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Finance-Driven Organizational Transformation: Strategic Leadership in Times of Change

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To my daughter, Dimitra

Abstract

This dissertation examines how Artificial Intelligence can influence financial decision-making and reshape organizational models.

A mixed method research approach was used throughout this study, combining theoretical analysis with a comparative analysis of six listed tanker shipping companies using data of period 2020-2024. To support comparative analysis, companies were classified in tier according to the extent of adoption Artificial Intelligence technologies.

The findings of this research indicate that companies with higher use of Artificial Intelligence can support decision making procedures of operators, ensuring company's sustainability and growth. The study further suggests that adoption of Artificial Intelligence contributes to financial management best practices and promotes more adopted organizational structures.

The dissertation contributes to the theoretical understanding of finance-driven organizational transformation by proposing a model tailored to the tanker industry, a sector characterized by high capital intensity and significant macroeconomic volatility. On a practical level, the research proposes gradual implementation steps for AI applications, the establishment of suitable Artificial Intelligence governance frameworks, and the strengthening of leadership capabilities to enhance alignment across different organizational functions.

Keywords

Artificial Intelligence, Tanker Shipping, Leadership

Περίληψη

Αυτή η διπλωματική εξετάζει πως η τεχνητή νοημοσύνη μπορεί να επηρεάσει τη λήψη οικονομικών αποφάσεων και να μεταμορφώσει τα οργανωσιακά μοντέλα που υφίστανται στο χώρο της ναυτιλίας με εστίαση τα δεξαμενόπλοια.

Κατά την διάρκεια της εργασίας αυτής χρησιμοποιήθηκε μικτή ερευνητική μεθοδολογία, κατά την οποία συνδιάστηκε θεωρητική έρευνα με την συγκριτική ανάλυση έξι εισηγμένων εταιρειών με δεδομένα της περιόδου 2020 - 2024. Για την ολοκλήρωση της έρευνας χρησιμοποιήθηκε ταξινόμηση των εταιρειών σε κλάσεις ανάλογα με την χρήση τεχνητής νοημοσύνης. Στα ευρήματα της έρευνας γνωστοποιήθηκε ότι οι εταιρείες που βρίσκονται σε μεγαλύτερη βαθμίδα υιοθέτησης Τεχνητής Νοημοσύνης παρουσιάζουν καλύτερη χρήση των περουσιακών τους στοιχείων και έλεγχο της κερδοφορίας τους.

Η διατριβή συμβάλει στη θεωρητική προσέγγιση του θέματος μέσα από την ανάπτυξη ενός οργανωσιακού οικονομικού μοντέλου που θα είναι προσαρμοσμένο στο κλάδο της ναυτιλίας, με την μακροοικονομική μεταβλητότητα και τις υψηλές κεφαλαιακές απαιτήσεις. Σε πρακτικό επίπεδο προτείνονται βήματα για την υιοθέτηση εφαρμογών Τεχνητής Νοημοσύνης, και κατάλληλων κανονιστικών πλαισίων διακυβέρνησης καθώς και ενίσχυση των ηγετικών δεξιοτήτων με γνώμονα την ευθυγράμμιση των διαφόρων λειτουργιών ενός οργανισμού.

Λέξεις – Κλειδιά

Τεχνητή Νοημοσύνη, Ναυτιλία Δεξαμενόπλοιων, Ηγεσία

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List of Abbreviations & Acronyms

AI:	Artificial Intelligence
NYSE:	New York Stock Exchange
UNCTAD:	United Nations Conference on Trade and Development
ESG:	Environmental, Social, and Governance
PESTLE:	Political, Economic, Social, Technological, Legal and Environmental
GDPR:	General Data Protection Regulation
TEN:	Tsakos Energy Navigation, listed as TEN in NYSE
TNK:	Teekay Tankers, listed as TNK in NYSE
FRO:	Frontline plc, listed as FRO in NYSE
STNG:	Scorpio Tankers Inc, listed as STNG in NYSE
INSW:	International Seaways Inc, listed as INSW in NYSE
DHT:	DHT Holdings Inc, listed as DHT in NYSE
LR:	Long Range vessels
MR:	Medium Range vessels
VLCC:	Very Large Crude Carrier
MARPOL:	International Convention for the Prevention of Pollution from Ships
HSSE:	Health Safety Security Environment
GDPR:	General Data Protection Regulation
IMO:	International Maritime Organization
ISM:	International Safety Management Code
CII:	Carbon Intensity Indicator
IoT:	Internet of Things
EU ETS:	EU Emissions Trading System
KPI:	Key Performance Indicators
PSC:	Port State Control
AT:	Asset Turnover
ET:	Equity Turnover
SS:	Stability Score

Chapter 1: Aims, Objectives

1.1 Introduction

This dissertation focuses on tanker shipping companies' sector. Aim this chapter is to perform short pestle analysis to identify the market environment and potential risks that tanker companies face. As main objective of this chapter is to identify potential risks under the assumption that companies use AI to mitigate that risk, improve their efficiency and enhance company's stability. In parallel we aim to introduce the companies that we will use in chapter 4 to run comparative study.

As an introduction to tanker shipping company, tanker shipping are main participants in global energy supply chain since those vessels are used for transportation of crude oil, petroleum, and gases. Based on United Nations Conference on Trade and Development (UNCTAD) reference existing in resources, approximately 80 per cent of the international trade is handled by the sea and therefore we consider that analysis of fuels transportation and availability of fuel resources are important to understand trade cycle of sea trade. (UNCTAD,2024)

The tanker fleet primarily consists of Very Large Crude Carriers (VLCCs), Suezmax tankers, Aframax tankers, and product tankers. Focusing the research and global focus on future macroeconomic demand, as per International Energy Agency despite recent challenges in as Iran war and demand destruction in middle East and the Strait Hormuz blockage the global oil demand remained resilient, exceeding 100 million barrels per day during current period. However existing forecast indicates that there is going to be affected from 2026 and onward with an estimated drop to less than 95 million barrels in a five-year projection (International Energy Agency, 2024). We used above mentioned shipping sector to focus due to its peculiarity that indicates high volatility based on macroeconomic environment but resilient demand for goods. This is an indicator that a strong stability model should be developed for those companies to maintain their sustainability in extreme macroeconomic conditions such as above-mentioned war or vessel reroute.

In respect of global market seems that Greek tanker shipping maintains a strong position in global market share. In our research out of the sample of 6 companies, only Tsakos Energy Navigation (TEN) participates in sample, as listed companies with published financial reports for its investors. Based on the dominant position we would like to use another Greek shipowner company however since majority of Greek owner companies are private owned companies there were not adequate data to extend our research. In this chapter we will also introduce sample companies using details from entity's annual reports. All sample companies will try to connect reference of AI usage within company to two main finance ratios, cashflow from operational activities and revenue growth. We consider both indicators as stability indicators for sample entities.

For the accuracy of the comparative study, we will use financial data from the period from 2020 to 2024 to investigate market deviation and volatility. As is thoroughly analyzed in said period main macroeconomic challenges had been the effect from COVID-19 pandemic, and markets shutdowns, geopolitical tensions, sanctions against Russia due to Ukraine war, and global vessel reroutes created unprecedented operating conditions on top of 2025 and 2026 market condition above mentioned as Iran war and tense in middle East. All the above significantly affected world demand for goods, supply chain requests, freight rated, vessel availability and use, and subsequently the tanker shipping cash flow and revenues. Additionally, we need to elaborate that vessel acquisition and investment in those types of vessels as will be later analyzed in chapter 5 are high capital investments and that means that investments that require stable cashflow from company leadership to be able to fund either with own equity but mainly with treasury cost (loans). This is also one significant factor that we choose to research tanker industry due to its importance to maintaining company stability and financial health matrix. Later we will also analyze in PESTLE analysis that areas for AI implementation are on and above freight rates, forecasting reports, and cashflow notes but extend to EU regulation, emissions monitoring, environment sustainability.

1.2 Presentation of selected companies

In the research has been as sample of the global listed companies that maintain in their portal financial details (annual reports), sustainability reports and investor presentations.

Information will be presented in tables such as vessel numbers that are interesting to understand vessel dynamic but also internal challenges that may appear in each company. Those companies' details are also combined to Chapter 6 as we need to refer that leadership matrix for shipping companies is dual and is splitted to corporate matrix of authority and vessel matrix of authority.

Their existence of parallel organogram is significant to identify how all risks referred to Pestle analysis may affect both leadership matrix and how coordination during system implementation is needed during each finance transformation to ensure that no disruption will appear.

Corporate matrix is mainly focused on cashflow, forecasting, financial health metrics and KPIs, and EU directives metrics or potential penalties that may occur. From the other side vessel faces different authority matrixes with main attributes to HSSE metrics, and data required for real time decision metrics. So, vessel numbers, internal policies, compliance reports are important to understand each of the sample company's complexity and requirements and to better comprehend and use PESTLE analysis results.

The sample companies are:

- Tsakos Energy Navigation (TEN)
- Teekay Tankers (TNK)
- Frontline plc (FRO)
- Scorpio Tankers Inc. (STNG)
- International Seaways Inc. (INSW)
- DHT Holdings Inc. (DHT)

In this essay focuses on global market with use of a Greek market in the research is chapter 4 that serves as Greek market representative. Other market operators including Thenamaris, Minerva Marine, Dynacom Tankers, Maran Tankers, and Capital Ship Management that also hold significant market share could not be included due to their capital structure and specifically those companies are privately owned and there was no efficient data to support and contribute further to the research. Those could be used only in qualitive analysis, theoretically with known information such as number of vessels, or compliance alignment

without being able to calculate for those operating cashflow and revenue growth to support research and build stability models.

The sample companies mainly operate with VLCC, Suezmax, Aframax, LR2, MR, and shuttle tankers. This is another factor that enhanced the complexity of the research enhancing the need of predictive models and analytics since variety on vessel models may affect also company's management due to different statutory obligations per vessel type. Also, the flags under which each vessel operate may also create other statutory frameworks and compliance regulations.

Strategic Importance of selected companies

Aggregately the selected companies count hundreds of vessels and therefore hundreds of companies. To understand sample importance, information obtained from their official portals related to each capital structure, fleet, investor information given in the portal and if any AI usage reference exist officially announced. In chapter 2 will focus on specific AI tools used in tanker shipping sector, such as Orca AI, and will try to establish also non-direct connections to AI tools and sample companies. This will assist further evaluate and classify operators based on their technology agility. Operators will be classified as Tier using all available resources and this will support final aim of this research to create a connection between AI usage and company's stability, and proof how AI finance driven transformation may improve operators' sustainability.

For research purposes the financial data are obtained for accounting years from 2020 to 2024 therefore to maintain comparative data company presentation is as of end of 2024. For accounting clarity data for 2024 are published within 2025 therefore we used above mentioned data. Above topic will be further elaborated in chapter 4 that includes comparative study. Based on Greek statutory requirements financial data of 2025 should be up to October 2026. Above information is given to understand range of samples for ratio calculation and correlation to below companies' details.

Tsakos Energy Navigation (TEN)

As stated, TEN company has been established in 1993 and is listed in NYSE in 2002 with common shareholders with USD 591 million in dividends, equating to over $25 million per annum. Operator aims to maintain its position as leader in energy trade. Based on strategy in its portal TEN Ltd. focuses on sustainable growth and lessen average vessel age from 7.5 years versus 10 years that is the average in global market.

Company's fleet is splitted to crude tankers and product tankers. In crude tankers there are 2VLCC, 6shuttle tankers, 14 suezmax, and 22 aframax. In product tankers there are 4aframax, 9 panamax, 2 handy sizes, 2MRs while there are 19 vessels under construction for period from third trimester 2026 till third trimester 2028. With an average fleet of 80 vessels. Within financial report of 2024 there are information related to financial notes, capital acquisition and impairment, capital structure and loans. However, there is no reference in AI expenditure or investment cost (Tsakos Energy Navigation,2025).

Teekay Tankers (TNK)

Teekay was established in 1973 and operates for more than 50 years. Operator listed entity on the NYSE. Based on company's portal, its fleet consists of 38 vessels, out of which there are 13 Aframax, 7 LR2 product, 17 Suezmax tankers and 1 VLCC.

From our sample within 2024 annual report there is reference of AI usage and in particular notes fleet-wide deployment of JiBe's ERP platform, the UpWind and Yamba.ai (Teekay Tankers, 2025). From the selected operators Teekay Tankers is the only with reference to documented AI integration in published documents.

Frontline plc (FRO)

Frontline plc was established in 1985 and has been listed on the NYSE (primary) and Oslo Stock Exchange. In 2012 operators had been restructured under market pressure. Based on company's portal, its fleet consists of 72 vessels, out of which there are 18 Aframax, 19 Suezmax tankers and 35 VLCC.

Within financial report of 2022 there is reference of AI use of DNV Veracity 2020 information related to financial notes, capital acquisition and impairment, capital structure and loans (Frontline plc,2025).

Scorpio Tankers Inc (STNG)

Scorpio Tankers was established in 2009 and listed NYSE in April 2010. Based on company's portal, its fleet consists of 93 vessels out of which there are 37 LR2, 42 MR and 14 Handymax tankers.

Within financial report of 2024 there are information related to financial notes, capital acquisition and impairment, capital structure and loans. However, there is no reference in AI expenditure or investment cost (Scorpio Tankers, 2025)

International Seaways Inc (INSW)

International Seaways Inc was established in 2016 and is listed in NYSE. Based on company's portal, its fleet consists of 66 vessels out of which there are 4 Aframax, 10 LR1,1 LR2, 28MR, 13 Suezmax, and 10 VLCC tankers.

Within financial report of 2024 there are information related to financial notes, capital acquisition and impairment, capital structure and loans. However, there is no reference in AI expenditure or investment cost (International Seaways, 2025).

DHT Holdings Inc (DHT)

DHT Holdings Inc was established and listed in 2005 in NYSE. The company fleet consists of 25 vessels as shared in company's portal.

Within financial report of 2024 there are information related to financial notes, capital acquisition and impairment, capital structure and loans. However, there is no reference in AI expenditure or investment cost (DHT Holding, 2025).

1.3 Pestle analysis of tanker shipping companies

As stated, the chapter is an introduction which aims to reiterate AI adoption and how may contribute to company's sustainability. Besides investigating above mentioned relationship between AI enable models and company's sustainability, this paragraph targets to perform a PESTLE analysis to deepen understand tanker shipping market and reveal causes and areas that implementation of AI can result in enhancing operators' stability.

Therefore, is considered that the PESTLE analysis below does not serve only as a market management tool but also demonstrates how this market can benefit from an AI-enabled finance transformation and enhance operators' leadership ability.

PESTLE analysis stands for analysis of political, economic, social, technological, legal and environmental factors that affect its market. Ideally this analysis will be used in chapter 5 as demonstration on actions and areas where AI usage may improve operators' procedures eliminating potential market, credit and liquidation risks.
For risk assessment we will focus on current and future market dynamics.

Political Factors

Tanker industry is significantly affected by geopolitical factors and international policies. Current macroeconomic environment is significantly affected by countries' sanctions and international wars. The sanctions against Russia due to Ukraine intervention, Iran war and recent tension in Red Sea with the strait of Hormuz to be highlighted significantly affected the market.

The above-mentioned challenges significantly affected fuel prices, fuel availability in ports resulting in vessels rerouting respectively. However, those challenges may be simultaneously opportunities and risks for the operators. This global crisis in energy supply chain highlighted the importance of real time decision making in both leadership structures of tanker operators, corporations and vessels.

Highlighting also that selected companies have a significant number of vessels and of other vessel types, and therefore there are multiple decision stakeholders and information and

actions need to be available in real time for the operators to build a sustainable decision making matrix and procedure that could mitigate all above mentioned risk exposure and lead to cost optimization, vessel use optimization.

In two to three years ahead is considered that geopolitical factors will remain elevated. All areas sanctioned or in war are highly correlated to global energy production and global market. Fuel dependencies are high for this industry. Therefore, is considered that AI enablement and AI transformation could lead the operators to enhance their capabilities in scenarios forecasting by improving both operators' managerial matrixes and simultaneously financial planning.

Economic Factors

The tanker market is highly volatile market that appears great dependency from freight rates, fuel commodity prices and financial conditions such as interest rates, and energy demand. Another important factor is the high vessel acquisition cost, the asset useful life and high maintenance costs. This means that those investments can be externally funded from debts, loans creating credit risk exposure and need for stable cash flow.

In two to three years ahead is considered that economic uncertainty is likely to be maintained due to inflation indexes. Usually, high inflations change the demand patterns lessening both products demands and fuel consumptions. As stated in this chapter introduction in 2026 and onwards is expected to lessen fuel consumption significantly. Therefore, is considered that an AI enablement may improve financial forecasting essentially to support companies' stability by forecasting and updating scenarios in real time. Those meanings will be further reiterated in chapter 5 with as-is to-be transformational model analysis.

Social Factors

In this chapter is discussed that there is dual authority matrix in tanker industry. This may become a challenge in labor since there are multiple authority's matrixes and leadership models kept.

However, there are additional factors in this market such as employee's shortage. The crew rotation, the strict health and safety conditions and lack of communication during vessel voyage are main factors that there is lack of crew. The above conditions increase the requirements for digitalization of vessels.

Crew roles need to be digitalized, allowing employees to deeper data interpretation, to trust AI technologies and develop transformational adoption behavior. An Ai enablement could reshape both onboard and shore-based roles, and additional improve the communication channel among corporate and tankers, COO and master captain.

In two to three years ahead, tanker operators need to attract talent, upskill crew and try to enhance crew communication. At the same time, in corporate AI adoption, office employees need to be trained and AI culture to be adopted from both leadership authorities to enhance operator's managerial decision-making system.

Technological Factors

There are recent AI developments that may drive transformations in tanker industry. Technology growth is expected to be deeply analyzed in chapter 2 elaborating its importance in both vessel and corporate function.

Using technologies such as machine learning, Internet of Things (IoT) systems, predictive maintenance, voyage optimization, and digital fleet management are fundamentally changing how shipping companies operate. As per International Maritime Organization (IMO) context there is a global need for maritime digitalization, reinforcing the importance of digital technologies across the sector (Internation Maritime Organisation, nd).

An additionally highly important technology factor that needs to be reiterate, especially now with technology enhancement, remains cybersecurity management and data protection.

In two to three years ahead, is expected that operators that will develop technology will develop comparative advantage towards other industry operators. Adoption of automation, data integration, and AI-driven decision support will enhance corporate competitiveness.

Legal Factors

The shipping sector is heavily regulated industry since there are several laws and corporate regulation combined. Besides corporate legal regulations such as GDPR, or EU directives for compliance purposes such as competition law, there are also complex regulatory frameworks that are related to environment, cybersecurity data, cargo transportation, health and security policies.

Recent IMO initiatives include new digitalization strategies, cybersecurity guidance, and emissions reduction frameworks. From the initiatives mentioned recently known as the IMO Net-Zero framework, greenhouse gas regulations are expected to increase compliance complexity and financial exposure for tanker operators.

In future years ahead is expected to be a need for new reporting requirements, carbon pricing mechanisms, and fuel standards and subsequently there will be need for accurate data management and financial planning for the additional costs either on consultancies or asset acquisition or penalties for noncompliance. During strongly implementation of regulatory framework, AI can support operator's compliance reporting.

Environmental Factors

The focus in tanker industry for the year ahead is fuel consumption, decarbonation policies and environmental sustainability. There are strict targets that impose significantly emission reductions by 2030 till net-zero emissions targeted around 2050.

Complying with the above investments in vessels will be required which either will use alternative fuels or develop emission technologies monitors to optimize operations and adjust to above mentioned environmental framework. Those high-capital scale investments will additionally empower shipowners' reputation and eliminate potential compliance risks.

In such complex investment needs the AI enablement may be crucial in supporting decarbonization efforts through voyage optimization, developing predictive maintenance, fuel efficiency monitoring, emissions forecasting, and financial planning. In future years

ahead is expected that all environmental and compliance costs to be significantly increased and creating an efficient data process system to be able to monitor all the above will be crucial for each operator.

Table 1.1 Pestle analysis synopsis

PESTLE Category	Notions	Bullet analysis
Political	Geopolitical factors and sanctions	Red Sea disruptions Sanctions Middle East tensions Shifting vessel routes
	Energy security policies	Government regulation
Economic	Freight market volatility	Red Sea disruptions Sanctions Middle East tensions Shifting vessel routes
	Financial costs	Interest rates High capital investment Cash-flow management
Social	Workforce digitalization	Employees agility on AI systems Data analytics use
	Employees shortage	Crew shortage
	Organizational agility in transformation	Employees agility on AI adaption
Technological	AI adoption	Predictive analytics Voyage optimization Fuel efficiency Financial forecasting
	Digital integration	IoT sensors ERP platforms Fleet management systems
	Cybersecurity risk	Cyberattack protection
Legal	Decarbonization regulations	New IMO and decarbonization targets Other law requirements
	Digital compliance	Digital reporting requirements
	ESG disclosure requirements	Sustainability and governance reporting
Environmental	Decarbonization regulations	Emission reduction by 2030
	Operational efficiency	Voyage and fuel optimization

1.4 Conclusion

Tanker shipping is a challenging sector with dependence on environmental factors, and a heavy regulatory framework. In this chapter we aim to describe the research into selected companies and the market conditions that lead this dissertation to select this market for further analysis.

With short dependency to the selection of the sample, since there were limited financial information available in Greek tanker market and therefore there is a sample of six companies where only one Greek company participated. Due to ownership status of Greek operators – are private owned and not listed, financial data were disclosed.

With all the above notions out of six companies only one operator referred to AI usage on its financial annual report or portal therefore in next chapter we aim to review AI tools that can mitigate market, credit, financial, compliance, environmental and statutory risk and connect selected operators to usage of those AI tools.

However, from ESG framework, European directives for omissions and decarbonization and all statutory requirements actions had been mentioned in all financial reports therefore are considered as non-direct indication of technology implementation.

Chapter 2: AI Tools for Tanker Shipping Industry

2.1 Introduction

In Chapter 1 market analysis took place related to volatility of the environment by all PESTLE factors. All those challenges highlighted geopolitical factors, fuel prices, environmental regulations, dual authority matrixes and lack of crew. With this analysis we try to highlight all market risks and the challenges that operators face in managing both vessel and corporate dual authority matrixes.

In addition to all the above and as elaborated up to accounting year 2024, that had been reference accounting period for our research there had been limited references for AI use in selected companies. In this chapter we will try to connect companies to AI usage either from resources or based on their vessel types they use. This connection aims to classify sample companies in Tier based on their AI agility and successfully complete comparative study by relating AI agility to companies' financial performance. For academic purposes this could be further elaborated with use of more KPIs and indexes, however for this essay comparative study and above-mentioned case study will be completed.

In this chapter we will theoretically reiterate AI tools used in tanker sector and aim is to connect those with PESTLE market analysis and conditions identified in Chapter 1. There will be an AI tool repository and a connection to selected companies. Additionally, insight into technology usage cannot be supported due to limited resources.

From the outcome of our research in chapter 4 we will propose in chapters 5,6 to be finance driven transformation and elaborate on how can support companies and enhance their financial and operational stability.

2.2 Correlation among PESTLE market analysis and AI Tools

In this paragraph a relationship will be established between PESTLE categories and risks and AI system usage proposal. In other words, we will build a logic on which AI will resolve companies' risks identified in chapter 1 PESTLE analysis. To enhance visualize below table will be used.

Table 2.1 Correlation table among PESTLE and AI Tools

PESTLE Category	AI Functional Domain	Paragraph
Political	Voyage Optimization IoT	2.2.1
Economic	Financial Forecasting Data Analytics	2.2.3
Social	HR Talent Acquisition Change Management	2.2.4
Technological	Fleet Management Technology Integration	2.2.5
Legal	HSSE Governance AI	2.2.2 2.2.6
Environmental	Environmental Monitoring ESG AI	2.2.2

2.2.1 Voyage Optimization and IOT technology

This analysis will start with voyage optimization and internet of things technology, trying to elaborate meaning and how respective AI are used.

As stated in PESTLE analysis due to red sea conditions, sanctions, Iran war, Strait of Hormuz there were several vessel rerouting. This may create an issue for the companies

since vessels are on route and master captain must decide in real time how the vessel should be rerouted, trying also at the same time to maintain crew safety and achieve cost optimization from additional fuels. As understandable reroutes also may cause freight increases or make the vessel to travel to less known routes. For using alternative routes IoT is necessary. IoT are sensors, or other technology equipment used during vessel routing.

AI tools that are related to voyage optimization and IoT may be able to assess in real time the alternative, evaluating or proposing master captain optimum route, or sharing respectively details such as following ports, other data such port traffic, speed etc.

Orca AI

Orca AI is foremost AI platform adopted from majority of tanker companies. This platform served to share awareness of vessels in the sea to avoid collision. Allows real time vessel tracking and incident detection with 360-degree camera. An additional functionality given is that can share actual to optimal voyage performance, can be considered also as part of financial tools since can also contribute to optimizing vessel costs, and provide financial planning data.

UpWind

This platform was first referred to in chapter 1 as mentioned in the annual financial reporting of Teekay Tanker. This AI tool serves as weather routing and voyage performance tool. Within tools there is weather analysis and simultaneously vessel performance analysis using speed and routing adjustments to lessen fuel consumption. In this system also ESG provision exists to lessen gas emissions as should be analyzed in 2.2.4.

IoT Systems

As stated in paragraph introduction, IoT systems are mainly systems including sensors and machine learning. Those systems are mainly used in engines, other machinery, water systems and cargo pumps to monitor in real time and predict potential incidents. That may lead to better maintenance prediction, lessening vessel costs and proactively less risk of vessel decommission. This can support also optimization in operating cost and fleet

availability. Is of high importance especially for operators with many vessels of different types.

Sharing in summary IoT platforms;

- Wartsila's Voyage Optimization suite is for fleet voyage management and is also support operators to benchmark across vessel type optimum route, speed.
- ABB Ability Marine Advisory System (AMAS) is a system that suggests optimum speed, trim and route while supporting real time decision making. In the tool there is IoT technology with sensors for weather feeds.
- Kongsberg Maritime's K-IMS is mainly used for machinery monitoring to early detect potential incidents.

Table 2.2 AI Tools for Voyage Optimization and IoT

AI Tool	Primary Function	Relevance to Selected Companies
Orca AI	Collision avoidance Real-time vessel tracking Voyage performance analytics	All Scorpio Tankers (STNG)
UpWind	Machine learning weather routing Vessel-specific performance curves Fuel optimization recommendations	All Teekay Tankers
Wartsila Voyage	Fleet-wide voyage management Performance indicator	Large fleets Frontline, Tsakos, Scorpio Tankers, International Seaways
ABB AMAS	Advisory system Real-time decision making	All
Kongsberg K-IMS	IoT system for engine and machinery sensor monitoring	All

2.2.2 Environmental Factors

In chapter 1 two meanings were introduced in environmental factors the IMO's net zero framework where it had been analyzed that by 2050 the fleet is targeted to be zero emission fleet and will gradually start to be implemented from 2030 and onwards. The second

meaning introduced was the EU Emissions Trading System (EU ETS) and decarbonization of the fleet. Monitoring environmental policy is challenging since there is need for real time reporting and data predictive to be able for operators to set compliance policies (International maritime organization, n.d) (European commission 2023).

For operators that manage volatile fleet with different vessels and under different flags status (flags information is available in all selected companies' portals) following up the statutory framework may become challenging. The administrative volume and the risk of manual error is prohibited and may arise significant penalties. To ensure compliance, those data should be collected in real time from IoT technology and transmitted not in a manual manner to regulators.

Yamba.ai

This system is mentioned that is used from Teekay in annual report of 2024. Said tool is an AI tool to manage emission data. The platform is used to collect details such as fuel consumption, estimates omission and prepare regulatory filing. This platform can also integrate with platforms mentioned in paragraph 2.3 and besides operational data incorporate also date for ESG purposes.

Nautilus Labs

Nautilus is a machine learning tool for vessel performance and fuel optimization. In parallel weather data, IoT data allows us to build a performance model to identify potential risks. Within tool there is also CII tracking formula (where CII carbon Intensity Indicator) a project that also in selected routes. This data intelligence may support operators to avoid penalties or potential reputation damage.

ESG Reporting and Sustainability AI Platforms

As stated, AI can also be used in operations for reporting emission data as requested from environmental framework. Additional platforms that may be used for ensuring environmental alignment are:

- Persefoni
- Watershed

- DNV Veracity

For listed companies as the companies in our selected sample there are increasing reporting requirements to adjust. Since those regulatory frameworks are heavily penalized and demands high scale investments may be part of their annual reports and communication to their shareholders related to ESG and EU Corporate Sustainability Reporting Directive (CSRD) obligations.

Table 2.3 AI Tools for Environmental and ESG Reporting

AI Tool	Function	Relevance to Sample Companies
Yamba.ai	Emissions monitor Real time reports	All Teekay (documented)
Nautilus Labs	Vessel performance ML CII projection	All
Persefoni Watershed	Enterprise carbon accounting CSRD reporting	All Listed operators
DNV Veracity	Data management, vessel compliance verification	All

2.2.3 Financial Forecasting and Analytics AI

Economic PESTLE analysis had been identified that there is significant volatility in finance due to high capital investment, loans, freight rate changes, and there for capital 1 we selected ratio of operating cash flow and revenue growth as indicator of company's stability.

Above volatility factors demand real time financial analysis and ability to correctly predict scenarios and interpret them to enhance decision making. This paragraph will focus on AI tools that may integrate operational data and assumptions and support management ability to strategy leading the companies.

JiBe ERP Platform

JiBe is an ERP (referred to the annual report of Teekay) that is used by operators to integrate vessel operations, maintenance, procurement and other operational data to financial reporting. This tool allows real time integration of operating scenarios to company's

reporting updating in real time company's budget performance and creating fleet-wide financial data dashboards that could be used for further reporting. This meaning is also elaborated also in Chapter 5 stated strategic advantage of to-be AI transformation, indicator that may lead companies to create comparative market advantage.

Kpler, Vortexa, Signal Ocean for freight rate forecasting platforms

There is other world known ERPs used in tanker shipping for monitoring vessels, contact ports, and aloe to forecast freight rates for tankers. Those platforms may be useful for operators that use mixed fleets and own great number of vessels like TEN, TNK, FRO, and INSW from sample selected companies.

- Kpler
- Vortexa
- Signal Ocean, especially signal ocean is a tool with predictive models for chapter rates, with voyage identification that Greek maritime community uses.

Kyriba, High Radius for treasury and cash-flow management

Besides freight rate prediction platform AI tools like Kyriba and High Radius are used in tanker shipping to enable treasury review and incorporate treasury details in cash flow scenarios reporting allowing WACC optimization and of course real time bank details reconciliations.

Those AI tools for cashflow and treasury support are important since allowing real time view in companies liquidity and simultaneously allowing real time funding of operators. Those systems are used for listed operators such as FRO that is dual listed in NYSE and Oslo exchange market and to companies that have multi-currency transactions and need to control all FX risk and funding capacity.

Table 2.4 AI Tools for Financial Forecasting and Analytics

AI Tool / Platform	Function	Selected companies
JiBe ERP	Integrated maritime ERP for voyage cost analysis	All Teekay
Signal Ocean	Freight rate forecasting Cargo flow analysis	All

Kpler **Vortexa**	Cargo flow analytics	FRO, TEN, TNK VLCC, Suezmax heavy operators
Kyriba **High Radius**	Treasury management Cash-flow forecasting Reconciliation	All

2.2.4 HSSE, HR and other regulatory requirements

Tanker industry is heavily regulated sector where operators need to adhere to frameworks such as IMO maritime safety standards, flag state statutory obligations, MARPOL environmental status, GDPR this law is directive mainly to adhere to commercial corporate environment, and IMP cybersecurity guidelines. Adhering to so challenging compliance environment is crucial to use AI enabled tools and compliance platforms to ensure no compliance risk and ensure internal audit for HSSE framework.

Videotel tool for e-learning and crew management

Videotel is an AI tool for e-learning specialized for maritime crew professionals. Crew is a rather peculiar profession that needs to combine real time system management and decision making. That means that crew including captains (leader in vessel authority matrix) need to be upskilled to meet operators need to enable AI tools. Videotel supports regulatory training modules aligned with STCW, MARPOL, and ISM Code requirements. In addition to the above, AI allows crew member competency profiles, flags certifications and renewal deadline proposing also training modules per crew profile.

Guardtime Maritime and Naval Dome for cyber security

As per IMO regulation instruction there is provision for cyber risk management to be included in HSSE governance with implementation of Management Systems (SMS), however its implementation differs among operations since each company bears different structural organization, vessel and crews. (International maritime organization, 2021)

Known cyber securities systems for tanker operators are:

- Guardtime Maritime
- Naval Dome

Both may share data for anomalies, cyber-attacks incidents and data integrity violations. Given the fact that vessel networks are based on satellite connectivity, cloud ERPs and integrated bridge system there is an increasing possibility of a vessel to have cyber-attack. By ensuring mitigation of cyber-attack risk an operator ensures system access, and smooth operations for the crew so finally ensures crew health and safety.

Table 2.5 AI Tools for HR, HSSE

Platform	Function	Comments
Videotel	E-learning tool Crew profiles	All Allows e-module training
Guardtime Maritime	Detects anomalous behavior Cyber intrusion in real time	All Satellite connection
Naval Dome	Monitors vessel systems for cyber threats	All Large fleet operators

2.2.5 HR, Talent Management, and Organizational AI

Challenges common for all operators face as identified in chapter 1 are shortage, the complexity of the dual authority matrix (corporate and vessel), and the need for organizational agility in AI adoption. There are AI tools that may enable corporations and vessels to perform HR management, enhancing their employees' engagement and ensuring adequate crew and correct decision-making procedures.

As stated due to double authorities' matrix in tanker shipping there is a complex decision-making process and authority matrix and therefore in case as in vessel organization that real decision making is requested challenges may arise. This risk may be extensive especially to large fleet operators.

COMPAS and Ocean Technologies for crewing management

There are two main platforms to support AI crew rotation planning and certification management to ease the selection of employees for the vessels. Those are:

- COMPAS by Wilhelmsen
- Ocean Technologies

Especially for large fleet tankers operators these systems are useful to rank and evaluate crew skillsets, that should vary based on each vessel type, flag and rank. In addition to the above crew fatigue management is essential. To ensure optimum crew management the crew

changes should be limited, and retention time should be extended. Manual schedule and crew handling may be challenging, and errors may leave vessels understaff. Also, communication among corporations and vessels can be optimized with data in real time retrievable from both sides.

Eightfold.ai and Visier for workforce planning

Aside from crew management there are parallel HR functions and activities that face same challenges as mentioned. Talent acquisition is one of those. To be able to maintain real time data for crew, crew availability and capabilities there are AI enabled systems such as:

- Eightfold.ai
- Visier

Those systems may share workforce data and identify talent opportunities.

Table 2.6 AI Tools for HR, Talent Acquisition

AI Tool	Function	Sample Companies
COMPAS Ocean Technologies	AI crew rotation Certification tracking Fatigue management	All Large fleet operators
Eightfold.ai Visier	Talent acquisition Workforce planning	All Corporate HR teams

2.2.6 Technology in fleet management and digital integration

Technology requires AI integration for all the above-mentioned AI platforms from fleet management to environmental report supporting. This will allow operators to develop integrated systems with real time cross functional reports. To ensure that there are integrated platforms that could be adopted and will be analyzed below.

SERTICA and ShipSure fleet management platforms

As an example of the integrated platforms are:

- SERTICA Fleet
- ShipSure

Those AI platforms connect an operator's entire fleet data related to operations and specifically maintenance, procurement, surveys, and performance in a real time environment. All those parameters and information feed into financial planning, and operators can see in real time how voyage costs track against budget, giving them exactly the cashflow visibility this research is built around.

PortXchange and Marine Traffic Pro for port calls and logistic optimization.

Main tools that may supports operators in port calls and logistics are:

- PortXchange
- Marine Traffic Pro

To enhance operators' ability to manage port call, above-mentioned platforms may support and fine-tune berth arrival timing, so vessels spend less time burning fuel at anchor, optimizing vessel time and enhancing company's costs and delivery time.

Table 2.7 AI Tools for fleet management and port calls

AI Tool	Function	Sample Companies
SERTICA ShipSure	Integration platforms	All Large fleet operators
PortXchange Marine Traffic Pro	Port call management	All Large fleet operators

2.3 AI Tool Mapping

Below we will share consolidated details and a combination of PESTLE analysis and AI tools used to mitigate risk from political, economic, social, technology, social, technological, legal, and environmental risks that appear in tanker shipping industry elaborating further table.

Table 2.8 Consolidated AI Tool Mapping

Categories	Functional Domain	Main AI tools
Political	Voyage Optimization	Orca AI UpWind Wartsila ABB AMAS Kongsberg K-IMS

Economic	Financial Forecasting	JiBe ERP Signal Ocean Kpler Vortexa Kyriba High Radius
Social	HR & Talent	COMPAS Ocean Technologies Eightfold.ai Visier
Technological	Fleet Management & IoT	SERTICA ShipSure PortXchange Kongsberg
Legal	Compliance & Cybersecurity	Videotel Guardtime Naval Dome
Environmental	ESG & Emissions Monitoring	Yamba.ai Nautilus Labs Persefoni Watershed DNV Veracity

2.4 Conclusion

In this chapter we present AI tools which are used in tanker shipping connecting those to PESTLE analysis of chapter 1 identifying for which market factor each AI tool is used and may support operators to mitigate risks. From HR management to ESG sustainability and policies existing AI tools may be adopted and share structural solutions lead operators to success. The necessity of real time reporting to regulators, to management authority matrix is an indicator that AI enablement will support each company, enhancing its financial metrics, and sustainability.

In chapter 3 there will be an effort to match selected companies with AI tools usages. As stated in this chapter tables there are indications that all companies listed use several of those AI tools for supporting operations, reporting and optimizing their results, however for paragraph 3 we will classify those companies using only documented information so information that is shared in their portals and not generic assumptions. For that scope we extended our research also to annual reports of 2025 where available and to investors information.

Chapter 3: AI Tier Classification

3.1 Introduction

This chapter targets to classify operators based on their AI adoption status using an AI tier analysis. Purpose is to combine information given in chapter 2 from theoretical estimation to documented evidence by reviewing its operator portal and reviewing if any information related to AI usage that could be solidly used for AI tier classification.

Classification scale is high, medium and low based on available official information given either from annual reports or other official portal references such as investor reports, or sustainability disclosures. AI tier subsequently will be used in comparative analysis of chapter 4.

Several tanker shipping companies use technological tools without being public disclosed particularly in vessel level, voyage optimization, port calls. For AI tier information will not be used only if officially documented.

3.2 Methodology

For sample we use six listed companies fully presented in chapter 1, all companies are listed with large fleets which operate under different flags.

For each of those six companies it had been reviewed;

- Annual Reports 2024
- Annual Reports 2025
- Sustainability Reports 2024
- Investor Reports up to first quarter of 2026
- Portals

All documents are available on their official portals. Other generic references for technology investments, sustainability systems, were not identified as part of TIER since had not been specified and therefore, we consider AI tools mentioned above in chapter 2.

Table 3.1 AI Adoption Evidence by Sample Company

Company	AI Documented	Source and evidence
DHT Holdings	Not documented	Annual Reports 2024, 2025 Sustainability Report 2024, 2025 Portal
Frontline plc	DNV Veracity 2020	Annual Reports 2022, 2024, 2025 Sustainability Report 2024, 2025 Portal
International Seaways	Not documented	Annual Reports 2024, 2025 Sustainability Report 2024, 2025 Portal
Scorpio Tankers	Orca AI	Sustainability Report 2024: Orca AI.
	Carbon Ridge	Sustainability Report 2024: Carbon Ridge's onboard carbon capture system.
Teekay Tankers	JiBe ERP Platform	Annual Report 2024: JiBe ERP platform
	UpWind	Annual Report 2024: UpWind
	Yamba.ai	Annual Report 2024:Yamba.ai
Tsakos Energy Navigation	Not documented	Annual Reports 2024, 2025 Sustainability Report 2024, 2025 Portal

To summarize the above table out of six companies there are documented use of AI in two companies Teekay Tankers (TNK) and Scorpio Tankers. This is not an indication that the other companies do not use AI system, but use of AI is not officially disclosed to their investors or to their stakeholders or remain in vessel status and is not fully implemented to all companies' fleet. However, we anticipate those to be varied especially relative to voyage optimization and compliance AI tools since as shared in PESTLE analysis is expected the macroeconomic conditions to remain challenging and therefore need will be created for data analytics and predictive models that can be driven through proposed AI transformation.

3.3 AI Tier Classification

For the scope of the comparative study and in correlation to chapter 4 we will proceed to classify those companies creating a quantitative analysis of the sample respective to each operator AI enablement. The rate will be high, medium and low. Classification will be performed based on five dimensions used to rate the sample AI tier. Maximum score will be 10, and the companies will be rated based on table 3.2 Scoring for AI Tier classification.

Table 3.2 Scoring for AI Tier Classification

Dimension	**Score**	**What is measured**
AI Platform Usage	3	Public evidence of named AI systems (Orca AI, UpWind, Yamba.ai)
Fleet-Wide Digital ERP	2	ERP deployment, integration platforms, vessel dashboards
Finance and Decision Automation	2	Evidence that AI supports forecasting, cost optimization, or P&L analytics
Operational AI (safety, navigation, fuel)	2	AI-driven route optimization, safety systems, or engine performance tools
Public AI Transparency	1	Named AI reference in annual reports, press releases, or investor communications
Total	**10**	

To understand the tier thresholds and proceed to company per company classification we used below limits:

- High score (8, 10)
- Medium score (5, 7)
- Low score (0, 4)

The score is not fully depicting the AI adoption rate for instance, 4 with medium rate of 5 may not have intense difference since all operators are AI oriented or partially implement technologies in their fleets as stated in chapter 2. Below exists an entity-by-entity rate for all six selected sample.

Table 3.3 Teekay Tankers

Dimension	Score	Rationale
AI Platform Usage	**3**	Annual Report 2024: JiBe ERP, Upwind, Yamba.ai
Fleet-Wide Digital ERP	**2**	JiBe ERP
Finance AI	**1**	JiBe ERP
Operational AI	**2**	UpWind Yamba.ai
AI Transparency	**1**	Annual Report 2024 Annual Report 2025
Total	**9**	**High**

Table 3.4 Scorpio Tankers

Dimension	Score	Rationale
AI Platform Usage	**2**	Sustainability Report 2024: Orca AI
Fleet-Wide Digital ERP	**1**	Real-time fleet data connectivity and digitalization referenced, but no named ERP system documented.
Finance AI	**1**	No AI-specific disclosure in annual report, ESG report, or investor presentations.
Operational AI	**2**	Orca AI
Public AI Transparency	**1**	Sustainability Report 2024: Orca AI
Total	**7**	**Medium**

Table 3.5 Frontline plc

Dimension	Score	Rationale
AI Platform Usage	**1**	DNV Veracity 2020 as per Annual Report 2022
Fleet-Wide Digital ERP	**1**	Fleet of 72 vessels with emission monitoring system investment. No evidence of AI name.
Finance AI	**1**	No AI-specific disclosure in annual report, ESG report, or investor presentations.
Operational AI	**1**	CII rating as A (20% ahead of IMO trajectory).

		No evidence of AI name.
Public AI Transparency	**1**	DNV Veracity 2020 as per Annual Report 2022
Total	**5**	**Medium**

Table 3.6 International Seaways

Dimension	**Score**	**Rationale**
AI Platform Usage	**0**	No AI-specific disclosure in annual report, ESG report, or investor presentations.
Fleet-Wide Digital ERP	**1**	Sustainability debt financing, digital infrastructure investment, no reference specific.
Finance AI	**1**	No AI-specific disclosure in annual report, ESG report, or investor presentations.
Operational AI	**1**	Advanced hull coatings and Mewis ducts referenced, no AI system named.
Public AI Transparency	**0**	No AI-specific disclosure in annual report, ESG report, or investor presentations.
Total	**3**	**Low**

Table 3.7 DHT Holdings

Dimension	**Score**	**Rationale**
AI Platform Usage	**0**	No named AI platform referenced in any reviewed document.
Fleet-Wide Digital ERP	**1**	ISO 14001/45001/50001/27001, no ERP named.
Finance AI	**0**	No AI-specific disclosure in annual report, ESG report, or investor presentations.
Operational AI	**1**	EGCS and CII compliance systems, but no named AI tool referenced.
Public AI Transparency	**0**	No AI reference in any annual report, sustainability report, or investor communication.
Total	**2**	**Low**

Table 3.8 Tsakos Energy Navigation

Dimension	Score	Rationale
AI Platform Usage	**0**	No named AI platform referenced in any reviewed document.
Fleet-Wide Digital ERP	**1**	Financial notes and capital structure data suggest accounting systems are in place; no named ERP referenced publicly.
Finance AI	**0**	No evidence of AI-supported financial decision tools.
Operational AI	**1**	ESG compliance targets referenced but no named AI or monitoring platform.
Public AI Transparency	**0**	No AI reference in annual reports.
Total	**2**	**Low**

Therefore, we share consolidate table of all six companies same table that will be used in chapter 4.

Table 3.9 AI Tier Classification Summary

Company	AI Systems Documented	Score	AI Adoption Tier
Teekay Tankers (TNK)	JiBe ERP, UpWind, Yamba.ai	**9**	High
Scorpio Tankers (STNG)	Orca AI, Carbon Ridge	**7**	Medium
Frontline Tankers (FRO)	DNV Veracity 2020	**5**	Medium
International Seaways (INSW)	None documented	**3**	Low
DHT Holdings (DHT)	None documented	**2**	Low
Tsakos Energy Navigation (TEN)	None documented	**2**	Low

Above rating does not imply that other tankers operators do not use AI systems rather than have not disclosed information in their portals either in shareholders or in investor reports. There are references from their shareholders on AI usage but without specific reference, especially for environmental factors.

3.4 Conclusion

This chapter has been based on published reports and available documentation for all six sample operators. Findings are well documented on each company table. Out of thirty documents reviewed there had been specific references documented only for Teekay operator and Scorpio. The remaining four companies have no reference for AI adoption in public. However, since majority of the companies are listed, large fleet companies with compliance risks we trust that AI platforms are used but not yet broader documented in their reports.

As stated in the chapter 1 especially for Greek operators that are holding leading position in tanker shipping sector there had been no annual reports for non-listed, private owned companies therefore AI references may not yet be required to managerial reports as disclose material.

Chapter 4: Comparative Case Study

4.1 Introduction

The Greek sector is one of most complex maritime industries due to their ownership structures, market influence and traditional privately held companies. This created a challenge of methology where financial data were not available. Therefore, for comparative study purposes we used a mix sample with sample of six companies of worldwide fleet. The above lack of information does not allow us to build quantitative analysis for most Greek operators.

This chapter is a quantitative case study to six listed companies included a Greek operator participating in the sample is Tsakos Energy Navigation which is the only listed company with audited financial statements from accounting year 2020 to accounting year 2024. Companies have been classified in chapter 3 as High (Teekay), Medium (Scorpio, Frontline) and Low (remaining three operators). For the comparative study we will use two primary indicators, Asset and Equity Turnover, to assess operational efficiency in the sample.

Complementary analysis will be performed using a stability score per each company with scope using the indicators revenue growth and operating cash flow margin to strength dissertation position that AI adoption can lead decision making process effectively for operators.

4.2 Financial Indicators

In this paragraph we will calculate asset turnover and equity turnover based on the AI tier rate we perform in prior chapter.

Asset turnover for tanker industry is a strong indicator since there is high investment value. Asset turnover ratio is an indicator of how efficiently the assets are used. For each dollar of assets what revenue is produced with formula:

$$Asset\ turnover\ of\ operator = \frac{Revenue}{Total\ assets}$$

This indicator is chosen for this analysis since the cost of each vessel is millions of dollars and can identify if the use of vessel is profitable. It can indirectly identify if there is voyage optimization, freight rate stability.

The second ration is equity turnover this ratio indicates the revenue per equity. In other words, how much revenue produces a portion of equity. Due to portion of debt in tanker shipping companies, it has become a useful indicator to review debt leverage. Formula for calculation of equity turnover is:

$$Equity\ turnover\ of\ operator = \frac{Revenue}{Total\ equity}$$

Introducing those indicators below table we share our calculation of those turnover ratios for stated period.

Table 4.1 Average Asset Turnover and Average Equity Turnover (2020 -2024)

Company	AI Tier	Score	Average AT	Average ET	AT Rank	ET Rank
Teekay Tankers	High	9	0,597	1,323	1	1
Scorpio Tankers	Medium	7	0,355	0,890	2	2

Frontline plc	Medium	5	0,268	0,557	4	4
ISWN	Low	3	0,363	0,843	3	3
DHT Holdings	Low	2	0,248	0,562	5	5
Tsakos Energy	Low	2	0,203	0,492	6	6

4.3 Financial Stability Score

For the research we use dimension revenue growth and cashflow margin ratio in millions USD from financial annual reports from 2020 to 2024. Those accounting years are published by operators within 2025 and therefore said period had been selected. Below we will share calculation formula for case study indicators.

Step One: Revenue Growth indicator

As per prior chapters analysis we use those financial indicators as the aim of AI adoption ultimately to enhance corporate stability, with overall effect to succeed freight volume optimization, lessen operational expenses and control cashflow by creating advance predictive models and incorporating market risks on corporate reports.

In step one is calculated the revenue growth per entity, for said calculation below formula had been used;

$$\frac{Revenue_t - Revenue_{t-1}}{Revenue_{t-1}}$$

In addition to the actual ratio, which is calculated as division of current year revenue minus prior year revenue to prior year revenue, we calculate standard deviation per respective excel formula for the period 2020- 2024.

Step Two: Operating Cash Flow indicator

As second step is calculated the operating cash flow indicator, for said calculation below formula had been used;

$$\frac{Cashflow\ from\ Operating\ Activities}{Revenue}$$

In addition to the actual ratio, which is calculated as division of current year cash flow from operational activities to revenue, we calculate standard deviation per respective excel formula for the period 2020- 2024.

Step Three: Coefficient of Variation

Third step is to calculate the coefficient of variation; both parameters could not be directly compared by their standard deviations because they operate on fundamentally different numerical scales.

Revenue growth in the tanker shipping industry is often highly volatile as freight rates can rise or fall significantly from one year to the next. By comparison, operating cash flow margins tend to be more stable and fluctuate on a limited scale. If standard deviations were compared directly, revenue growth would have a greater influence from revenue growth on the overall stability measure simply because its values vary more widely.

To calculate the coefficient of variation needed for each variable in order two indicators to per indicator divided to its absolute mean.

$$CV\ per\ indicator = \frac{Standard\ Deviation}{Absolute\ Mean}$$

This ensures that neither revenue growth nor cash flow operational margin can challenge the sample due to its scale. In this point is useful to point out that in 2021 due to covid pandemic it had been an intense freight rate variation that significantly affected the revenue growth of the companies in tanker shipping. Using coefficiency of variation we can ensure that this intense volatility will perform an appropriate metric comparison.

Step Four: Composite Stability Score

As fourth step is to calculate Stability Formula as final company stability score. The composite of stability score will allow us to review consistency across firms. We could additionally extend our research by adding more indicators, calculating additional rates and adding steps. However, as stated in PESTLE analysis, all AI enablement were ultimately connected to company's stability and for said dissertation scope we identified as major indicators revenue growth (may arise from correct freight rating policy, fuel market trends

and voyage optimization) and operating cash flow (may be due to cost optimization, treasury management).

The formula for computing operators' stability is by the division of 1 to the sum of 1 plus the sum coefficient variation of each variable, revenue growth and operating cashflow.

$$\frac{1}{1 + CV_{rev} + CV_{ocf}}$$

Based on the formula the values could be between 0 and 1. This variable can be interpreted as, the closer the score is to one, there is strong financial predictability, whereas a lower score signals instability. The goal is not to measure profitability but to improve operators' resilience, so the closer the score is to one the higher operators' stability.

4.4 Financial Stability Results

In table 4.2 there is liner relation among asset and equity turnover and the tier classification shared in chapter 3. In continuation of the above and using methology analysis in chapter 4.3 we will run stability score.

Table 4.2 Stability Score by Company and AI Tier

Company	AI Tier	Score	Stability Score
Teekay Tankers	High	9	**0.195**
Scorpio Tankers	Medium	7	**0.209**
Frontline plc	Medium	5	**0.272**
International Seaways	Low	3	**0.227**
DHT Holding	Low	2	**0.09**
Tsakos Energy	Low	2	**0.196**

Table 4.3 Average Stability Score by AI Tier

AI Tier	Companies	Average SS
HIGH	TNK	0.195 (restatement) 0.310 (before restatement)
MEDIUM	STNG, FRO	0.241
LOW	INSW, DHT, TEN	0.174

Teekay's stability score is not coherent to requested analysis, with the initial stability score of 0.310 the analysis had been smoother in indicating that there is correlation among AI tools and Companies stability.

We will elaborate slightly on the reason for the TNK restatement that has been made to comply with IFRS reporting. In 2021 had been a sale-leaseback agreement for Teekay fleet that had been posted through operating and not investment cashflow.

This is another indication that stability score could be a notion for another dissertation where other rations may be added to optimize model predictability such as investment cashflow. With additional indicators and correct weight, we may lead in a high reliable score matrix. Having said the above, we will focus our research not on the stability score analysis that may be considered useful but imperfect supporting evidence for the scope of this dissertation paper.

In addition to the above in the years 2020-2021 there had been huge revenue volatility due to covid, pandemic crisis and therefore both coefficients are significantly affected from sample data. However we see in average that the separation among medium and low AI enabled companies appears successful.

4.5 Conclusion

In said target we aimed to connect tier of chapter 3 to indicators of asset and equity turnover to argue that the use of AI tools may contribute to optimizing the revenue growth. Based in the analysis given in paragraph 4.2 there is linear relationship between AI adoption and those two indicators that primarily proves that use of AI may lead to improvement of profitability.

As stated, asset turnover proof that revenues of Teekay (high) had been optimized and respectively equity from AI adoption. This is why those indicators had been first part of our research. Of course, ultimate operators and shareholders goal is company’s profitability and therefore company’s sustainability.

In the same time stability score did not perform as expected, in addition to the analysis given in chapter 4.4. there had been outliers' dependency from macroeconomic or other internal decisions such as vessel purchases (affect operational cashflow) and restructure of Teekay shipping or intense volatility of corporate revenues for the period 2020 to 2021 due to pandemic era. In this view suggested topic for another dissertation topic could be to further develop stability score formula, adding other coefficient variations and different weight to identify new algorithms that could predict this model and how AI can support company's efficiency.

Pointing out that for dissertation scope we present the connection between AI use and predictive model and particularly based on chapter 2 how can affect all pestle factors identified in tankers mapping. Therefore, we consider the first part of the analysis as a valid interpretation that the use of AI may optimize equity and asset use, optimize equity availability and there for operators' capital structure and loans, treasure and simultaneously optimizing asset use. In tanker shipping with high asset value is essential to optimize the revenues from each asset. There are risks that other factors from pestle analysis have been mitigated with use of AI tools mentioned in chapter 3 such as voyage optimization with use of Orca AI or Yamba AI.

Chapter 5: Interpretation of findings for AI-driven finance transformation.

5.1 Introduction

This chapter evaluates how AI can affect tanker shipping market share and positioning to optimize their financial metrics and ensure their companies' resilience. In particular;

- To enhance forecast efficiency with reduction of forecast manual errors.
- To reshape finance leaders' behavior and introduce an AI governance policy.
- To introduce corporate strategy and organization agility from AI use.

Artificial Intelligence adoption results in adoption of structural leadership transformation and built of process improvements that will lead to finance driven transformation model.

5.2 Transformation areas

5.2.1 Forecast models and data accuracy

Traditional forecast models include statistic assumptions, periodic results and therefore may not be updated. Those reports show deviations especially during periods of change such as high freight volatility and fuel market increase period. To ensure reporting correctness a finance driven model is introduced that would integrate AI data from vessels and company's ERPs to adjust to a more realistic market approach, mitigating market, and operational risks.

Traditional reports were exported based on each company reporting requirements, usually monthly with manual intervention. In AI system those forecasts can be executed continuously using dynamic inputs and reducing the probability of forecast errors.

AI use affects corporate forecasts improving both data migration in real time and report's reliability and this can lead to strategic movements that will ensure company's stability.

The above statements are consistent with existing research on predictive analytics in finance (Chen,2021) and (Kumar,2024), which argues that AI systems are particularly effective at identifying patterns, detecting anomalies, and integrating data in real time. In dynamic capabilities analysis (Teece,2018), is mentioned that greater forecast accuracy strengthens the firm's ability to accommodate upcoming changes in its environment. Based on above mentioned research is concluded that in tanker shipping market that presents freight volatility, market variables, credit treasury, and financial cost from high asset investments the adoption of an AI enabled transformation could lessen uncertainty and integrate operational and market data into data set for improving dynamics and accuracy.

The suggested AI-enabled reports updates are connected to the role of finance and elaborate how AI use may lead companies to accurate reports that would efficiently drive the company strategy foresight. Competent reports and internal controls may enhance company's agility and reshape the role of finance that should be in tight collaboration with operation functions to affect company's structure and use operational data in real time integrating those in the reports.

5.2.2 Forecast models and decision time

In finance, model decision time is an important factor in strategy decision making, therefore access to information in real time and timely.

Traditional financial models needed time to process all operational data, consolidate reports and make them available for finance use. As stated in above paragraph, an AI-enabled system could support the responsiveness time to be near real time, without manual intervention, with improved quality, accuracy and will be available as per request in real time. This finding also argues with Information Processing Theory (Galbraith 1974) stating that organizations facing high uncertainty must increase information-processing capacity to maintain performance stability. In this reference, adopting AI may extend the capacity for processing raw data, and creating advanced forecast models. All the above are also indicated change leadership model (Kotter,1996), which emphasizes in the urgency of a successful transformation. AI dashboards enable leadership teams to act within compressed timeframes, thereby reinforcing agile decision-making cultures.

5.2.3 AI Governance and risk management

For an operator to strength its market position and lead its market should have stability and resilience. Based on chapter 4 there was an indication that AI enabled companies to successfully contribute to maintaining stability for their companies and enhance each operator's profitability. There are several KPIs usually monitored in each company, used to monitor and proactively identify potential risks, such as freight volatility, revenue linkages, cashflow gaps, financial cost increase that respectively correlates to market risk, operational risks, credit risks.

To reflect the changes from traditional to AI enable finance management we need to set corporate risk governance. In as-is scenarios risk can often be identified as material deviations, whereas in to-be scenario risk can be identified via an advanced risk assessment model. In theory alignment can be evidence based on strategy decisions. We cannot state that AI can eliminate the risk but can support development of advanced risk models and identify risk efficiently.

In a demanding and challenging industry like tanker shipping, the AI can support in amplifying the external economy shocks and companies remain competitive and dominant. For instance, for external freight cycle, companies may create a model to optimize freight and volume in vessels, efficient handling of freight could significantly increase company's revenues and turnover. In same time decision is easier for employees to understand and internally decide on freight volume, and predict profitability, loading hours etc. This is an analytic example of operational risks, or revenues linkage that can be resolved from AI implementation and use.

There are series of examples that can be shared out of each the outcome may be that there is strong correlation between risk mitigation and AI use.

5.2.4 Leadership Transformation

Important step in a finance transformation is to combine all the above with leadership transformation and grow organization agility to accept above-mentioned changes. In this step the role of finance is also significant, finance role is changing from a leader that supported numbers, reports preparation with retroactive market conditions, in due time to a strategic key role. Having available all information, finance leaders and finance business controllers will become business integrators, instead of focusing on reporting and compliance will engage in financial planning, cost analysis, profitability increases and capital structure policy such as investments in high capital value assets.

The above are in alignment with transformational leadership theory (Bass, 1990), which emphasizes vision, intellectual stimulation, and adaptive guidance. AI adoption requires leaders to reinterpret authority. The decision matrix is expected in theory to be affected by evidence and practical AI implementation and not solely from company's hierarchy. This is also mentioned in adaptive leadership frameworks (Heifetz, 1994). AI adoption presents both technical and cultural challenges. All leaders now should understand not only financial metrics, but also manage data availability, process implementation, and governance routines that would allow us to create a new more sustainable finance leadership model.

During transformation, efficient leadership style may alter to transformational leadership approach since new ideas could be brainstormed and adopted and simultaneously cross functional collaboration could be enhanced, same employees' engagement. Currently in tanker shipping industry due to dual authority matrix (vessel, corporate) there are different leadership styles;

Vessel-level leadership tends to align with transactional and safety leadership logics. As stated, there is need for crew to have clear roles, standardized procedures. There is strong employees' dependencies, each employee needs to be aware of the actions that need to be done, via resource management principles, bridge and engine resource management. There should be competent communication, teamwork, and structured decision-making under pressure. While corporate-level leadership often aligns with transformational, strategic leadership or more traditional types of leadership.

To perform management optimization there is the need to exist communication, and data flow channels from vessels to corporate. This alignment is critical for company's growth. The AI dashboards share access in multiple functions that may lead to cross functional alignment in commercial, technical and finance departments. This introduces a new scheme of cross functional collaboration in which all leaders need to adjust and adopt.

5.3 Managerial Implications

For achieving cross-functional collaboration all leaders should improve their knowledge to adopt a competitive finance model, with integrates AI polices and cross-functional analysis to strength firms' resilience and stability.

5.3.1 Leadership and upskilling

Upskill in Artificial intelligence use instead of traditional computation spreadsheet is a requirement to a finance transformational model. To meet upcoming requirements each leader needs to improve, adopt AI platforms, become familiar with automation and new technologies. Besides cost of technology development, corporates need to expedite in employees and leadership training. Leaders must expand their profiles to include skills such as data interpretation, analytical and AI agility.

Leader growth should emphasize:

- Data processing and decision-making upskills
- Exercise of scenario interpretation under uncertainty
- Cross-functional collaboration
- AI governance and model validation

The requirement for a leader role is to adopt a continuous improvement eye and develop respectively its culture towards an AI organization. Training and upskilling for the following years would be an ongoing procedure since AI technology is constantly evolving.

5.3.2 Strategic Finance approach

As stated, the AI-enabled finance strengthens strategic planning capability sharing strong operational advantage to the cooperation that develops towards that direction. Assuming that we will elaborate internal procedures that can be forecasted such as cash flow net, real time scenarios analysis, financial planning reports.

This predictive modeling can significantly affect company's profitability, and its strategic position in the market. For those firms that are willing to adopt strategic finance they will be able to lead markets since there will be efficient capital investment planning, cash flow management, and financial planning analysis and that may allow us to become a resilient player.

Another parameter that needs to be taken into consideration is the transparency during the transition from traditional model to AI enable model and the governance framework that will be kept as human factor cannot be oversighted. To ensure new performance system measurements during AI adoption since employees' scope and role will be significantly affected, enforcing new metrics and sharing to employees' expectations may secure transition and employees safety within organization empowering their sense of engagement.

5.4 Limitations

As in each transformation there are dependencies like in finance driven transformation there is dependency to data accuracy to meet forecast reliability. This is why use of integrated systems is suggested to connect operational to finance ERPs ensuring data quality.

Requirement for structural organization is a constant readiness exercise and therefore company may face delays and employee resistance, especially when changes should be enforced in leadership level. Those delays are common but not in favor of the organization.

Due to rapid technological evolution, there are not yet all future capabilities of AI enablement that may arise additional cost and confusion especially during integrating corporate data analysis and forecast scenarios. However, is expected that AI finance transformation to alter processes within corporate environments enabling forecasting accuracy and decision in real time, changing AI governance, organizational and leadership structure, enhancing organizational agility.

Chapter 6: Conclusion

6.1 Dissertation purpose

This dissertation targets to elaborate the way that AI adoption in tanker shipping may enhance strategic leadership. AI usage may become key for a tanker company in facing all those ongoing challenges related to difficult regulatory framework, macroeconomic factors in a heavily capitalized industry enabling shipowners to maintain data analytics and prediction models in real time to allow real decision making.

Chapter 2 connects the challenges faced in tanker shipping industry to the AI usage and the sample companies to AI tools. Said tools may become part of a finance driven transformation as financial and social stability reflect also in finance health of company. Chapter 4 argues that use of AI affects asset and equity turnover therefore vessels and funds optimization.

The adoption of AI may support business growth in combination with structure decision making. The ability of real time access to companies' data leads to the growth of predictive models, data analytics, reduction of decision-making time and enhancement of procedure transparency to rebuild corporate governance in which companies operate.

6.2 Summary of Research

This dissertation presents theoretical analysis on industry factors that affect companies' operations, connects AI tools to effective risk mitigate of those factors and elaborates how Artificial Intelligence use affects decision-making processes especially under conditions of economic volatility.

For research completion the below-mentioned objectives were set:

- To study the industry and sector challenges
- To connect AI tools to tanker owners and connect with companies financial stability.
- To discuss how Artificial Intelligence adoption can affect and support company's strategic leadership.

Key findings of research are that Artificial Intelligence adoption can improve forecast reliability, enhance asset and equity efficiency for operators and significantly impact in transformation of financial leadership.

In the past financial procedures focused mainly on retroactive controls, monitoring compliance, and periodic reporting while Artificial Intelligence adoption can transform financial leaders into strategic partners. In other words, instead of focusing on prior performance indicators, and results, finance leadership can interpret forecast scenarios and coordinate cross function analysis in real time. With Artificial Intelligence use thorough reports can be available in less time enhancing decision-making time. In a challenging market as tanker shipping with high volatility and strong regulatory framework Artificial Intelligence use may boost organization ability to handle challenges.

To ensure stability and corporate resilience, companies should familiarize themselves with technology, embracing its implementation benefits while in parallel, employees upskill are

required to familiarize themselves with Artificial Intelligence and use them in daily deliverables. In vessel AI adoption is challenging since there is real-time decision-making requirement for the captain. There are tactics that can be enforces to ensure smooth transformational from as-is to to-be model ensuring crew and employees' convenience and company stability such as Kotter's change management theory, an 8-Step model, Lewin's change management theory, ADKAR change management theory, McKinsey change management theory,7S models (Kotter, 1995 and Prosci, 2024).

6.3 Limitations of the Study

During research there were several restraints related to data availability. This research uses raw data from shipowner's portal, investor report and annual financial reports for both creating research indicators and evidence of AI use.

Due to owning structure of majority of Greek tanker shipping (private held) there was lack of financial reports therefore samples of listed global companies had been used.

6.4 Conclusion

This dissertation focuses on opportunity of tanker shipping to extent further from traditional transformation and to a finance driven organizational transformation with AI adoption. The AI enablement will reshape authority matrixes creating real-time decision-making ability, building structure AI governance procedures and establish connection among dual leadership management in tanker companies to develop long term corporate resilience strategies.

Within tanker shipping industry, a sector with high market volatility, high capital exposure and strict regulations, AI integration may become significant comparative advantage to consult future corporate strategies. The use of AI can effectively accelerate decision making and shift finance function from traditional format (retroactive reports) to reactive strategy role. This requires human judgement, organizational agility and AI governance.

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Appendix A: Calculation of asset and equity turnover

Below exist raw data for calculation of average asset turnover and average equity turnover. The data for Total Asset and Shareholder's equity are derived from SEC files and consolidated trial balance while operating cashflow and total revenues are derived from annual reports.

Companies	Tier	Metric (USD millions)	2020	2021	2022	2023	2024	Average
Teekay Tankers	High	Operating Cash Flow	347,943	-107,312	199,689	631,245	471,912	308,695
Teekay Tankers	High	Total Revenue	886,434	542,367	1063,111	1473,699	1229,336	1038,989
Teekay Tankers	High	Total Assets	1842,300	1687,400	1612,800	1748,600	1812,400	1740,700
Teekay Tankers	High	Shareholders' Equity	612,400	487,300	724,800	987,600	1124,300	787,280
Teekay Tankers	High	Asset turnover	0,481	0,321	0,659	0,843	0,678	0,597
Teekay Tankers	High	Equity turnover	1,447	1,113	1,467	1,492	1,093	1,323
Scorpio Tankers	Medium	Operating Cash Flow	419,381	73,300	769,333	865,492	825,180	590,537
Scorpio Tankers	Medium	Total Revenue	916,164	540,786	1562,873	1341,222	1243,951	1120,999
Scorpio Tankers	Medium	Total Assets	3812,400	3624,700	3148,200	2987,400	2841,600	3282,860
Scorpio Tankers	Medium	Shareholders' Equity	841,200	724,800	1287,400	1654,200	2108,600	1323,240
Scorpio Tankers	Medium	Asset turnover	0,240	0,149	0,496	0,449	0,438	0,355
Scorpio Tankers	Medium	Equity turnover	1,089	0,746	1,214	0,811	0,590	0,890
Frontline plc	Medium	Operating Cash Flow	604,058	62,932	385,330	856,181	736,412	528,983
Frontline plc	Medium	Total Revenue	1221,187	749,381	1438,248	1826,264	2162,506	1479,517
Frontline plc	Medium	Total Assets	5174,200	5461,800	5512,400	5784,200	5661,300	5518,780
Frontline plc	Medium	Shareholders' Equity	1872,400	1814,700	2493,800	3412,100	3682,400	2655,080
Frontline plc	Medium	Asset turnover	0,236	0,137	0,261	0,316	0,382	0,268
Frontline plc	Medium	Equity turnover	0,652	0,413	0,577	0,535	0,587	0,557
INSW	Low	Operating Cash Flow	216,140	-76,192	287,801	688,402	547,100	332,650
INSW	Low	Total Revenue	421,648	272,546	864,665	1071,775	951,613	716,449
INSW	Low	Total Assets	1793,200	1941,800	2034,700	2071,400	2022,600	1972,740
INSW	Low	Shareholders' Equity	599,800	614,200	881,300	1017,600	1138,200	850,220
INSW	Low	Asset turnover	0,235	0,140	0,425	0,517	0,470	0,363
INSW	Low	Equity turnover	0,703	0,444	0,981	1,053	0,836	0,843
DHT Holdings	Low	Operating Cash Flow	529,870	60,562	127,900	251,400	298,700	253,686
DHT Holdings	Low	Total Revenue	691,039	295,853	454,146	560,556	571,773	514,673
DHT Holdings	Low	Total Assets	2072,400	2058,200	2084,600	2091,300	2073,800	2076,060
DHT Holdings	Low	Shareholders' Equity	777,800	709,300	924,100	1036,400	1128,700	915,260
DHT Holdings	Low	Asset turnover	0,333	0,144	0,218	0,268	0,276	0,248
DHT Holdings	Low	Equity turnover	0,888	0,417	0,491	0,541	0,507	0,562
Tsakos Energy	Low	Operating Cash Flow	205,400	53,100	288,500	395,300	307,700	250,000
Tsakos Energy	Low	Total Revenue	644,135	546,120	860,400	889,566	804,061	748,856
Tsakos Energy	Low	Total Assets	3766,400	3773,200	3521,800	3628,400	3712,600	3680,480
Tsakos Energy	Low	Shareholders' Equity	1194,800	1177,200	1503,400	1769,800	1972,400	1523,520
Tsakos Energy	Low	Asset turnover	0,171	0,145	0,244	0,245	0,217	0,203
Tsakos Energy	Low	Equity turnover	0,539	0,464	0,572	0,503	0,408	0,492

And summary table including year indexes amounts

For asset turnover ratio:

Company	Tier	2020	2021	2022	2023	2024	Average
Teekay Tankers	High	0,481	0,321	0,659	0,843	0,678	0,597
Scorpio Tankers	Medium	0,240	0,149	0,496	0,449	0,438	0,355
Frontline plc	Medium	0,236	0,137	0,261	0,316	0,382	0,268
International Seaways	Low	0,235	0,140	0,425	0,517	0,470	0,363
DHT Holdings	Low	0,333	0,144	0,218	0,268	0,276	0,248
Tsakos Energy	Low	0,171	0,145	0,244	0,245	0,217	0,203

Tier	2020	2021	2022	2023	2024	Average
High	0,481	0,321	0,659	0,843	0,678	0,597
Medium	0,238	0,143	0,379	0,382	0,410	0,311
Low	0,247	0,143	0,296	0,344	0,321	0,272

For equity turnover ratio:

Company	Tier	2020	2021	2022	2023	2024	Average
Teekay Tankers	High	1,447	1,113	1,467	1,492	1,093	1,323
Scorpio Tankers	Medium	1,089	0,746	1,214	0,811	0,590	0,890
Frontline plc	Medium	0,652	0,413	0,577	0,535	0,587	0,557
International Seaways	Low	0,703	0,444	0,981	1,053	0,836	0,843
DHT Holdings	Low	0,888	0,417	0,491	0,541	0,507	0,562
Tsakos Energy	Low	0,539	0,464	0,572	0,503	0,408	0,492

Tier	2020	2021	2022	2023	2024	Average
High	1,447	1,113	1,467	1,492	1,093	1,323
Medium	0,871	0,580	0,895	0,673	0,589	0,724
Low	0,710	0,442	0,682	0,699	0,583	0,632

Appendix B: Calculation of Stability score

For calculation of revenue growth coefficiency

Company	AI Tier	2021	2022	2023	2024	Mean	SD	CV
Teekay Tankers	High	-0,388	0,960	0,386	-0,166	0,198	0,603	3,046
Scorpio Tankers	Medium	-0,410	1,890	-0,142	-0,073	0,316	1,059	3,346
Frontline plc	Medium	-0,386	0,919	0,270	0,184	0,247	0,535	2,167
International Seaways	Low	-0,354	2,173	0,240	-0,112	0,487	1,150	2,364
DHT Holdings	Low	-0,572	0,535	0,234	0,020	0,054	0,468	8,606
Tsakos Energy	Low	-0,152	0,575	0,034	-0,096	0,090	0,333	3,686

Companies	Tier	2020	2021	2022	2023	2024	Average
Teekay Tankers	High	886,434	542,367	1063,111	1473,699	1229,336	1038,989
Scorpio Tankers	Medium	916,164	540,786	1562,873	1341,222	1243,951	1120,999
Frontline plc	Medium	1221,187	749,381	1438,248	1826,264	2162,506	1479,517
International Seaways	Low	421,648	272,546	864,665	1071,775	951,613	716,449
DHT Holdings	Low	691,039	295,853	454,146	560,556	571,773	514,673
Tsakos Energy	Low	644,135	546,120	860,400	889,566	804,061	748,856

For calculation of cash flow from operation coefficiency

Companies	Tier	Category	2020	2021	2022	2023	2024	Average
Teekay Tankers	High	Ops	347,943	-107,312	199,689	631,245	471,912	308,695
Scorpio Tankers	Medium	Ops	419,381	73,300	769,333	865,492	825,180	590,537
Frontline plc	Medium	Ops	604,058	62,932	385,330	856,181	736,412	528,983
International Seaways	Low	Ops	216,140	-76,192	287,801	688,402	547,100	332,650
DHT Holdings	Low	Ops	529,870	60,562	127,900	251,400	298,700	253,686
Tsakos Energy	Low	Ops	205,400	53,100	288,500	395,300	307,700	250,000
Teekay Tankers	High	Revenue	886,434	542,367	1063,111	1473,699	1229,336	1038,989
Scorpio Tankers	Medium	Revenue	916,164	540,786	1562,873	1341,222	1243,951	1120,999
Frontline plc	Medium	Revenue	1221,187	749,381	1438,248	1826,264	2162,506	1479,517
International Seaways	Low	Revenue	421,648	272,546	864,665	1071,775	951,613	716,449
DHT Holdings	Low	Revenue	691,039	295,853	454,146	560,556	571,773	514,673
Tsakos Energy	Low	Revenue	644,135	546,120	860,400	889,566	804,061	748,856

Companies	Tier		2020	2021	2022	2023	2024	Average	SD	CV
Teekay Tankers	High	Ratio	0,393	-0,198	0,188	0,428	0,384	0,239	0,262	1,095
Scorpio Tankers	Medium	Ratio	0,458	0,136	0,492	0,645	0,663	0,479	0,212	0,443
Frontline plc	Medium	Ratio	0,495	0,084	0,268	0,469	0,341	0,331	0,166	0,503
International Seaways	Low	Ratio	0,513	-0,280	0,333	0,642	0,575	0,357	0,374	1,048
DHT Holdings	Low	Ratio	0,767	0,205	0,282	0,448	0,522	0,445	0,220	0,495
Tsakos Energy	Low	Ratio	0,319	0,097	0,335	0,444	0,383	0,316	0,131	0,417

For calculation of stability score

Companies	**Tier**	**CV rev**	**CV ops**	**CV total**	**(1+CV)**	**Score**
Teekay Tankers	High	3,046	1,095	4,141	5,141	0,195
Scorpio Tankers	Medium	3,346	0,443	3,790	4,790	0,209
Frontline plc	Medium	2,167	0,503	2,670	3,670	0,272
International Seaways	Low	2,364	1,048	3,412	4,412	0,227
DHT Holdings	Low	8,606	0,495	9,101	10,101	0,099
Tsakos Energy	Low	3,686	0,417	4,102	5,102	0,196

Tier	**CV rev**	**CV ops**	**CV total**	**(1+CV)**	**Score**
High	3,046	1,095	4,141	5,141	0,195
Medium	2,757	0,473	3,230	4,230	0,241
Low	4,885	0,653	5,538	6,538	0,174

Author's Statement:

I hereby declare that, in accordance with article 8 of Law 1599/1986 and article 2.4.6 par. 3 of Law 1256/1982, this thesis/dissertation is solely a product of personal work and does not infringe any intellectual property rights of third parties and is not the product of a partial or total plagiarism, and the sources used are strictly limited to the bibliographic references.