase steadily. The results of the investment appraisal financial modelling exercise for the above-mentioned specific purchase case were satisfactory for accepting the project. Due to low purchase prices and high residual

value, the initial required investment was lower while return and other results would be better for a 15-year-old ship than for a 10-year-old unit. However, the risks increased together with age. Considering that the prices of Aframaxes were hitting their historically low levels in 2018 and that within the next five years the demand for modern tonnage was anticipated to be firm and thus raise their values up to 35% above the 2018 levels, the purchase of a more modern unit was recommended at the time as it could give an opportunity of a beneficial resale at the end of the project or earlier. In view of the latest market developments, we can now conclude that overall, despite the unprecedented turbulence during the pandemic years, the 2018 investment recommendation proved correct and insightful.

The current paper's intended contribution is an investment analysis based on primary data from a relatively small shipping company. The disclosed primary data for the intended 2018 purchase of an Aframax oil tanker is unique and valuable. Detailed financials for this relatively small size of shipping investment (\$11 to \$19 million) are rarely published. Thus, the current paper will provide useful practical guidance for potential investors and other professionals who follow the energy shipping market as well as contribute to academic research in shipping finance. The framework is applicable well beyond the described case study.

The paper continues with a literature review on the nature of investments in ships as well as the corresponding risks. We give in section 3 a brief overview of the shipping business. Section 4 explains our case study research design and methods, while section 5 presents the 2018 oil tanker purchase case details. The paper's last section gives conclusions and comments on the paper's contribution.

2. Literature review, or why is investing in ships so challenging?

Numerous experts and academics previously raised the issue of investing in the shipping industry covering practical aspects of ship sale and purchase, management, and finance. Shipping investments have a lot in common with putting money into other tangible assets: they are of high “capital intensity, where the amounts borrowed are large, not only in absolute terms but also as a percentage of total asset value,” and they imply “business structures, where most ships are owned through

single purpose companies, often with bearer shares belonging to disparate groups with the overall perception of secrecy on both operational and financial matters.” (Stephenson, Harwood 2006, p. 71). Although there are many similarities, we must note peculiar characteristics that make the investment alternative studied riskier than others. Ships are movable assets, sailing between different jurisdictions in perilous conditions and traded in volatile markets. Ship values and earnings are hard to predict by outsiders and frequently experience sharp swings. Unsurprisingly, many investors feel fear and try to avoid this risky environment.

According to Mintzmyer, “a very privileged few of us do very well by trading on our ‘gut feelings’. The rest of us suffer from a natural ‘Recency Bias’, which is what also drives major forecasting errors across the markets. The majority of investors I work with view anything shipping related as a terrible investment idea, and a heavy number refuse to even consider trading opportunities.” (Mintzmyer 2017, p. 2). Often, the fears, wrong decisions, and lost opportunities appear because of lacking information and poor analysis. For well-informed players however, shipping investment can be very attractive. As mentioned by Marvest (2021), “the shipping industry is perfect for a long-term investment. Experience has shown that the returns are five to ten percent per year, so that a long-term investment can even be doubled.”

Those who want to take the most of this high return investment option should understand what the sources of revenue are and how the shipping business is arranged. “The demand side of the markets is represented by the need for freight transport, whereas the supply side consists of the ships that deliver the commodities” (Schinas et al., eds. 2014, p. 3). Most shipping companies own vessels in order to operate them and make money trading the ships and providing a transportation service – selling such transportation service with a profit. While there is a common focus at providing logistic services as a source of revenue, shipping investors can get a considerable income also from selling the asset. Unlike investments into many tangible assets, constructed or acquired for getting profits from operating them (e.g. hotels, power plants or factories), the value of a ship does not always decrease gradually over time, and may even increase after a few years. This gives opportunity for owners to earn on reselling the ship with a profit at the end of the project or

earlier, and this is based on another important peculiarity of shipping investments – the cyclical nature of the industry, as has been highlighted in the literature. “Shipping cycles are driven by market fundamentals affecting the supply of tonnage and the demand for transporting the cargoes” (ICS 2015, p. 7). Shipping cycles create an environment in which weak shipping companies are forced out, leaving the strong ones to survive and prosper, thus fostering a lean and efficient shipping business.

Martin Stopford, a famous British economist and shipping analyst, wrote in his seminal book “Maritime Economics”: “The practical importance of cycles cannot be understated. In July 2008, a 280,000 dwt tanker was earning \$170,000 a day, but just 12 months later in 2009 it was earning only \$11,000 a day. This volatility in earnings has a tremendous impact on the way everyone involved in the commercial operation of shipping views the business. For shipowners it offers an incentive to “play the cycle”, earning premium revenue when the market is high and, in an ideal world, fixing the ships on time charter or selling out just before the market moves into a trough.” Stopford identified 22 shipping cycles starting from 1741 until 2009. He argues that understanding this market mechanism is crucial for success and correct decision making. “For shipowners with many years in the business, the instinct that drives their decisions probably derives from the experience of past cycles, reinforced by an understanding of the international economy and up-to-date information obtained from the international grapevine. For those without a lifetime of experience, either newcomers to the industry or outsiders, the problems of decision making are daunting. Many bad decisions have been made because of a misunderstanding.” (Stopford 2009, p. 133)

The importance of timing received amply coverage in academics (Kim 1999; Sødal et al. 2007; Alizadeh, Nomikos 2007). To quote from Kim’s dissertation “A Strategic Model for Investment in Korean Shipping under the New Liberalization Treaty”: “The working of the longer-term adjustment mechanism in shipping is seriously hampered by the problem of imperfect knowledge about future market development. Shipowners regularly order vessels at the top of market, only to find that when they are developed freight rates have collapsed.” (Kim 1999, p. 30).

To the utmost, market hikes were possible due to easy access to finance in the previous years, but situation has changed a lot. “Ship owners have a constant need to raise money to support their activities. Their financial needs have to be predominantly covered by taking recourse to the financial markets” (Schinas et al., eds. 2014, p. 55). The relationship between the financial markets and the shipping markets has always been close, and the boom in the mid-2000s can be attributed as much to the easy availability of finance, while by 2015 the shipping market did not look “too attractive from a lender’s point of view with vessel in certain sectors barely able to cover operating expenses, let alone debt service” (ICS 2015, p. 9).

On one hand, since the rates freight rates driving factor is correlation of supply and demand (Kim 1999; Strandenes 2002; Klovland 2002; Stopford 2009; Lemper, Tasto 2014), this trend should reduce fleet oversupply happening due to reckless construction, revitalize the market and give opportunity to increase return from investment. On the other hand, it becomes even more challenging to convince investors and lending organizations that a shipping project is economically viable.

3. Overview of the shipping business

3.1. Major shipping markets

There are four major shipping markets that operate separately but influence each other and form the industry together, namely newbuilding, freight, sale and purchase, as well as demolition. One is followed by other they run through a life cycle of a typical modern ship.

The **Newbuilding market** increases the supply side of the shipping industry. When a ship does not exist yet, a purchaser, normally represented by a shipping, energy, or industrial company, is approaching a builder with a request for a design and construction of a new vessel at his shipyard. The whole process is lengthy and takes from 18 months up to 4 years. At the same time, prices are volatile in this market. It is not a single story that an owner purchased a ship when rates for transportation were at a peak level and dropped to the bottom when she was ready. The delivered ship caused even higher imbalance between the supply and demand,

becoming one more factor obstructing freight market to recover. A proper market research and forecasting before ordering will help purchasing party to avoid financial loss and failure.

The **Freight market** is playing the main role on a shipping scene. After sailing from shipyard and until being scrapped, with exception of just few months used for technical maintenance, any cargo ship is physically spending her whole life on the water and commercially in the freight market. Freight market contracts are called “charter party” and can be concluded on a voyage basis (Voyage Charter or Contract of Affreightment) and period basis (Time Charter or Bareboat Charter). Freight indexes for standard dry cargo and tanker routes are collected from a panel of shipping brokers and published on a daily basis by Baltic Exchange, an organization with an almost 280 years history based in London and providing information for maritime industry and assessment of freight markets. The criterion for defining the routes is the volume of trades, which has to be big enough to matter for the overall market. The freight market is a very conservative place. In spite of growing popularity of online platforms, mobile applications and other new technologies through different industries, communication at freight market did not change much over the past 15–20 years. Parties exchange with information and conclude deals via phone calls, emails and messengers. In the most cases, communication is done through brokers, who link the supply and demand sides. There can be one broker or two – one representing shipowner and one charterer. Brokers work for commissions, normally 1.25% from the freight and other voyage revenues. They are industry experts and one of the three major parties in the freight market. They give the latest market outlook, assess current and expected rates, help shipowners to find a suitable cargo for their ship and prepare contracts. However, to operate the ship, it is still extremely important either to have an experienced in-house commercial team or to hire a professional commercial management company that understand freight market principles, know players, have a wide contact base, will take right strategic decisions and ensure effective running of commercial management.

The **Sale and Purchase (S&P) Market**: at some stage, a shipowner might decide to sell the vessel. The potential buyers at S&P market normally represent the same categories of companies and have the same motives. Shipping companies buy

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vessels to operate and earn money providing transportation services. Energy and industrial companies need ships to ensure logistics of the own cargoes. Investors might consider participation in a ship's purchase as an alternative to diversify their portfolios and get a higher return. Speculators believe that the asset price will go up and they can earn on it. Yet, why would buyers prefer a second-hand to a new built? First, as an obvious reason – normally second-hand ships are cheaper than new built (with exception of short peak periods at the freight market). Second-hand ships are already partially depreciated, and their price is less volatile than with the more modern tonnage. In the absence of long-term contracts or joint ventures, purchase of second-hand tonnage can be a safer option to invest. It is easier to predict earnings during the next 5–10 years than during the following 10–20-year period. If the market does not pick up during this period, the ship can be sold for scrap at a price that in most cases will be close to the net book value. Another reason, as mentioned before, is that the second-hand tonnage is more valuable than the new built tonnage at a peak market. One can get a ship into ownership immediately without need of waiting several years of construction when prices will imminently drop. Finally, a rare ship's specification may be required for a particular projects or trade. For example, ships with enforced capabilities of sailing in severe ice conditions have high demand in Arctic regions regardless of their age. Deals at the sale and purchase market are typically concluded through brokers. Similar to the freight market, S&P brokers work for commission paid by the seller (normally 1% from the sale revenue) and will accompany an investor through a process of ship's purchase.

The **Demolition Market**: after years of trading at freight and S&P markets, ships end their life at scrap yards. Recycling is balancing fleet supply and is a source of revenues for shipowner. The process is pretty much the same as at the S&P market, however in this case the owner is selling his ship to demolition yards. The usual lifespan of a modern merchant ship is 20–30 years. Each owner decides himself when to scrap a ship. The main factors that influencing his decision are financially driven:

- International statutory regulations, which require serious retrofitting for compliance and can be very costly; limitations for usage of ships above the certain age, set by large industrial companies acting as charterers and making ship hardly

tradable – e.g. most oil major companies, like BP, Exxon, Chevron, Lukoil, etc., impose condition assessment programme (CAP) limitations by classes with high rating after 15–20 years and do not accept any tankers older than 25–30 years;

- Technical condition of the ship: sometimes it can be more practicable to scrap an old ship than to maintain its technical condition;

- Freight market conditions: at bullish markets, when rates are inflated, owners will keep trading their ship as soon as possible or try to resell at a high price, whereas during recession years, owners might decide to avoid losing money paying operating expenses and to scrap their ship several years earlier.

The sale process is handled by demolition brokers. They communicate with buyers and help to arrange formalities. The buyers are normally the intermediaries that buy a ship and passes it to the yard where the ship will be scrapped and recycled. The broker gets a commission from the seller (normally 1% from the price) and buyers intermediaries deduct their address commission (normally 3%) prior paying to the seller. Major demolition yards are in Asia – China, Bangladesh, India and Pakistan. However, it is also possible to scrap a vessel also in Turkey. Rates are calculated per ton of ship's weight (light displacement ton or LDT) and are driven by the condition of steel market. Prices differ also from country to country. For instance, demolition prices, in November 2017, were 400 \$/LDT in Pakistan, 390 \$/LDT in India, 380 \$/LDT in Bangladesh, 265 \$/LDT in Turkey and 230 \$/LDT in China. Another factor that has influence on demolition price is the Hong Kong Convention that addresses environmental issues of scrapping, utilization of hazardous substances, working conditions, and requires “green” recycling. The convention was adopted in 2009, but it was not in force in 2018 (IMO 2018), and it has still not been adopted by the required percentage of countries as of early 2023.

Currently only few yards comply with the requirements of the Hong Kong Convention. “Green” recycling is normally discounted for 20-30 \$/LDT compared to the usual recycling and is used mainly by the companies as a part of their Corporate Social Responsibility program or experiencing outside pressure, with e.g. stock listed companies. However, the Hong Kong convention can come into force during the period of owning the vessel and prospective investors should keep it in mind. Another factor to consider about ships scrapping are additional costs to be

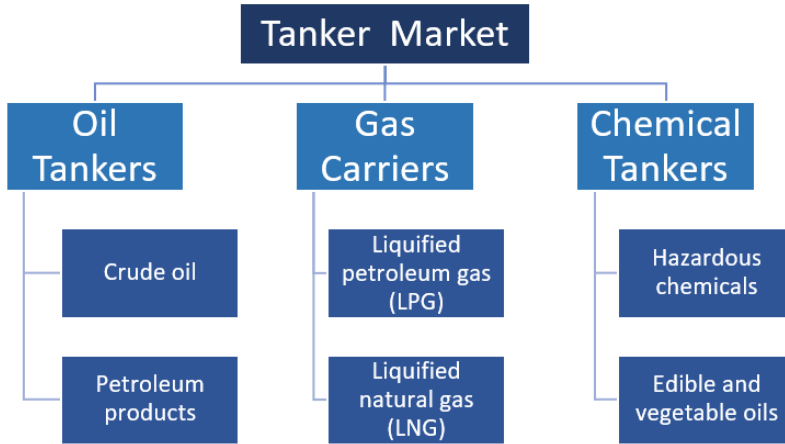
borne by the seller, which include costs of repositioning of the asset to the yard and expenses for preparatory jobs, such as gas free works in fuel and cargo tanks, agency charges, crew repatriation and other miscellaneous costs.

Activities at the four shipping markets mentioned above, though going in parallel, are closely interacting. As well summarized by Stopford (2009, p. 179), “these four markets are linked together by the cash flowing through the balance sheets of the companies... The freight market generates cash; the sale and purchase market moves it from one balance sheet to another; the newbuilding market drains it out of the market in return for new ships; and the demolition market produces a small inflow in return of old ships.”

3.2. Segmentation of shipping markets

Newbuilding, Freight, S&P, and Demolition markets are driving the industry function within the same distinct segments: passenger, specialized, liner, dry cargo, and tanker shipping. The segments are distinguished from each other by the traded commodities and types of the ships, used for their stowage and transportation.

Since the case to be dealt with later in this paper concerns a company that is operating oil tankers, we are giving additional information for this sector. Modern tanker ships are designed for different liquid commodities and can be segmented further by loaded cargoes (see Figure 1). Shipowners, charterers, brokers, and other players interact within the same subcategories of the four shipping markets.

Figure 1. Segments of the tanker market

The market of oil tankers is operating ships to be classified by product, size, and deadweight capacity (maximum weight of cargo and stores they can lift), as shown in Figure 2.

3.3. Shipping cycles

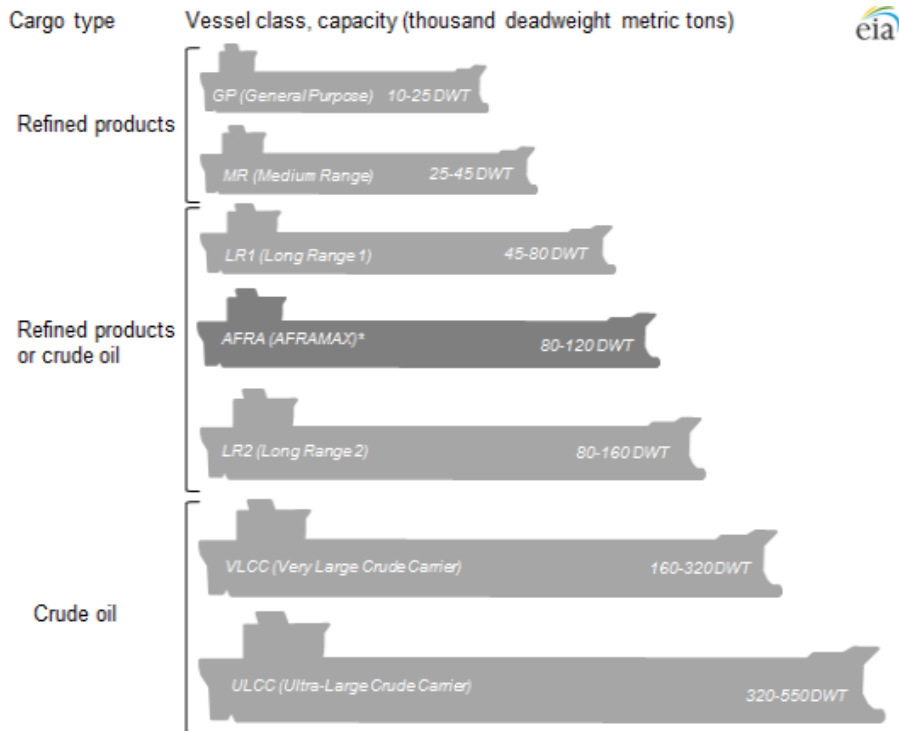
In 1922–1925, the Russian economist Nikolai Kondratiev published several papers and books describing a phenomenon of “long waves”, lasting 50–60 years, striking different areas of economy and characterized by four primary cycles. His theory raised multiple academic discussions and studies and led to the expansion of the idea of business cycles, which became particularly popular in the middle of the 20th century.

The major contribution in research of business cycles in the shipping industry was done by a British economist and shipping guru Martin Stopford. He found evidence and showed that the maritime economy had cyclical fluctuations and trends throughout its long history. Stopford defines three major elements of the cyclical time scale.

1) **Long shipping cycles** – last 50–60 years and like Kondratiev Waves they are driven by technical, economic, or regional factors (Stopford 2009). These factors have a direct impact on the technical development of maritime fleet, trading

patterns, and markets. Thus, despite long cycles being hard to identify, they are of utmost significance and deserve attention.

Figure 2. Classification of oil tankers by size



2) **Short cycles** – last 5–10 years and represent the “typical” shipping cycles, driven by supply and demand correlation and consisting of four distinctive stages:

1. *Trough* – Characterized by surplus tonnage, minimum freight rates and financial pressure leading companies to stagnation, demolition or laying-up of the tonnage, distress or even closure. The market value of the vessels decreases.

2. *Recovery* – Characterized by balancing of tonnage supply and demand for transportation, growing confidence, and sentiments.

3. *Peak/Plateau* – The supply-demand curve is balanced or there is even a lack of versatile tonnage. Freight rates grow rapidly, sometimes reaching sky-high levels. Shipowners feel euphoria, all operational vessels are taken out of

lay-up, scrapping of old tonnage is stopped, banks are keen to lend money, shipping companies and investors are hastily placing new orders for construction at shipyards. The market value of the vessels increases.

4. *Collapse* – The volume of the tonnage is growing, which gradually results in oversupply. Freight rates start falling. Vessels market values remain high as ship owners are unwilling to believe that the peak is past.

Each of the stages might last several years, however duration might not equally repeat every cycle.

3) **Seasonal cycles** – are freight rates variations that regularly occur in different shipping markets during the specific periods of the year because of seasonal changes in demand.

Just a few examples – demand for bulk carriers increases during the harvesting periods, normally summer and autumn; ice-class vessels are paid more in northern regions during the winters; the peak season for oil tankers falls on mid-autumn – mid-spring, when electricity and heating demand increases.

The shipping industry was always an area for smart and courageous people, where successful business decisions were often ruled by gut feeling and talent of the best ship owners rather than recommendations of analysts. And while understanding of the cycles is crucial for those who want to succeed in shipping long-term, it is helpful to also know the practical aspect of the issue.

3.4. Leading experts on the shipping market outlook in 2017

In 2017, several leading shipping people shared their views and tips for investors (Pierce 2017).

John Hadjipateras, CEO at Dorian LPG, a liquefied petroleum gas shipping company and a leading owner and operator of modern very large gas carriers (“VLGCs”), admitted that volatility could not be eliminated, but he believed that it could be made a friend. He makes his investment decisions based on market judgements, not on outside fads. “The price doesn’t matter much if you’re buying or selling at the right point in the cycle”. Another principle is mitigation of risks through a strong balance sheet. “No matter how good the deal, there’s a chance

things don't go as hoped for. If it turns to be a loser, then be sure the loss can be absorbed”.

Harry Vafias, president and CEO of StealthGas Inc., an international provider of seaborne transportation services primarily to the liquefied petroleum gas sector (LPG), noted: “It's not easy to detect if an upturn is a solid rise or dead cat bounce. Some signs include: charterers taking ships on longer periods, forward freight agreements firming, reduction of demolition activity and people waiving inspections. If indeed it's a solid rise, then the faster you buy ships, the better”.

The secret of George Economou, a Greek billionaire shipowner, CEO of DryShips Inc. and Ocean Rig, and the owner of Cardiff Marine, is to be comfortable with the order book (showing estimated supply), to consider the forward demand, to have low financial leverage (increasing staying power), to invest at the trough and to exit before the peak.

According to Norwegian Co-CEOs of the stock listed DHT Holding, an independent crude oil tanker company, Svein Moxnes Harfeild and Trygve Munthe, it is a right time to invest when “asset prices are low, demand is strong, and the order book is dwindling.”

3.5. Assets valuation

A cargo ship is a tangible asset and from time to time requires valuation saying how much it is or will be worth at a certain moment. Often values change rapidly and vary a lot during the life cycle of a vessel. They are influenced by market returns, volatility, competition, outside pressure (safety and environmental regulations), future expectations and uncertainty.

It is important to note that valuation of a ship does not equal to its inspection. If checking documents or physical survey discover problems, this can be a reason for cancellation of a deal and negotiating a discount for purchase price. Yet, this has nothing to do with the official valuation, which is based on the assumption that a ship is in a good and seaworthy condition.

Valuation is governed by other principles and is normally performed by sale and purchase brokers. Though various brokers have subjective and not always precisely

the same opinions, all of them are using one of the following approaches, each of them having its benefits and limitations.

1. Market approach (last done)

This is the most frequently applied method, where the ship is valued by comparison to a sale of a similar unit in recent dates. The main factors taken into consideration and used for adjustment of the previous transactions are vessel type, age, size, cargo capacity, technical specifications, and additional conditions, like a contractual burden, place of delivery, dates of the compulsory maintenance in dry dock, etcetera.

Pros: It is a quick and quite reliable method of assessment in a transparent and properly functioning market environment.

Cons: In markets with more implicit reporting or a rare number of transactions, there might be insufficient data for a fair assessment. In addition, in bearish conditions with uncertain perspectives, weak companies are less resistant and are keener to sell their assets cheaper than their strong competitors who can afford to hold a reasonable price.

2. Cost approach (replacement cost)

This approach is normally used in market segments, where replacement unit cannot be bought or delivered fast. These are mostly the customized special purpose vessels engaged into sophisticated projects; for instance, floating oil refineries, drill ships, heavy lift or research vessels. According to the cost approach, vessels are valued on a basis of expenses a seller would incur for supplying a replacement unit with similar characteristics in the present conditions. Normally it is the cost of a newbuilding adjusted for depreciation.

Pros: The method allows to make valuation without having a recent market reference.

Cons: The number might not reflect a fair market valuation or, in other words, a price other buyers are ready to pay.

3. Income approach

This is a financial method, where the value of a vessel equals to a net present value (NPV) of all future cash flows generated from operating her plus the residual

value from resale or demolition. This approach is considered to be the most precise. It is based on theory and is supported by results of financial model.

Pros: It is based on a well-rounded and well documented methodology, which takes into consideration future projection and economic conditions.

Cons: The virtues of this approach can become its shortcoming. The method requires assessment of many input parameters. Wrongly selected assumptions can lead to false judgements and inaccurate valuation. NPV might not always coincide with the market (last done) value.

Attempting to reduce the effect of the shortcomings and to get a universal and safe method of appraisal, valuation standards have been developed.

In 2009, the Hamburg Shipbrokers Association introduced a methodology named Long Term Asset Value (LTAV). In line with the Income approach, it is based on the Discounted Cash Flow model (DCF). However, for taking into consideration also the volatility of shipping market, it is supplemented by conservative and statistically proven principles.

According to LTAV, estimated revenues, expenses and demolition prices can be replaced by the relevant average historical values measured in the last 10 years for the vessel of similar type. The last 10 years LIBOR plus bank margin is taken as the cost of financing in the model. The economic life is considered to be 20 years for ships of age less than 15 years, and 25 years for the ships of 15-year-old and above. Karatzas published several papers on the valuation of ships, one such paper in 2009.

Although LTAV is widely accepted and used by e.g. PwC, it is important to understand its disadvantage. The risk lies in the reliance on a historical period, which might include abnormal conditions such as the market boom in 2008, which will unlikely be repeated in the nearest time.

Another example of a valuation standard is drawn from the “Pfandbrief” Act, commonly used in Germany for issuing bonds. It is a conservative method, stipulating that the value of a ship is the least out of the market value, replacement cost and the average 10 years historical price for a similar unit. Such valuations are used for issuing bonds in the German capital markets, and the law indicates that the value of a vessel shall be the least of a) replacement cost (construction cost for a

newbuilding), b) present market value of the vessel, or c) the average historical value of similar vessels in the last 10 years.

As can be drawn from the above, none of the methods and standards can fully eliminate all risks and shortcomings. This is a task of the investment advisors and their principles to choose fair assumptions and approaches that suit best for the project at hand.

3.6. Legal and administrative aspects of a shipping project

There are many legal and administrative aspects involved in purchasing and operating a ship. This section will give a brief outline of key things to know for the project stakeholders and that are also required to consider for further research and analysis.

Single-Vessel Company (SPC)

Typically, though not always, ownership of a vessel is legally registered in terms of a separate legal entity, called a single-vessel or one-ship company. It is a form of a special purpose company (SPC), having the following reasons for use:

- *Capital reasons* – the SPC structure allows investors, participating in a project, to share ownership of the particular vessel and banks are also keener to give a mortgage to the company, secured by its only asset and not affected by other obligations;
- *Security reasons* – the limited liability of SPC isolates the parent companies of investors and beneficial owners from the financial risks and covenants connected with buying and operating a ship;
- *Accounting reasons* – owning an asset through a special purpose entity gives flexibility to achieve the financial ratios required by regulations (e.g. the Basel Standards) and desired by stockholders of public companies;
- *Legal reasons* – with a one-ship structure it becomes hard to identify and sue a real beneficial owner of the vessel;
- *Regulatory reasons*, such as jurisdiction of ownership.

Jurisdiction

To be allowed to trade in international waters, a ship must have an IMO number (for unique identification), a name, a flag (nationality) and a port of registry. Various

countries have conditions for registration and running a ship under their jurisdiction. Traditional maritime countries (e.g. UK, Greece, Norway) have stricter rules. They require that the owning company shall be registered within the country of its ship nationality. Besides, they apply a high level of control over the ship's condition, tax liabilities, safety and employment rules. In contrast, there is a number of countries that do not have a compulsory requirement for the owner's nationality and are often called "open registries" or "flags of convenience". Apart of this, these countries have other incentives for committing with them, such as easier safety procedures, lower wage floors and requirements to technical condition allowing to reduce running costs, tonnage tax per registered ton instead of profit tax, flexible corporate and mortgage laws, avoidance of trade sanctions and political risks. The negative impact of flags of convenience, such as exposure to safety and strong resistance by trade unions, was reduced by international conventions for minimum safety and manning standards and regular external inspections. Currently, the share of open registries in the world fleet is more than 50%, with Panama, Liberia, Marshall Islands, Malta, and Bahamas being in the top 5 and Cyprus holding the 6th place by number of ships registered.

Ship management

Every shipowner needs a team of professional managers to operate the ship. The job of ship managers starts already during construction and, in most cases, during the process of acquiring a second hand ship. At this stage, they inspect the ship, ensure the transfer of an asset and related equipment according to the sale form, arrange registration and obtain approvals by class societies. Depending on its competences and size, a company that is buying ships as an investment, might need a partial or a full management by third parties, which includes:

- *Commercial and operations management* – ensures employment for the ship and execution of the contract, including chartering, operations, post-fixing activities and claims handling;

- *Technical management* – ensures maintenance of ships condition and certification according to the statutory international regulations with staff normally consisting of senior seagoing officers, masters and chief engineers.

- *Crew management* – tasked to supply the ship with a crew, to monitor compliance with manning requirements of labor conventions, oil majors and governments, to pay wages, arrange training and repatriation of the ship staff;

- *Administrative management* – deals with registration of the companies, changing jurisdictions, accounting, and passing financial audits.

More than a third of the world's tonnage is outsourced to third party ship managers. Relationships of ship managers and owners is regulated by a management agreement. The main things to know about such contract include:

1) The ship manager gets a fixed fee plus possible performance bonuses from the owner for running his ship;

2) The ship manager takes the role of an agent for the owner with limited areas of responsibility, where he will act as a principal.

The main locations for large ship management companies are Limassol (Cyprus), Dubai (UAE), Hamburg (Germany), Manila (Philippines), Hong Kong, and Singapore.

3.7. Cash flow from running the ship

When investing in a ship, it is important to project the future cash flows, taking fair assumptions and making sensitivity analyses. When reviewing the freight markets, we already pointed out the four possible employment options – voyage charter, contract of affreightment, time charter and bareboat. The first two are concluded on a voyage basis and the last two on a period basis. Each of these options has its own sources of revenues and set of costs.

1. Revenues

The main revenue items are:

Voyage charter and COA (Contract of Affreightment)

Freight – a payment received by the owner of the vessel for transportation of charterers' cargo from point A to point B. It is normally paid and calculated at a rate per unit of weight or volume of the cargo, or at a fixed lump sum fee of for instance, \$10 per metric ton of cargo loaded, or \$200,000 regardless of the quantity loaded.

Demurrage – a premium charged from the charterer by the owner for using the vessel above the maximum time agreed as per the charter party (contract). It is

imperative to understand that every single second of utilizing the vessel is paid by one of the stakeholders (owner, charterer, insurance company, etcetera) from when it is built and until it is scrapped. Demurrage allows an owner to cover his expenses and lost opportunities if a voyage is delayed. It is normally calculated as a rate per day, for instance, \$200,000 per day pro rata.

Other voyage claims – reimbursements for fulfilling special provisions, For instance, extra fuel burned for proceeding at higher speed, or deviating of the vessel to other place than originally agreed.

Time charter and bareboat

Hire – a payment received by owner of the vessel for using (“renting”) his vessel by charterer during the certain period of time. It is calculated at rate per day, for instance, \$15,000 per day pro rata. The hire rate is lower for bareboat charterer than for time charter, as in in the first case operating costs are paid by the charterer, whereas in the latter case they are remaining “on owners’ shoulders”.

Other charges – reimbursements for extra insurance and similar additional items requested by charterers.

2. Expenses

Although academically speaking not entirely correct, expenses are in practice often equalized to costs. Two major categories of costs, *fixed* and *variable* costs, can be split for *capital*, *running* and *voyage* costs, see also Table 1 and refer to Figure 4 as well.

Capital costs are fixed and depend on how the ship is being financed. The different ways of financing include private equity, Initial Public Offerings, bank loans and mortgages, bonds, leasing, private placements, and special forms of financing, like what is abbreviated in German as KG and KS. The possible alternatives will be described in more detail in the next section. Depending on the terms of financing, capital costs include debt repayment, interest costs, dividends, and depreciation.

Running costs are another type of fixed costs, incurred regardless of whether the ship is trading or stays idle at the moment. Operating expenses (OPEX) are payable for day-to-day handling of the vessel. They include crewing, stores, spare

parts, engine lubricants, maintenance, administrative, insurance and management costs. These costs depend on many factors, such as type, age, size, condition of a ship, number and nationality of crew members, ship registration, trading area, etc. Another cost payable for running a ship, apart from OPEX, is periodic maintenance. This includes costs for special survey and dry-docking payable not on a daily or annual basis, but on a period basis. Normally, a modern ship has to pass special survey and dry docking every five years and intermediate survey every 2.5 years (in-water for ships younger than 15 years and in dry-dock after 15 years).

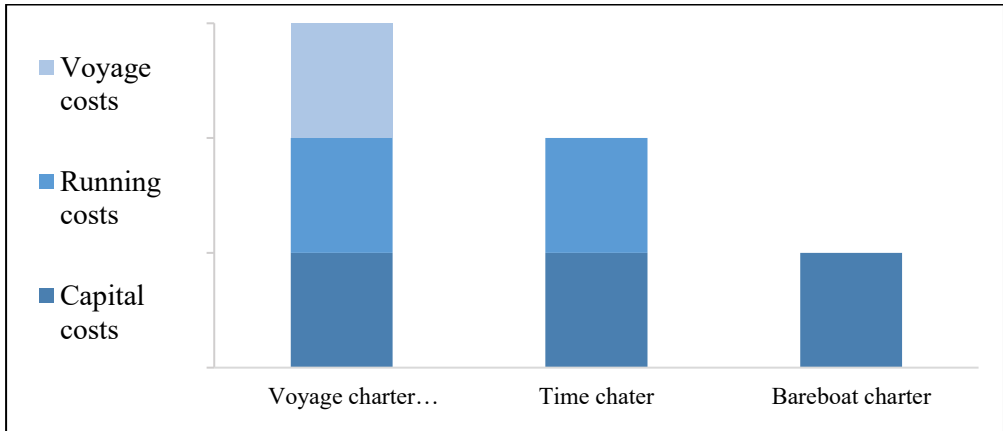
Table 1. Breakdown of shipowner's expenses

Category	Type	Cost
Fixed Costs	Capital Costs	<ul style="list-style-type: none"> • Depreciation • Debt repayment • Interest / dividends
	Running Costs	Operating expenses (OPEX) <ul style="list-style-type: none"> • Crew • Spare parts and stores • Lubricants • Maintenance and repairs • Insurance • Administrative costs • Management fees Periodic maintenance <ul style="list-style-type: none"> • In-water special survey • Dry docking costs
Variable Costs	Voyage Costs	<ul style="list-style-type: none"> • Bunker costs (fuel) • Port costs • Canal transit costs • Taxes and dues • Cargo handling costs

Voyage costs are costs associated with the performance of a specific voyage and contain bunkers, port expenses, charges for transiting canals, taxes and dues on cargo and freight, cargo handling and other similar costs. They vary from one voyage to another depending on the route and dates of the voyage, ports of loading

and discharging, quantity of the transported cargo, terms of agreed charter party, price of bunkers, weather conditions, etcetera.

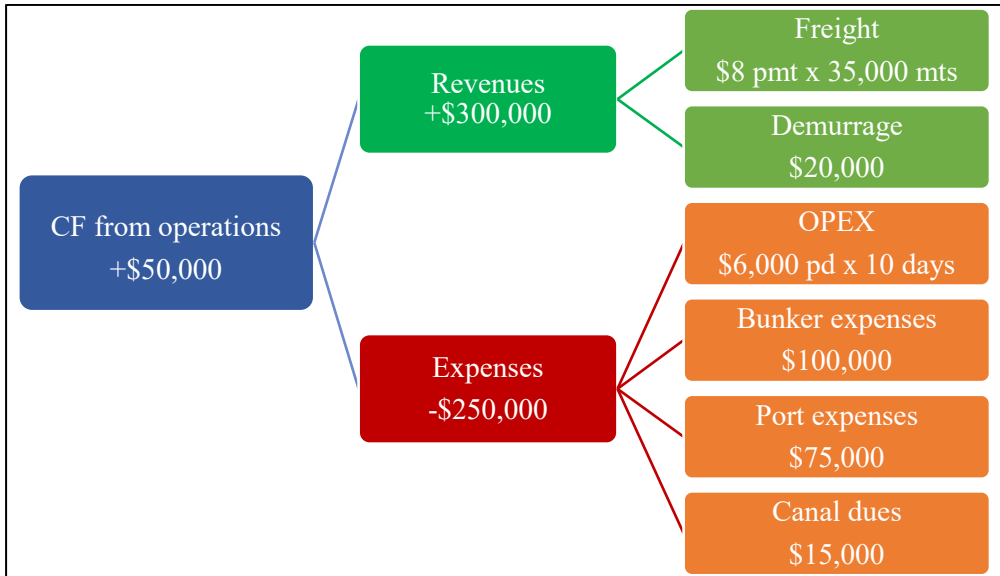
Figure 3. Structure of expenses under different types of contracts



3. Cash flow from voyage operations

Now, once we have described the structure of revenues and costs in vessel operations, we will draw in Figure 4 a typical map of operations cash flows using an example of a tanker making a voyage with duration 10 days for transporting 35,000 metric tons of petroleum cargo from Novorossiysk (Russia) to Eleusis (Greece).

If we assume that the vessel will operate 350 days a year (i.e., a full year excluding 15 days interruption for maintenance) and would be employed for the same trade in direct continuation, she could do 35 voyages. If freight rates and expenses remain without changes during the whole period, the annual profit from operations would be equal to $\$50,000 \times 35 = \1.75 million.

Figure 4. Typical cash flow (CF) from voyage operations

4. Time Charter Equivalent

Finally, it is important to define **Time Charter Equivalent (TCE)**, which is not a part of the accounting cash flow statement but based on what has been discussed above and is used as an essential indicator for cash flow analysis in the shipping industry.

The Time Charter Equivalent is calculated by subtracting voyage expenses (variable costs) from the voyage revenues and then dividing for the duration of the voyage.

$$TCE (\$/day) = \frac{\text{Voyage Revenues } (\$) - \text{Voyage Expenses } (\$)}{\text{Duration of the Voyage } (days)}$$

In our above example, the TCE would be calculated as follows:

$$TCE \left(\frac{\$}{day} \right) = \frac{\$300,000 - (\$100,000 + \$75,000 + \$15,000)}{10 \text{ days}} = 11,000 \$/day$$

Although TCE is not an accounting measure by GAAP (US) or IFRS (international) standards, the shipping companies often include this information in

their financial statements. This has several purposes. First, as the name says, it is used to define a time charter hire rate, which in ideal circumstances should equal to the projected voyage based TCE. Second, it measures daily revenue during a certain period and gives a quick assessment of the performance. If TCE is more than the running costs, a voyage generates profit. If TCE is positive but less than the running costs, a voyage ends with a loss. If TCE is negative, it is cheaper to stay idle paying running expenses than doing a voyage. Third, it can be applied for benchmarking through a comparison with a market TCE, calculated on the basis of a standard freight index (e.g. Baltic Index). Fourth, it is a tool for deciding between different employment opportunities and choosing the most efficient. Under other equal conditions, it is preferable to fix the shorter voyage with a lower profit and higher TCE than an alternative longer voyage with a higher profit and lower TCE. Choosing the first opportunity, the performance will be more efficient, and the vessel will be ready earlier for the next employment.

3. Research design and methods

The research process started in 2018 with a Delphi study to gather expert opinions on the changes taking place in the shipping market (see section 3.4). We continued our research process with a concise economic analysis of the 2018 shipping market, and we then applied the findings to a feasibility study for purchasing an Aframax oil tanker by a company based in Cyprus. While the specific feasibility study represents just one case and, inevitably, has its limitations, this case however describes a typical “small” decision, for which detailed financials are rarely publicized. In line with Yin (2014), the focus of the specific case study is on the decision-making process. A close examination of a specific case study is helpful to researchers because first, it allows the development of a nuanced view of reality, and second, cases are important for researchers’ own learning processes in developing the skills needed to do good research. Developing skills to a high level, based on a concrete, context-dependent experience, is central for all professionals, as a matter of fact. Concrete experiences are achieved via continued proximity to the studied

reality and via feedback from those under study. Every academic discipline should encompass a substantial number of case studies, since, as argued by Flybjerg (2006, p. 242), "...a discipline without a large number of thoroughly executed case studies is a discipline without systematic production of exemplars, and that a discipline without exemplars is an ineffective one. In social science, a greater number of good case studies could help remedy this situation."

In the current paper, qualitative methods, such as interviews with experts and personal observations, were combined with quantitative data, both primary and secondary, to set a conceptual decision framework for the purchase of an oil tanker and to apply it to the specific case.

The quantitative primary data was gathered from the Company's past financial reports. The analysed secondary data included numerous brokers' reports, market outlooks and surveys, and related business articles.

The qualitative interviews of the Delphi study were completed in several groups and rounds. The first group consisted of five industry experts. All respondents had substantial experience, expertise, and insight knowledge of shipping market processes, but showed different profiles: S&P broker, Managing Director of a company owning and operating tanker fleet, CFO of an investment company focused on Shipping and Offshore project investments, Chartering Manager in an oil company, and Tanker broker. Experts were interviewed for the first time in the period of October-November 2017. These were friendly, but professional one-on-one dialogues, performed face-to-face or using instant messengers, and starting from small talks to explain necessity of impartial answers and to drive respondents into the subject. Each of the respondents was asked the same questions. In April-May 2018, all experts were contacted again, reminded about their answers, and were asked again about their opinions. It is interesting that neither of the experts changed their opinions.

The second group was uniform and consisted of technical experts representing four top ship management companies. The companies were screened by their market reputation and experience of handling crude oil tankers. The principle was the same. Each respondent was asked via email a number of similar questions, which had two

main purposes – to compare candidates for technical management if the investment project is realized and to get reliable data for a financial feasibility analysis.

The feasibility study included the preparation of a sophisticated financial model in Excel, for which we explain the variables and inputs below. The latter are very seldom publicized, if at all, and acquiring them goes with building up trust and understanding. Stemming from an experienced shipping company, this is valuable primary data.

4. 2018 Oil Tanker Purchase case study

4.1 The Company overview

The Company used in this case study was based in Limassol, Cyprus, and provided the following services in 2018:

- Seaborne cargo transportation: carriage of liquid bulk and chemical trades, combining spot voyages, time charter, and contract of affreightment solutions;
- Commercial management: a full range of ship management services, including chartering, post-fixture operations, demurrage and claims handling;
- STS and storage solutions: a highest quality service in ship-to-ship cargo transfer as well as provide floating storages;
- Bunker services: efficient bunkering solutions and brokerage services to shipowners and vessels operators;
- Advisory support: expertise and practical advice in commercial, operational, and financial areas across diverse shipping sector, with the ISO 9001 certification for research and consulting activities.

The Company managed to consolidate in its portfolio:

- industry giants such as Litasco, Vitol, Trafigura and Glencore, who chartered the company's vessels on a regular basis and in a few instances entered in long-term agreements or joint ventures;

- a large panel of shipping brokers from different countries and regions, who gave prompt access to market overlooks and outlooks and helped to employ the vessels;
- a worldwide net of small local agents, suppliers and service providers, who assisted with a very specific task or information essential for commercial and daily operations job.

An internal analysis showed that the main strengths of the company were its well-established business model, tuned operations, and extensive experience in commercial management. Managing own ships in the highly competitive industry, where all firms have in their possession similar tangible resources, did not provide an advantage by itself; however, the business relationships, organizational culture and managerial skills of the company made the difference. These intangible resources formed the core competences, were hardly imitable, gave sustainable competitive advantage and allowed participating in the ship investment project.

5.2. Choice of the vessel type for the project

The Company was operating oil tankers and was looking to make an investment in this market segment. The management of the Company suggested focusing on large Aframax tankers (deadweight DWT 110,000 – 115,000 metric tonnes)¹. The reasons were as follows:

a) Wide geography of trade and worldwide demand:

“Due to their favorable size, Aframax tankers can serve most ports in the world. These vessels serve regions that do not have very large ports or offshore oil terminals to accommodate very large crude carriers and ultra-large crude carriers. Aframax tankers are optimal for short- to medium-haul crude oil transportation. Aframax class tankers are largely used in the basins of the Black Sea, the North Sea, the Caribbean Sea, the South and East China Seas, and the Mediterranean.” (Wikipedia n.d.). Such geography of trade minimizes lack of demand risks due to

¹ An Aframax is an oil tanker with a DWT between 80,000 and 120,000 metric tonnes. The term is based on the Average Freight Rate Assessment (AFRA), a tanker rate system created in 1954 by Shell Oil to standardize shipping contract terms (EIA 2014).

local instability or political changes. In addition, it allows to utilize vessel more efficiently finding arbitrage trades and backhaul cargoes.

b) Aframax tankers are often utilized as floating storages for crude oil and petroleum products. Normally, the requirements for floating storages set by major oil companies are less strict than for tankers involved into conventional operations e.g. in respect of maximum age, which gives additional opportunity of employment.

c) As a charterer and vessel operator, the Company gained vast experience of transporting cargoes by Aframax size tankers and commercially managing these ships.

d) Aframax tankers are relatively heavy, which ensures substantial residual value and increases upside risks of selling the asset for scrap, if prices for steel rise.

5.3. Analysis of secondary data

We give a summary outlook of the 2018 shipping market. The year 2018 was named in multiple sources as the bottom of the crude tanker cycle by the following reasons:

- OPEC/Russia crude oil production cuts;
- high fleet growth since 2016;
- dramatic decline in tanker floating storage over the course of 2017;
- accelerated crude oil stocks draws due to rising crude oil prices;
- decreased Venezuelan crude exports.

While the situation in 2018 was depressing, it had a positive influence on the industry by forcing owners of old tonnage to scrap their old ships thus reducing the supply and giving a ground for growth of rates in future. The beginning of 2018 proved to hit the 35-year record of demolition.

“Tanker scrapping has started 2018 with a bang, as a combination of low freight rates, high scrap prices, an aging tanker fleet, and the impact of upcoming vessel regulations have combined to create the perfect “scrap storm”. Since the start of the year a total of 8 mdt of tankers have been scrapped, including 17 VLCCs, 3 Suezmaxes and 14 Aframax. The average age of scrapping has been 20 years, though the total includes a significant number of vessels in the 17–18-year category. This indicates that many Owners are deciding not to go through with the 17.5-year

intermediate survey. If this pace of scrapping is maintained for the rest of the year, tanker fleet growth could be close to zero in 2018 (or even negative for the first time since 2001). Our view is that low earnings and high scrap prices will continue to spur scrapping throughout the year” (Teekay 2018).

However, as we know from the literature on shipping cycles, a trough gives place to recovery. Experts of Gibson Shipbrokers believed that that the active scrapping activity would continue. They named regulatory pressures (e.g. ballast water management, bunker spec) and an aging fleet as the main factors. The conclusion in 2018 was that the steady scrapping combined with decreasing orders of a new tonnage will reduce the growth of global fleet and will balance the supply.

Marine transport advisors McQuilling Services LLC noted on the demand growth in their market outlook: “According to the International Monetary Fund, global growth is on track to expand 3.7 percent in 2018, an upward revision from previous expectations. Global crude supply is projected to rise by 1.5 million b/d in 2018, despite continued efforts from OPEC and non-OPEC countries to rebalance the markets and normalize inventory levels. Crude and residual fuel ton-mile demand is projected to increase by about 1 percent on an annual basis throughout the forecast period with a decelerating trend observed in the outer years of our forecast. We project 2018 demand growth of 1.8 percent supported by higher long-haul West to East crude flows, particularly out of the U.S. Gulf, Brazil, and Europe with pressure on demand continuing from reduced Middle East flows to the U.S.” (McQuilling 2018, p. 2).

According to the International Energy Agency (IEA) in 2018, demand for crude oil was expected to continue to grow in the next years. Another factor increasing tonnage demand was the growth of refineries capacities. Particularly in Asia, this means continued demand for tankers that will deliver crude oil to run the refineries. Whilst the EIA forecasted to see the lowest net capacity additions in 2018 compared with 2017 and subsequent years, a number of the recently built refineries were expected to be ramping up production to nameplate capacity throughout 2018, boosting both crude demand and potential product flows.

Finally, crude oil production cuts of OPEC countries make consumers in Asia to replace partially export from the Persian Gulf for volumes from the Atlantic. Growth

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of exports from US, Latin America and Africa to Asia increases durations of voyages and the tonne-miles of the vessels and provide upward pressure for demand (Galbraith 2018, p. 26).

Table 2. History of sales for Aframax size tankers in 1H 2018

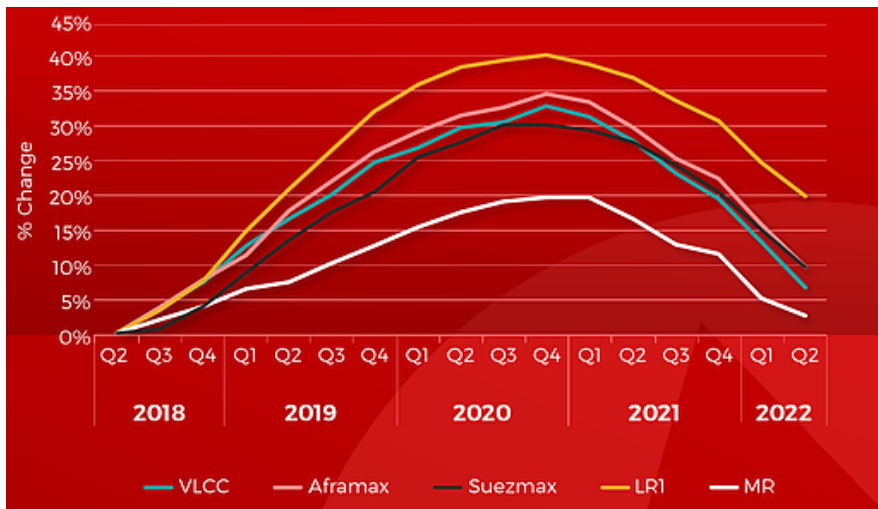
DATE	NAME	DWT	YEAR	PLACE BUILT	SM
21/06/18	Krasnodar	115,605	2003	Hyundai S Korea	9.5
30/04/18	Zirku	105,587	2003	Hyundai S Korea	10.5
26/03/18	HS Medea	113,013	2003	Hyundai Samho S Korea	10.7
28/02/18	Ridgebury Sally B	105,672	2003	Sumitomo Japan	9.2
28/02/18	Maersk Privilege	105,483	2003	Sumitomo Japan	12.7
15/02/18	HS Carmen	113,033	2003	Hyundai Samho S Korea	11.3
26/01/18	Vega Voyager	104,864	2003	Samsung Heavy S Korea	10.8
16/01/18	Ridgebury Alice M	105,745	2003	Sumitomo Japan	11.3
01/06/18	Pantelis	114,500	2004	Samsung S Korea	11.5
01/06/18	Sparto	114,500	2004	Samsung S Korea	11.5
03/07/18	BM Bonanza	105,614	2007	Sumitomo Japan	16.8
21/06/18	Sentosa River	115,146	2008	Sasebo Heavy Japan	19.5
10/05/18	United Seas	110,295	2008	Mitsui Japan	20.0
30/04/18	BM Breeze	105,387	2008	Sumitomo Japan	18.0
10/05/18	Aegea	115,878	2009	Samsung S Korea	23.7
10/05/18	Amorea	115,760	2009	Samsung S Korea	23.7
26/03/18	Diamond Bliss	107,605	2009	Tsuneishi Japan	22.1
20/05/18	United Honor	112,795	2010	New Times China	19.8
10/05/18	United Journey	112,723	2010	SPP S Korea	26.1
26/03/18	Diamond Destiny	107,508	2011	Tsuneishi Japan	26.6
26/03/18	Diamond Eternity	107,497	2011	Tsuneishi Japan	26.6
26/03/18	Diamond Faith	114,737	2016	Namura Japan	39.7

Source: Eggar Forrester (2018).

The conclusion in 2018 was that one should be expecting growth of demand for crude oil tankers in the next years. The oversupply of tonnage, low market returns and high number of ships approaching their anniversary dates of special surveys in

dry docks, which is rather costly, became catalysts driving the asset prices down. Asset prices have touched their 15 years low levels in 2017 and slipped even lower in 2018. Table 2 contains statistics of actual sales for crude oil tankers of age 15 years and below in the Aframax segment by early 2018. Prices for 15-year-old units were set in the \$9.5-12.7 million range and for 10-year-old ships in the \$18.0-20.0 million range, with a downside trend from the beginning of the year onwards and until the then present.

Figure 5. Vessels value forecast



Source: VesselsValue (2018).

The shipping data provider Vessels Value anticipated that the trend would change direction from the third quarter of 2018 onwards and would reach its peak by the end of 2020 – beginning of 2021, when Aframax prices were expected to gain 35% (see Figure 5) (Vessels Value 2018).

Most of the sources used agreed as of 2018 that the shipping market would be busier and would bring higher returns in the next years. Below are the forecasts given by two panelists of the Baltic Exchange, which could be used as inputs for assumptions in further financial analysis.

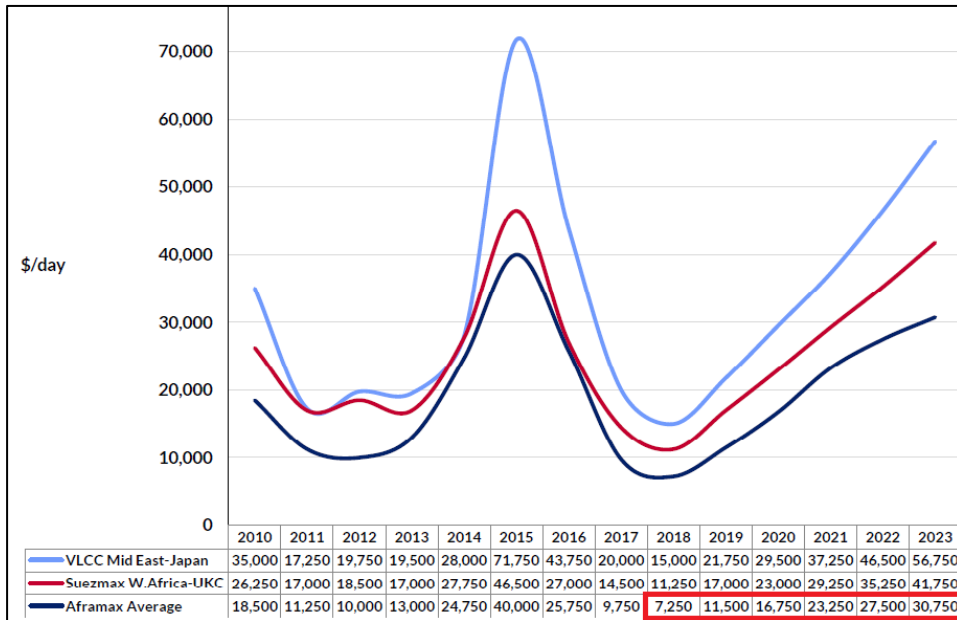
THE IMPORTANCE OF TIMING IN ENERGY SHIPPING: A CASE FROM CYPRUS

Fearnleys (est. 1869), the major European broker with offices worldwide and headquarters in Oslo (Norway), estimated the average TCE for Aframaxes over the next 5 years to be \$20,900 per day (see Figure 6, whereas updated reports may be available via <https://fearnleys.com/research/>). Gibson Shipbrokers (est. 1893), the company with a global presence and headquarters in London, expected that the same segment's average TCE from mid of 2018 till mid of 2023 would be \$19,500 per day (see Figure 7, whereas updated reports may be available via <https://www.gibsons.co.uk/services/gibson-consultancy-research>).

Figure 6. Tanker earnings forecast

Year	VLCC*	Suezmax	Aframax	LR2**
2013	14 100	13 400	12 500	15 700
2014	25 300	27 500	25 300	17 100
2015	61 100	45 800	39 500	26 200
2016 actual	38 900	28 300	22 500	21 800
2016 forecast	37 000	27 700	21 200	21 400
<i>Deviation vs. forecast</i>	5,1 %	2,2 %	6,1 %	1,9 %
2017 actual	18 800	15 500	12 700	15 400
2017 forecast	20 000	17 500	13 600	15 100
<i>Deviation vs. forecast</i>	-6,0 %	-11,4 %	-6,6 %	2,0 %
2018 forecast	17 500	12 500	12 500	14 500
2019	40 000	29 500	22 500	23 400
2020	60 000	41 400	31 200	31 700
2021	45 000	32 500	24 700	25 500
2022	20 000	17 500	13 600	14 500

Source: Fearnresearch (2018).

Figure 7. Tanker earnings estimates

Source: Gibson Shipbrokers (2018); McQuilling Services (2018).

5.4. Analysis of primary data

The earnings forecasts shown above were given as a bulk average for the market. Some companies perform worse by several reasons. Others, having a competitive advantage by having developed a net of partners, with commercial intuition, the right strategic planning, and a pinch of luck, can perform better.

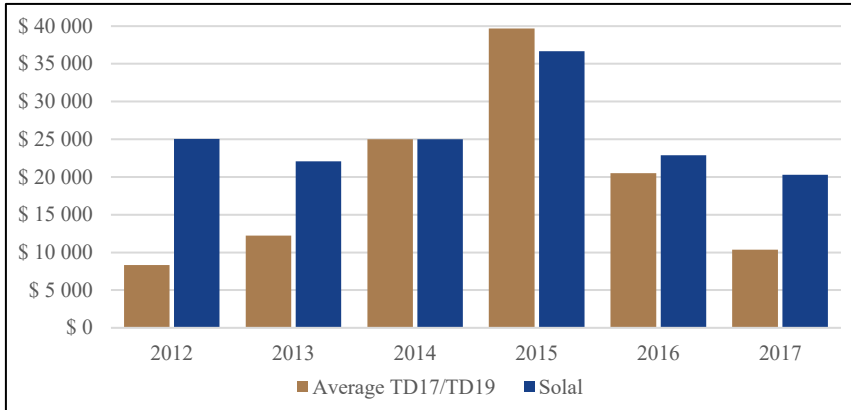
We reviewed the past financial performance of the Company in running commercial management and operations of Aframax tonnage since 2012 until 2017, and compared with a market performance according to the Baltic Index on the two major standard tanker (BDTI) routes in Europe:

- TD17: 100,000 metric tons crude from Baltic Sea to UK/Continental Europe (UKC)
- TD19: 80,000 metric tons crude on a Cross Mediterranean voyage

During the period, the Company chartered 21 Aframax tankers on a period (tc) basis and 148 Aframaxes for a single voyage. The average market (TD17/TD19)

TCE constituted 19,345 \$/day, while the Company performed at the average annual TCE 25,318 \$/day (see more details in Figure 8).

Figure 8. Average annual market TCE vs Company TCE



Source: Baltic Exchange and Company financial reports

The results from the Delphi study interviews with commercial and technical experts (see the details of those interviews in Appendices A and B) allowed us to conclude that the shipping industry, in 2018, was attractive for investments. Sentiments about the busy shipping market were high. Cash problems, massive aging, and new industry regulations were named as the main reasons for tighter supply in the next years. The demand was expected to increase steadily. Opinions of the commercial experts group supported the results of the secondary data analysis.

To summarize, the year 2018 appeared to be the perfect time to do shipping investments:

- The year 2018 was named as the bottom of the crude tanker cycle, which according to the literature on shipping cycles and past experience is always followed by growth.
- The steady scrapping combined with decreasing orders of a new tonnage would reduce the growth of global fleet and will balance the supply in the next years.
- In the same time, growth of demand for crude oil tankers was expected.
- Capital requirements were reducing in 2018. The asset prices have touched their 15 years low levels in 2017 and slipped even lower in this year.

- Next years should bring opportunity of decent profit not only from operations but also from a resale at a price higher than a book value. The falling trend would change direction from the third quarter of 2018 and will reach peak by the end of 2020 – beginning of 2021, when Aframax prices were to gain 35%.

5.5. Financial model

The ship investment model was built especially for this project using Microsoft Excel. The model includes two categories of information – input data (assumptions and sensitivity analysis) and output data (calculations, summary of results and charts). We list below our assumptions, grouped in seven categories.

1) Project details

The duration, assumed for the project, was 5 years, for several reasons. First, the management of the Company was interested in a mid-term investment. Second, to benefit from the right timing and not to wait a few years for placing an order and constructing a new ship, it was suggested to purchase a second-hand unit. The less the age of a ship, the less technical and commercial risks are associated with its use. However, capital investments for newly built units are huge and to get a decent return from it, more time is required normally. Owners are not rushing to give up their modern ships within the first 10 years unless there is a need or an upside market swing. Most available market candidates were ships approaching their 10 years or 15-year-old anniversaries and expensive drydocks, and older units. Third, running a ship for more than 5 years requires to make an additional drydocking maintenance, which, as already mentioned, is costly. Last but not least, available secondary data and expert advises allow making reasonable forecasts for the period up to five years. In five years, another research and evaluation can be done for deciding if the Company should stick to the original plan or if it would be worth to extend the project for an additional period.

2) Capital expenditures

Capital expenditures are expenses associated with construction of a new vessel or the purchase of one in the S&P market. Cost overruns, registration fees,

supervision and other pre-delivery expenses are also considered and form the gross price of the asset.

3) Dry docking and periodical maintenance expenses

Each tanker must pass periodic surveys and/or overhauls. Every five years and starting from a 5th year, special surveys are done in dry dock (ships aged 5 years and onwards). Every five years starting from the 3rd year, intermediate surveys are done in water (ships aged 2.5, 7.5 and 12.5 years) or in dry dock (ships aged 17.5 years and onwards). Costs of such overhauls are massive. According to IFRS and industry practice, these costs are capitalized. The usual approach for depreciating periodic overhauls are full depreciations over the 5 years cycle, in contrast to the asset itself that is depreciated over the whole duration of the useful life. In addition to periodic maintenance, owners can retrofit or upgrade the vessel. Costs of such upgrades increase the value of the ship and are considered in the same section.

4) Operating expenses

The projected OPEX of Aframax tanker \$2.4 million per annum is in line with a quotation, given by the selected technical management company (respondent 4 in Appendix B) and is assumed to escalate for 2.5% each year.

5) Revenues

The two key components of revenues are market rates and number of operating days per year. According to the secondary analysis, the average market TCE forecasted by major shipbroking companies for the next 5 years was 20,250 \$/day, while the Company managed to work at an average annual TCE 25,318 \$/day in 2012-2017 and outperformed the past market benchmarks for more than 5,000 \$/day. The model was calculated four times – twice for 15-year-old units and twice for 10-year-old. Key inputs for each scenario are presented in Table 3 below.

Table 3. The key inputs for the calculated financial models

Year built	Scenario	TCE, \$/day	Operating days	Price, \$	Special survey cost, \$	Intermediate survey		Sale in the end of period
						Place	Cost, \$	
2003	Base	25,000	340	11,000,000	2,000,000	Drydock	800,000	Second-hand
2003	Conservative	20,000	340	11,000,000	2,000,000	Drydock	800,000	Second-hand
2008	Base	25,000	350	19,000,000	1,500,000	In-water	50,000	Demolition
2008	Conservative	20,000	350	19,000,000	1,500,000	In-water	50,000	Demolition

The considered number of operating days per year was 350 for the 10-year-old ships and ten days less for 15-year-old ones, the degradation of operations (growth of out-of-service period) is 1% per annum.

The revenues are also affected by the commission paid for the commercial management services – 1.25% on all freights, demurrages, time charter hire payments, etcetera.

6) Salvage value

There are two possible alternatives to selling a ship at the end of the project – in the S&P market or in the demolition market. The model allows switching quickly between the alternatives. Normally, it is possible to sell a ship before the end of her useful life at a price higher than the scrap value. The actual level depends on the situation in the freight market and the technical condition. The models assume that a 10-year-old vessel will be sold in five years at the current market price of 15-year-old units. Current prices are at their historical bottom in 2018, and any positive difference in resale price represents an upside risk and means additional return for the investors.

It is assumed that the useful life of a purchased tanker is 20 years, and that a 15-year-old vessel will be sold at her scrap value at the end of the project. If the market conditions allow to find buyers ready to acquire the unit in five years at a price higher than the demolition price, the investors will get additional earnings.

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Sensitivity analysis allows for evaluating the impact of the residual value on NPVs and IRRs.

The scrap value depends on weight of the ship and price of the steel. Average Aframax weights are in the region of 17,500-20,500 long tons. The 2018 prices for demolition sales varied in the range \$440-460 per ton. Average price for the last 10 years was \$405 per ton. The price assumed in the model is slightly lower: \$400 per ton.

During the interviews, the commercial industry experts were questioned also in respect of demolition sales for understanding of the additional costs structure. Usually, the buyer takes 3% address commission and 1% for the broker. In addition to it, the seller must pay agency fees and minor miscellaneous expenses, to prepare cargo tanks for cutting or to make a respective discount to buyer, if the latter undertakes to do this job. The cost is set in the region of \$300,000. Finally, the seller has to reposition the ship from the place of discharging the last cargo to the demolition yard. The model assumes \$250,000, which corresponds to repositioning from Singapore to the Indian Subcontinent (India, Bangladesh).

The net scrap price is used not only as a possible salvage value, but also as a residual value at the end of useful life, required to calculate annual depreciation.

7) Taxes

Shipping companies in Cyprus are eligible for paying tonnage tax instead of the normal corporate tax. It is calculated at a flat rate per net ton of the company's fleet and does not depend on the generated profits. The company has to be registered in Cyprus to be qualified for paying tonnage tax.

However, Turkey prohibits Cypriot owned or flagged ships calling its ports due to the conflict arisen after Turkish invasion into Cyprus in 1974. Excluding Turkish ports from the trading area, makes vessel less competitive and reduces employment possibilities. Oil cargoes are often not sold yet at the stage of loading and charterers (sellers) need to keep all options open for discharging. Also, the Turkish port of Ceyhan is used for export of Azeri crude from Caspian Sea through Baku-Tbilisi-Ceyhan pipeline. Daily export counts to more than 600k barrels a day and involves such major oil companies and charterers as BP, Chevron, Socar, and Vitol. Last but

not least, Turkish straits are a major logistic hub, which is widely used by ship management companies for crew changes, delivery of spare parts, supply, and inspections.

Thus, it is worth considering an alternative registration of the SPC for maintaining competitiveness. Establishing SPC in Malta allows to be qualified for the tonnage tax and get the benefits of EU registration. Commercial management will be outsourced and implemented by employees in a Cyprus office.

Table 5. Project results summary

Age of the vessel	15 years	15 years	10 years	10 years	
Scenario	Base	Conservative	Base	Conservative	
Year built	2003	2003	2008	2008	
Project duration, years	5	5	5	5	
Average TCE, \$/day	25,000	20,000	25,000	20,000	
Operating days per year	340	340	350	350	
Total initial investment	\$11,160,000	\$11,160,000	\$19,160,000	\$19,160,000	
Debt-to-equity	50/50	50/50	50/50	50/50	
Salvage value	\$6,530,415	\$6,530,415	\$11,000,000	\$11,000,000	
WACC	11.50%	11.50%	10.75%	10.75%	
Project	NPV	\$11,168,796	\$4,977,752	\$8,308,763	\$1,810,777
	IRR	38.24%	23.65%	23.03%	13.47%
	Payback period	2.51	3.56	3.55	4.26
Equity	NPV	\$9,774,678	\$4,103,422	\$6,675,921	\$837,864
	IRR	56.09%	32.10%	32.64%	17.21%
	Payback period	1.99	3.37	3.23	4.28
Time charter breakeven	13,777	13,777	15,263	15,263	

Annual tonnage tax can be calculated at Transport Malta Portal and equals to about €8,500 or about \$10,000 per year for an Aframax size vessel.

If the Company would not be qualified for tonnage tax for some reasons, the financial model allows to estimate and consider payment of corporate taxes.

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We describe below the financial model results. As mentioned earlier, the model was calculated four times for two ships of different age and two different scenarios – base and conservative. The key projected results are presented in Table 5.

Prices are assumed to be \$19 million and \$11 million for 10 and 15-year-old ships respectively and are based on the market approach. The debt-to-equity ratio used in all models is 50/50.

The useful life is 20 years, and the duration of the project is 5 years. Thus, the scenarios for 15-year-old unit assume sale for scrap in the end of the period and salvage price equal to the scrap price of \$6,530,415; the scenarios for 10-year-old assume resale at second-hand market at the current market price for 15-year-old unit to be \$11,000,000. Given that most of the tankers can operate for at least 25 years, and that current market prices are historically low, there is a good possibility of selling the assets at a higher salvage price in the end. Any positive difference represents the upside risk.

To show investors if the project is worth proceeding with or not, several basic and supplementary factors were taken into consideration and analyzed.

Net Present Value (NPV) – a measure used in capital budgeting to assess profitability, calculated as the difference between present value of cash flows and cash outflows, generated by the project over its duration. A project should be undertaken only if its NPV is positive. The NPVs for all four scenarios are positive, meaning that the present value of projected earnings exceeds the estimated capital expenses, and therefore, this investment would add value.

Internal Rate of Return (IRR) – being another metric of the investment profitability, it is the discount rate that makes the NPV zero. A company should make an investment only if the IRR is greater than the cost of capital. The IRRs for all four scenarios exceed hurdle rates, meaning that the projects are worth proceeding with.

Payback period – used as an alternative to NPV and measures the time needed to compensate the initial costs of investment after initiation of the project.

The calculated payback periods show that the money from the investment will return back before the end of the project for all 4 scenarios. The payback period

varies from about 2 years for a 15-year-old vessel (base case) to about 4.3 years for a 10-year-old vessel (conservative case).

Breakeven rate – represents the rate required to service the debt, to pay operating expenses and periodical maintenance costs. It is one of the measures used by lenders to assess the likely performance of a shipping investment project and sufficiency of cash flow to meet the obligations.

Time charter breakeven rate equals 13,777 \$/day for 15-year-old ships and 15,263 \$/day for 10-year-old ships, which is well below the projected and historic earnings. The forecasted market TCE for the next five years equals 20,250 \$/day and the historic TCE of the Company is 25,318 \$/day.

Our recommendation in 2018 was that the results of financial modelling were satisfactory for accepting the project. Due to low purchase prices and high residual value, the initial required investment was lower while return and other results were better for a 15-year-old ship than for a 10-year-old unit. However, the risks increased together with age. Considering that the prices of Aframaxes were hitting their historically low levels in 2018 and that, within the next five years, the demand for modern tonnage was anticipated to be firm and thus raise their values up to 35% above the 2018 levels, the purchase of a more modern unit was recommended at the time, since it could give an opportunity of a beneficial resale at the end of the project or earlier.

6. Concluding remarks

We can summarize our findings and answer the questions set by the Company in the original 2018 feasibility study as follows.

“Should we have invested in a ship?”

Yes, the Company was operating in a favorable business environment and possessing a mixture of experience, resources, and skills to undertake the project, while purchase and managing shipping assets could give a great earning opportunity for sophisticated investors. More specifically, the ideal ship types to be considered were the Aframax size crude oil tankers.

“Was it worth to decide in 2018?”

Timing is a crucial component of success, more so than the capabilities of the Company. The best moment for making investment is at the trough of a shipping cycle, just before the recovery and peak, when assets are cheap, while there are signs of a near upturn. The year 2018 was exactly such a time. Prices of ships were at their historical minimums, while the industry experts and authoritative sources shared an opinion and forecasted earnings to rise gradually over the next five years. The main drivers for it were increasing volume of scrapping due to massive aging of existing fleet and major changes in regulations, diminishing orders for construction of new units, and steadily growing demand for oil and its transportation.

“Is it going to be a good investment?”

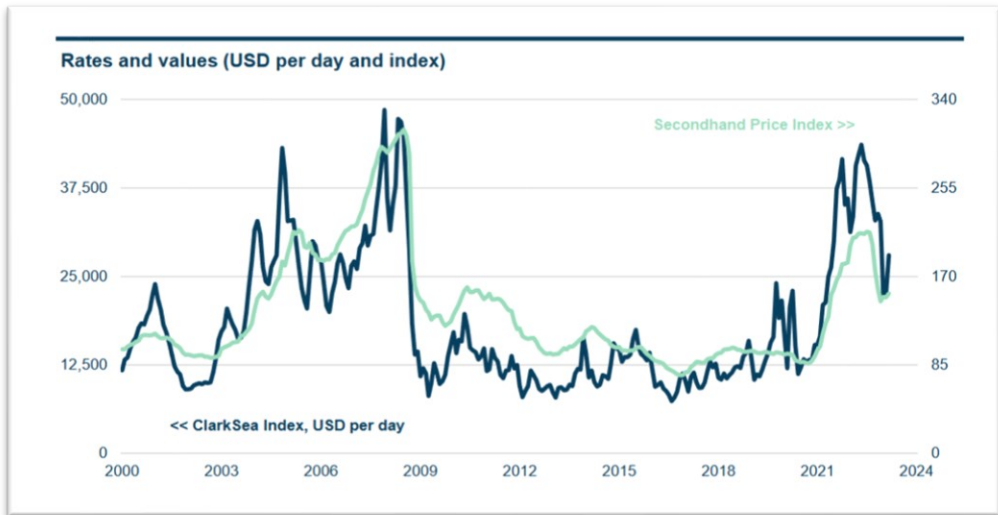
Risks found proper mitigation strategies, while results of financial modelling appeared attractive for undertaking the project. Investors would get a decent return from purchasing a second-hand tanker, meaning that banks would maintain sufficient security for the loan capital until its full repayment. This was a good investment alternative considering the balance between risk and higher expected returns than provided by more safe assets such as common stocks or bonds.

To conclude, the performed study considered current and expected market situation, utilized expert knowledge and available practical tools, and demonstrated feasibility of the project. The Company did not proceed with the project due to several internal reasons. The methodology used in the feasibility study provided, however, useful results. To confirm, we give below several relevant quotes.

Market Shipping Review (2023, p. 14): “The ClarkSea, our overall day rate charter index covering seaborne transportation (tankers, bulk carriers, containerships and gas carriers together representing over 80% of global shipping capacity), increased 30% y-o-y to reach an all-time annual high across 2022 of \$37,253 / day (the index was started in 1990).” (see Figure 9). Specifically for tankers, “the market saw significant improvement through 2022, benefitting from the redistribution of Russian exports / European imports because of the Ukraine conflict and the impact of direct sanctions on tonnage, as well as improved global oil demand and supply “post-Covid”. Tanker earnings averaged \$40,766/day, more than four times the 30-year low of \$7,127/day recorded in 2021. Trends were especially strong in the mid-

sized crude and products segments, with VLCC earnings averaging \$23,885/day (up from c.\$3,000/day in 2021), Aframax earnings averaging a record \$55,967/day (up 579% on 2021) and MR earnings averaging a record \$31,775/day (up 371%).”

Figure 9. ClarkSea Index 2000–2023



Source: Shipping Market Review (2023, p. 14).

Jallal writes (2022, p. 1): “Although traders were nervous over taking Russian cargoes, by the end of February [2022] the Aframax tanker sector saw some incredible gains, with TCE of over US\$200,000 per day reported on the Baltic to UK Continent route. Fast forward to the end of November, and the TCE for tankers is in boom territory. Average VLCC (eco & scrubber) TCE for 2022 is US\$42,000 per day, versus US\$14,000 per day in 2021. For Suezmax tankers (eco & scrubber) the difference is US\$48,000 per day, versus US\$10,000 per day in 2021. But the standout result is the Aframax sector (eco & scrubber), where TCE rates of an average of US\$60,000 per day have been achieved so far in 2022, versus US\$11,000 per day” in 2021.

Despite the unprecedented turbulence during the pandemic years, the 2018 investment recommendation was correct, and thus, the suggested decision

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framework with its novel timing element can be applied for analysis of other shipping investment opportunities.

The current paper's novelty and contribution to the existing literature in shipping finance is the detailed investment analysis based on the primary data from a relatively small shipping company, whereby timing plays a singular role. The disclosed primary data for the intended 2018 purchase of an Aframax oil tanker is unique and valuable. The detailed financials for this relatively small size of shipping investment (\$11 to \$19 million) are rarely published. Thus, the current paper will provide useful practical guidance for potential investors and other professionals who follow the energy shipping market as well as to contribute to academic research in shipping finance. Combined with a concise review of the shipping market conditions in 2018 and expert predictions for the coming years, the primary data allowed the authors to build a solid financial model and offer a decision framework for assessing shipping investment opportunities. The framework is applicable well beyond the described case study.

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Appendix A. Delphi Study Results – First Round; Industry/Commercial Experts

A. When, in your opinion, is the right time to purchase a tanker?

R1: In the middle of 2018. Let the seasonally strong winter market pass. So more likely 2nd-3rd quarters in my view.

R2: We think right time to purchase is within the next 12 months as earnings are forecasted to improve from the end of 2018. The timing will also be impacted by the age and specification, whichever the buyer wants.

R3: This year gives probably the best opportunities for investment for the previous decade. The asset values at their historically low levels despite of high expectations for the future market.

R4: The right time to buy is when values are cheap, before expected massive aging of existing fleet. It gives optimism for higher freight market in the forthcoming years due to lack of supply and higher return against lower investment.

R5: Greek companies that always felt the market trends the best and purchased more than 150 vessels during the first two months of 2017. The rest are waiting for passing the bottom of the cycle and additional correction of value. ... I think the timing will be best in 2018. Now still too many ships are on the water and under construction. Current freight rates are too low.

B. What are your expectations about the tonnage supply in the future years?

R1: Current order book is heavy, and tonnage is already oversupplied, but there is still a lot of buying interest in the Aframax and LR2 sector. There will be some scrapping, despite scrap price coming off a bit. According to our info, the number is 81 in 2017, 55 in 2018 and 24 in 2019. The scrapping should increase in 2020, when new bunkers rules come into force.

R2: In 2017/18, scrapping is expected to be primarily driven by market forces and anticipated weak TCEs. Demolition is likely to ease off in 2019 as market fundamentals improve; however, scrapping could intensify once again in 2020 and beyond due to a switch to cleaner and (much more expensive!) bunkers and Ballast Water Management convention requirements.

R3: The growth of supply is slowing down. Although the number of delivered tankers remained steady this year, the increased scrapping resulted in net fleet growth reduced for 47 ships. We expect that older tonnage will continue leaving the market, pressed by cash problems due to reduced earnings we see now, increased steel prices, regulations for bunkers and ballast water.

R4: Orderbooks show that many Aframax/LR2 tankers will be delivered this and next year, after which the fall in supply is expected. Same time, a massive aging is expected next years.

R5: Tonnage supply should steadily decrease during the next five years. Massive aging, low freight rates in 2017 and 18, IMO 2020 Sulphur Cap and requirement for installation of expensive Ballast Water Treatment Systems are the main drivers.

C. How will the new 2020 bunker regulation change the market?

R1: The strict sulphur requirements will boost demand for distillate bunker fuels. To produce the distillates refineries will need more crude oil. Morgan Stanley analysts say this additional demand will be in region 1.5 million barrels per day, which equals to 3 Aframax tanker parcels per day or 90 parcels per month. The crude market will be busier.

What else is certain, these will be good times for clean products and hard times for dirty product tankers. Bunker suppliers will need more gasoil, but less fuel oil. In our opinion, the shift in product tankers market will remain until a substantial number of owners wash their ships for clean petroleum products.

R2: It is difficult to say at this stage, how new 2020 bunker regulations will change market, but our research team believe that it will reduce the trading value of older ships, which either have high consumptions, or are not suited to burning MGO. We see it unlikely that any vessel over 10-year-old will be retrofitted with a scrubber, so we expect the scrapping age to reduce somewhat around 2020. It may be that more vessels are scrapped ahead of their 3rd special survey (15 years) than is typical. That being said, the market dynamics are expected to be better as of 2020, so it could prolong the life of some ships. Vessels with scrubbers (there are not expected to be that many come 2020) will have much higher valuing, assuming the price spread between HSFO and 0.5% holds out.

R3: The biggest impact will be on old ships with an age 20 years and above. Take increased costs for bunkers, add here higher OPEX and longer periods of off-hire, and scrapping will seem a good solution.

R4: Ship owners and operators find themselves in uncharted territory with the Sulphur Cap regulation. The decision on how best to operate the vessel when 2020 comes is a purely commercial decision. Unfortunately, many variables need to be considered to make this decision. Information from bunker suppliers, equipment manufacturers, and financial institutions is often conflicting, and majority of owners are still not prepared for the new standard. The closer it comes to 2020, the higher will be the pressure, which may affect a choice between trading and scrapping for older units.

R5: The thing, which many stakeholders are missing giving their forecasts and taking further decisions on retrofitting ships with scrubbers or scrapping, is the price gap between conventional and non-conventional bunkers. The new regulation will change not only the sea trade, but also refineries (supply) and buyers of marine fuels (demand). The current difference of \$250-300 between high sulphur fuels and distillates can easily come down to \$50-100, once suppliers will build the new logistic chains, but refineries start producing higher share of new products. With this scenario, owners, and investors, staking on keeping the vessels and using distillates, will be better off.

D. What about the demand side?

R1: The slowdown of trade is in the past and expectations are positive. Seaborne trade is forecasted to increase with a rate 1.1 times of global GDP growth this year and the trend will likely continue.

R2: We see that demand for crude continues to grow regardless of OPEC measures. If restrictions set by the cartel remain in place, exports from US will increase. High tonne-mile voyages from to Asia and Europe will push the trade up.

R3: Oh, demand inspires optimism. With US and Canadian crude oil exports, geography of trade is becoming more global. Shift of trading routes, expected increase of tonne-miles, new refineries, and reducing oil stocks will help the industry.

R4: The steady growth of world industry and increasing tonne-miles of crude tankers indicate that demand is to grow. The problems at shipping markets we see over the past 2 years are because of excessive supply, but they are temporary.

R5: These days it is easy to assert that demand is bad, but it is not. Factors lying on a surface are forecasted international oil demand growth, resupply of inventories, increasing strategic reserves by China and record high levels of refining in US. Once list of ships will be balanced, freight rates will gain the upward momentum.

Appendix B. Delphi Study Results – First Round; Technical Experts

A. What notice is required to arrange a pre-purchase inspection of a vessel by an inspector?

R1: About 3 days.

R2: For efficient deployment and arrangement with the agents, we would suggest as much time in advance but a week's notice, if possible, is adequate. It is advantageous to have the agents' information as early as possible and get the sellers to provide various documents and records well prior to the inspection. We will provide a list of documents and preparation required on the vessel to enable a smooth inspection.

R3: The notice period should be a minimum of 2 days to allow for preparation, travel, and any necessary documentation unless visa processing is required.

R4: Clearly as much notice as possible would be preferred to align the requirements with existing commitments, however dependent upon vessel location, and subject to no visa requirements, a superintendent could be mobilized with 3 to 4 days' notice, often less.

B. What time is required to prepare a report after completion of the inspection?

R1: 1 day inspection + 3 days for report making.

R2: 3-4 working days.

R3: 2 days.

R4: Typically, as per the inspection report should be completed within 7 days of returning to the office, however we would look to reduce this as much as possible recognizing the client's requirement for expediency. A brief overview of the vessel's condition can be provided within one day of return, if not earlier and prior to the return from the vessel.

C. What is the price of such a service?

R1: \$4,800 (excluding agency, launch service if any).

R2: For inspections in Singapore the costs would \$2,500/day, any expenses for launch, agency if required would be additional. For inspections outside Singapore, it would be \$1,000/day including travel days for one inspector. Boarding, lodging, transport, and other expenses would be additional as per actual costs incurred.

R3: Costs are \$500 per day plus costs + 2 days reporting. The fee may be waived should the vessel enter our management promptly thereafter.

R4: The cost of inspection, including detailed report, is \$1,400 plus expenses.

D. What OPEX figure can be used as a benchmark for a 15-year-old tanker?

R1: A ballpark figure is \$6,000 (without Insurance, tonnage dues, agency expenses, docking, major up gradation, charterers' expenses & pre-operational costs. Assuming standard spares, stores and tools are onboard). Take another USD 500 for insurance.

R2: Between \$5,600 – 6,000 per day for a vessel that has been maintained and operated to high industry standards subject to the nature and area of the trade. An important factor would be the yard where the vessel is built, and the name of the manufacturer of the equipment fitted . We will be in a better position to assess if details of the vessel and intended trading are provided. The above does not include dry docking or insurance. You may allocate \$800-900 /day towards premium for basic H&M and P&I cover, Loss of Hire and other additional cover would add to the premium.

R3: \$5,800 per day or about \$2.1million per year, including insurance costs.

R4: \$6,600 per day basis European officers and Filipino ratings; \$6,450 – basis Indian crew.

E. What are usual age limitations of major oil companies (Chevron, BP, Shell, Total, etc.)?

R1: Chevron will have issues for time chartering for over 15 years, however over 20 years, Total and Chevron will not be chartering or using the vessel for their business.

R2: None of the oil majors categorically state that they do not accept 15-year-old vessels. We have a vessel older than 15 years on Oil major Time charter in addition to being used for spot voyages. The important factor for Oil majors when reviewing older vessels is a serious commercial interest, the SIRE record and history of the vessel, the rating of the manager and their individual requirement for CAP ratings and Structural review.

R3: Vessels over 15 years require CAP rating (not less than 2), except Chevron – Chevron requires CAP 1 for hull and machinery. Chevron does not accept vessels over 18 years for crude oil cargoes.

R4: Very few Oil Majors will “openly” state that they will not use a vessel whose age is between 15 years and 20 years, citing the requirement for CAP rating, however this age of vessel is “less preferred” than younger tonnage. The majority of companies agree on a maximum of 20 years.

F. What should be the costs of dry-docking excluding costs of deviation and off-hire (being without contract/employment)?

R1: 2nd special, we can anticipate, about \$1.2 million, 3rd special \$1.5 million subject to CAP survey and steel renewal requirement, if any, at Chinese yards. We take the 17.5 years intermediate (same as above always subject to CAP & steel renewal and Chinese yards).

R2: This depends on the condition of the vessel, results of the thickness measurements, extent of steel renewal, extent of tank coating, general scope of work and location of the yard. Other important factors would be CAP requirements, retrofitting of equipment such as Ballast Water Management system, Scrubber etcetera. An indicative estimate for yards in China: 3rd Special / \$1.2 million; 4th Intermediate / \$800,000.

R3: The dry-docking costs heavily depend upon the trading area as well as the technical condition of the vessel. The cost for the 2nd Special Survey is estimated to be in the region of \$1.0 million, 3rd about \$1.2 million, whereas the cost of the 4th Intermediate Survey is estimated to be in the region of \$800,000.

R4: As a median estimate, I would consider around \$1.2 million to be a reasonable estimate for a well-maintained ship -basis China. For cases which involve significant coating works in addition to any steel renewals, \$2.2 million would easily be reached.

Intermediate survey for ships 15 years and above requires call at drydock and costs in region of 800,000, for ships less than 15-year-old it can be done in-port or in-water and is much cheaper – about \$25,000–50,000.

G. What is the cost of installing Ballast Water Treatment System, required for all ships according to new regulations?

R1: A rough estimation is \$1.0 million excluding dry docking costs.

R2: About \$1.0 million.

R3: Installation and certification cost about \$\$1-1.5 million and is done in dry dock.

R4: It costs in the region of at least \$1 million based on current prices.