ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΕΙΡΑΙΩΣ

DEPARTMENT OF MARITIME STUDIES

POSTGRADUATE PROGRAMME

in

SHIPPING ADMINISTRATION

RISK MANAGEMENT IN THE SHIPPING INDUSTRY

IOANNA SALIGKARA

Master's thesis

submitted to the Department of Maritime Studies

of the University of Piraeus as part of

requirements for obtaining the Master's degree

Specialization Diploma in Shipping

Administrative

Piraeus

September 2021

Copyright

«The person who prepares the Diploma Thesis has the full responsibility for determining the fair use of the material, which is defined on the basis of the following factors: the purpose and nature of the use (commercial, non-profit or educational), the nature of the material used (part of the text, tables, figures, images or maps), the percentage and importance of the part, which it uses in relation to the whole copyrighted text, and the possible consequences of this use in the market or in the general value of the copyrighted text».

Three-Member Examination Committee

This Diploma Thesis was approved unanimously by the Three-Member Examination Committee appointed by the GSS of the Department of Maritime Studies of the University of Piraeus in accordance with the Rules of Operation of the Postgraduate Program in Maritime Administration.

The members of the Committee were:

-Mr. Andreas Koutoupis …… (Supervising Professor)

-Ms. Maria Karakasnaki

-Mr. Christos-Vasilios Naoum

The approval of the Diploma Thesis by the Department of Maritime Studies of the University of Piraeus does not imply acceptance of the author's opinions.

Contents

TABLE OF FIGURES

TABLE OF TABLES

Acknowledgments

This Diploma aims to describe, illuminate and present the offer of Shipping in a country that is at the same time the basis of its heavy industry. Its offer is invaluable and its operation occupies a huge field of activity worldwide, covering thousands of jobs.

At this point I have only to express my immense gratitude that I participated in this Postgraduate Program, which gave me the opportunity to get to know the wonderful world of Shipping up close and to put a priceless stone in the pyramid of my knowledge.

I would also like to thank my Supervising Professor, Mr. Andreas Koutoupis, who without his help and guidance, would not have completed this Master Thesis as he contributed catalytically in his own way and with his inexhaustible source of knowledge in its elaboration.

In closing, I would like to thank all the teaching staff, the secretarial support for their prompt response to our questions, the University of Piraeus and especially Mr. Angelos Pantouvakis, without whom, the program would not be what it is and it would not have the level it has reached.

In closing, to thank from the bottom of my heart my family, my people and my friends, who support my every choice but especially my mother, who took care to inspire me with the courage and zeal to achieve anything and everything, that I would like to achieve in my life.

Thank you

ΠΕΡΙΛΗΨΗ

Όλες οι εταιρίες σε όλους τους κλάδους έρχονται αντιμέτωπες με διάφορους κινδύνους, τους οποίους καλούνται να αντιμετωπίσουν. Το ίδιο συμβαίνει και στον κλάδο της ναυτιλίας, όπου κατά κύριο λόγο οι κίνδυνοι που υπάρχουν είναι οικονομικοί και πιστωτικοί. Το στοίχημα, λοιπόν, αυτών των εταιριών είναι να υπάρχει ένας τρόπος ώστε να προβλέπουν τους κινδύνους πριν ακόμα χρειαστεί να τους αντιμετωπίσουν. Για να γίνει αυτό, χρειάζεται η εφαρμογή ενός ολοκληρωμένου συστήματος που θα προβλέπει πιθανούς κινδύνους και θα τους διαχειρίζεται πριν γίνουν μεγάλο πρόβλημα

για την εκάστοτε επιχείρηση. Τις έννοιες αυτές και τα εργαλεία για την εφαρμογή του συστήματος αυτούς μελετάμε σε αυτή την εργασία.

ABSTRACT

All companies in all industries are faced with various risks, which they are called to face. The same is true in the shipping industry, where the risks are mainly financial and credit. So, the bet of these companies is that there is a way to anticipate the risks before they even have to deal with them. To do this, it is necessary to implement an integrated system that will anticipate potential risks and manage them before they become a major problem for each business. We study these concepts and the tools for implementing these systems in this paper.

1. THE SHIPPING SECTOR

1.1 THE SHIPPING MARKET

The Shipping market, or shipping industry, consists of four sub-markets that have taken on the task of shipping.The first market deals with freight (Freight Market), the second deals with the purchase of used ships (Sale and Purchase Market), the third is the purchase of new ships (New building Market) and the fourth trades within the operation of scrap yards (Demolition Market). (YHV Lun, MA Quaddus, 2009)

In particular, in the freight market, shipowners, who are the providers of fare revenue, ie the source of capital required by the shipping company, play a key role. In addition to the above, the fare market extends to the derivatives market, through which shipowners have the ability to hedge the business risk arising from fare fluctuations. In the used ship market, shipowners, either as buyers or sellers, complete their transactions with the cooperation of freight brokers. Prices are dynamically adjusted as determined by the respective supply and demand, yielding significant revenue to the shipowner. (M Stopford, 2013)

The purchase of newly built ships refers to the overall course followed by the shipowner and the shipbuilder in order for the former to acquire the ship to be ordered. Important factors that interact in this market are the specifications desired by the potential shipowner, the agreed delivery time, the payment terms and the amount of financing. The prices of the newly built ships are proportional to the size, while in the long run they seem to follow a certain range.

The fourth market, the scrap yard, deals with old ships, which are no longer exploitable by the owners, so they are sold for scrapping. A refinery buys the old ship in order to reap the benefits of exploiting the steel and other equipment of the ships. The prices of the materials are shaped by the age of the ship, its general condition and the level of demand that appears for the used waste material available for reuse (scrap). (X Zhang, B Podobnik, DY Kenett, HE Stanley, 2014)

The above four markets coexist and operate within the required cash flows. They offer significant facilities to their members, profit opportunities, flexibility in their strategies and consequently allow the shipping company to develop its competitiveness. (Tzelina Charlafti, Giannis Theotokas, 2007)

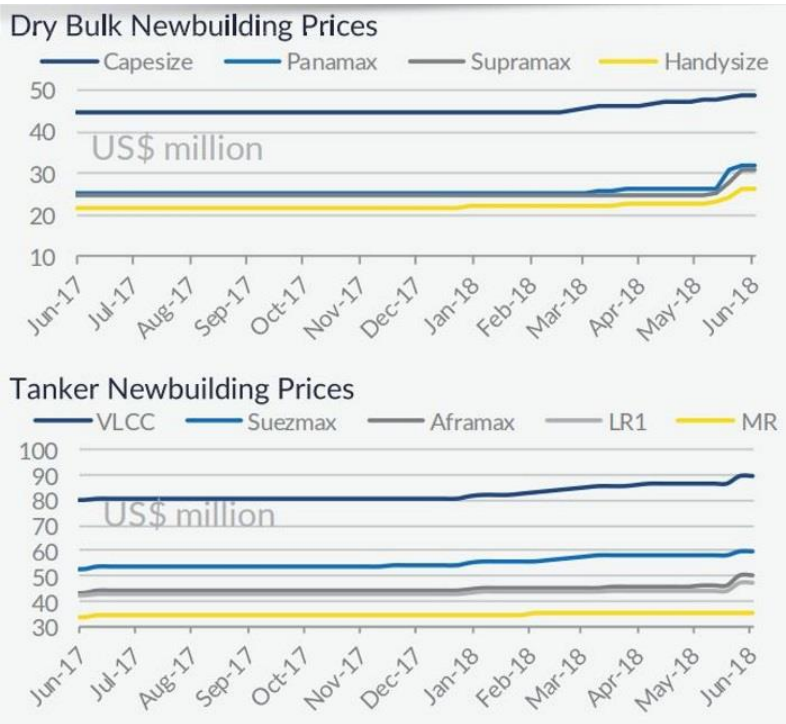


Figure 1: Dry Bulk and Tanker newbuilding prices (Hellenic Shipping News, 2019)

1.2 THE STRUCTURE OF THE SHIPPING SECTOR

The structure of the shipping industry is determined by the set of sectors that make it up, by the different types of ships and by the type of cargo they carry. The main categories in shipping are:

- Bulk shipping truck
- Regular shipping
- Passenger shipping

The category of bulk shipping includes companies that handle dry cargo, liquid cargo or cargo with risk or special specifications.In the category of regular lines belong the companies that have ships capable of handling cargo differently from each other with strict conditions regarding the delivery time, the itinerary and the required fares. The loads carried along these lines are either "loose" or "boxed" liquids, refrigerated or heavy. In passenger shipping, the characteristic of companies is the fluctuation of demand and the emergence of production of demand. The latter comes from the demand for other services primarily, which lead to the need for shipping services or facilities. (AW Veenstra, PH Franses , 1997)

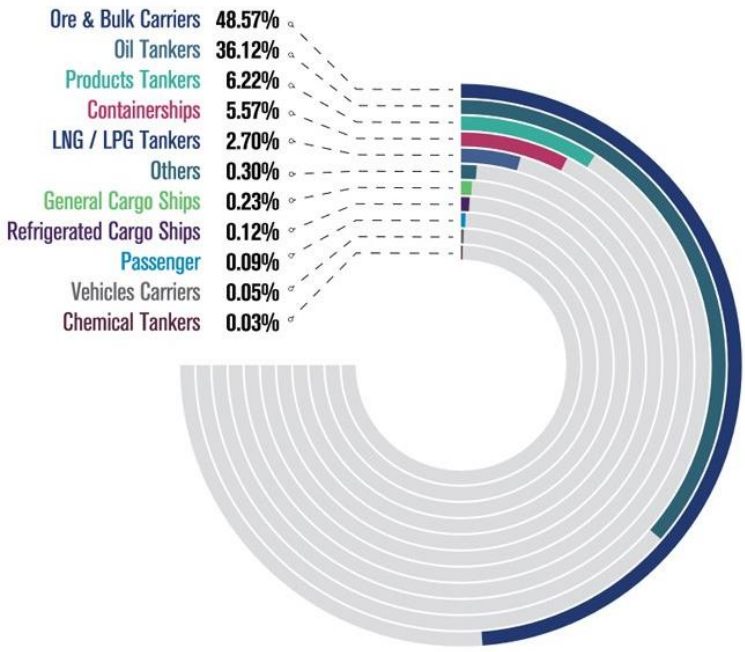


Figure 2: Ship categories analysis (IHS Markit, 2019)

1.3 SHIPPING CATEGORY

In the shipping industry the basic categorization refers to the following types of companies: (Y Cao, Z Jiang, S Ye, W Wu, S Liang, 2019)

- Shipown companies: companies based in the global or domestic market that own ships having their exclusive operation.
- Management companies: companies that, for a pre-agreed fee, undertake the smooth economic and operational course of the ships by implementing the required strategic tools
- Brokerage companies: in this category there are charter brokers, freight brokers, insurers, buyers, suppliers, spare parts and generally companies that mediate for various sea transport services.
- Exploitation and distribution companies: companies dealing with the resale of fuels and lubricants related to ships.
- Supplier companies: companies that are mainly engaged in the supply of spare parts, materials and consumables for ships.
- Ship manning and staffing companies: undertake the selection, evaluation and wider manning of the ship, as well as any kind of negotiation on the contracts and agreements with the crew.

- Shipping agents: their object is the transport of cargo and what it entails, such as bill of lading, invoices, agreements, signings, payments, etc.

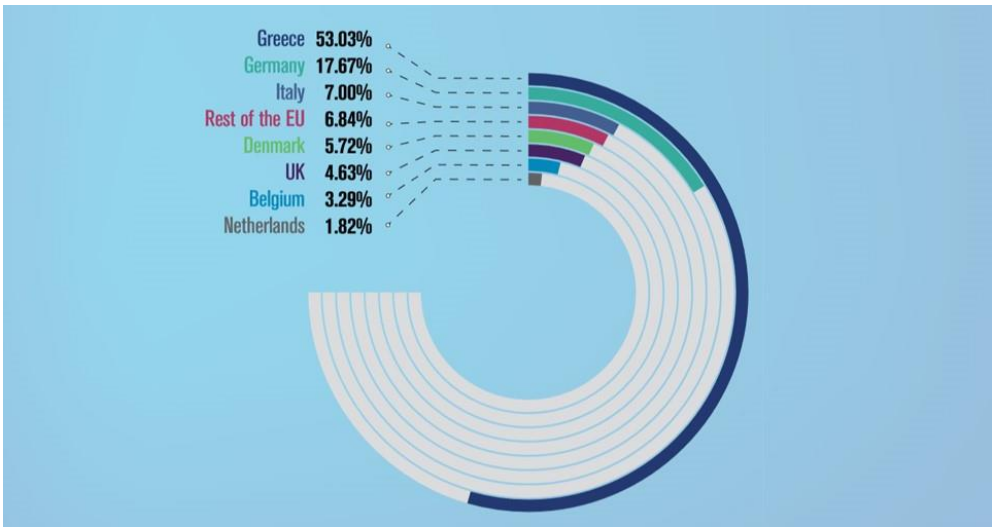


Figure 3: Ownerships of the EU (European Commission, 2018)

1.4 CATEGORIES OF MODERN SHIPS

Observing the historical evolution of ships, it is easy to understand how they improve and evolve technologically, according to the needs of maritime transport. The separation of ships is based on their cargo. Ship cargo is the total volume or weight of goods that a ship can carry. In cargo ships the maximum payload is mainly expressed by their capacity, which is their competitive advantage.

Moving cargo by ship is distinguished by many criteria. However, the basic distinction between these is "dry loads" and "wet loads". Dry loads are divided on the one hand into "similar loads" and "general loads" and on the other hand, depending on the volume they occupy, into "heavy loads" and "light loads". Another distinction is the specific type of dry load. Finally, from a safety point of view, there are the general hazard distinctions that characterize goods in transit by any means of transport. (S Hamad, YH Ali, SH Shaker , 2020)

The categories in more detail:

- Dry cargoes: Characterized by all solid cargoes except liquid cargoes, such as various packaged goods
- Homogeneous loads: These are the so-called bulk loads. They consist of the product itself and are transported without packaging. Such cargoes are from

the category of dry cargoes cereals and ores, as well as the previous category of all liquid cargoes that are transported by type

- General cargo: Usually characterized by industrial and agricultural products that are transported packaged
- Special cargoes: Specific loads that require special safety measures and special facilities are characterized.
- Heavy cargoes: Characterized by dry cargoes occupying a volume of more than 50 cubic feet per ton of weight
- Light cargoes: Characterized as dry cargoes occupying a volume of up to 50 cubic feet per tonne of weight
- Specific type: Characteristic dry loads are characterized depending on their type, eg ores, cereals, timber, etc.

Liquid loads are those that are not solid. Various chemical gaseous charges are transported liquefied and belong to this category. Liquid cargo trucks are called Tankers and depending on the type of cargo they carry are divided into:

- Oil Tankers
- Liquified gas Carriers
- Wine Carriers etc.

In conclusion, depending on the usual type of transported cargo of a ship, the ship itself is characterized.

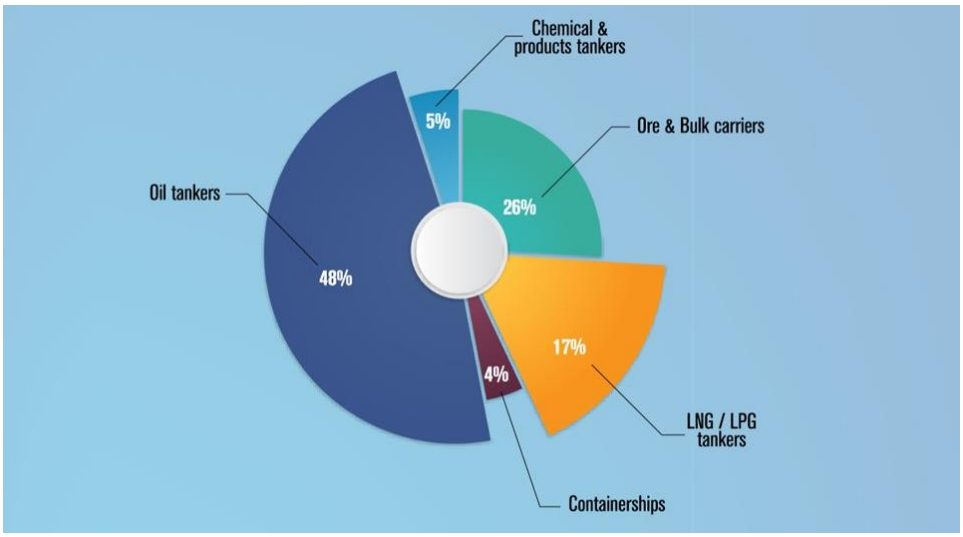


Figure 4: Ship type analysis (IHS Markit, 2019)

Another very important category is VLCC (Very Large CRUDE Oil Carriers) and ULCC (Ultra Large Crude Oil Carriers). VLCCs are widely used to transport large quantities of oil. They use the same technology as tankers but on a much larger scale. They are usually up to 250 meters long and have a displacement of up to 200,000 tons. ULCCs are a special category of ships for oil tankers that exceed 250 meters in length and 200,000 tons. The largest ship in the world belongs to this category and its displacement reaches 550,000 tons. These ships require experienced personnel to build and navigate them and are the main mode of transport of oil in the world today.

1.5 GENERAL AND SPECIFIC CHARACTERISTICS OF THE COMPANY IN THE SHIPPING MARKET

According to M. Stopford, 2009, the main characteristics of the shipping market include the periodicity and cyclicality of fluctuations shown by all the economic variables associated with it. (Martin Stopford, 2009)

At the level of a study, international economists analyzing this industry argue that in both the long and short term, particular phenomena and cyclical conditions are formed, which concern quantities such as gross product, price level, unemployment, supply and the demand for labor etc. In particular, in the long run and with a duration of about fifty years, the time required to move from the maximum to the minimum prices is between thirty and fifty years. In the long run, the investments and the cycle that they write during the ten years in the industry are examined. In the short term, cyclicality is linked to the turnover of the industry and its duration ranges from three to four years. (PM Panayides, R Wiedmer, 2011)

The above cases are also referred to as shipping cycles favoring the systematic ways in which the balance between supply and demand is restored. The formation of such a cycle depends on variables of both the internal and external environment of the shipping company.

After all, the impact of such factors is generally observed in the industry due to either political, technical, economic global changes and conditions and are not easy to analyze. Such factors are observed in the long cycle. In contrast, the factors associated with crises that occur in the short term are easy to examine and evaluate. (L Styhre, 2009)

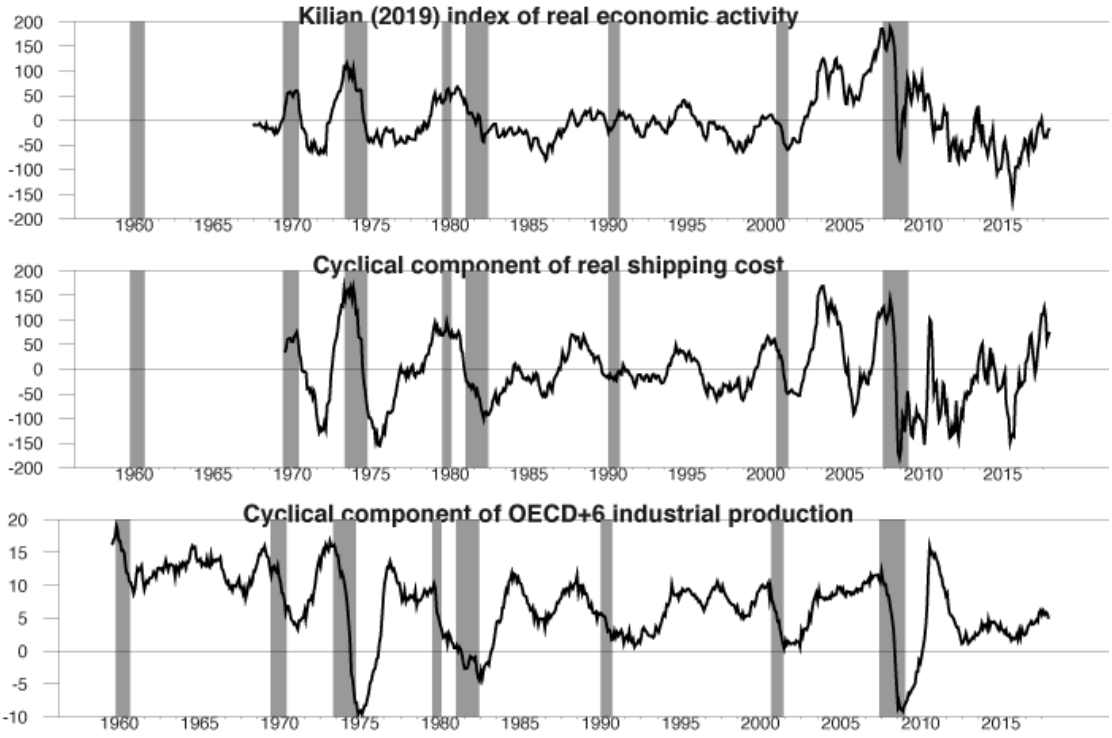


Figure 5: Alternative measures of global real economic shipping activity (James D. Hamilton, 2019)

In addition to the above shipping cycles, there is also the seasonal one, which is analyzed on an annual basis and concerns the seasonal demand in maritime transport. A typical shipping cycle is completed in the following four phases:

- Dyspragia
- Revitalization
- Bliss
- Recession

Shipping cycles are of particular interest for the analysis of the industry, but also for the understanding of the overall market mechanism. However, the irregularity of the circularity prevents the prediction of the cycles. A shipping company operates in a dynamically changing environment with global influences. This globalized character of the shipping market creates the complexity and special dynamics of the industry.

Other special features are the derivative demand for shipping, the difficulty of forecasting, the long distance between the production unit and the headquarters, the intense competition, the difference in the size of the companies, the choice of immediate return strategies and the flexibility in shaping the variable costs. Other peculiarities for the shipping industry and the general environment in which the shipping company

operates, are the high working capital required, the diversity and different nationality of the human resources, the geographical dispersion of the companies, the insurance premiums and the risks associated with fare fluctuations. In particular, a shipping company derives its productive factors from the global market, while providing its services in the same market.

Regarding the derivative demand, this means that the demand for the services of the shipping company is directly dependent on the wider economic conditions in the industry. This is because it is observed that during recessions the demand is limited resulting in strong fluctuations in the freight markets. Predicting the above demand becomes difficult, as the volatile external environment of the shipping company creates conditions that make it difficult to make decisions and devise strategies.

Regarding the existence of a distance between a production unit and an administrative center, ie a ship and offices, it causes even greater restrictions on the application of administrative models, on the management of human resources and on the organization and operation of the shipping company.

Another special feature of the shipping environment is the coexistence and competition that develops between companies of different sizes, ways of management, strategies and operational models. As a result, all companies, regardless of size, face the flexibility, capability, prospects and market share of the same global shipping market. (M Acciaro, PN Hoffmann, MS Eide, 2013)

The characteristics of the company are also influenced by the formulation of strategies aimed at immediate performance; a fact that signals the relative pricing of the services provided. In particular, when fare prices are low a shipping company often makes the decision to buy a new ship during this period. The opposite is true in the case of fare increases, where shipowners prefer to sell part of their fleet.

Finally, another feature of shipping company is the flexibility in dealing with market changes. This element refers to its ability to change its strategy whenever it sees an opportunity or observes a negative market development. Flexibility is mainly based on the ability to reduce operating costs, by changing the flag, by staffing with more economical staff, by reducing the speed of the ship, as well as by applying business and administrative models based on predetermined objectives. (A Bergek, Ø Bjørgum, T Hansen, J Hanson, 2018)

1.6 SHIPPING INVESTMENT FINANCING

The shipping industry is a high-intensity capital industry, with high value fixed assets (ships) and needs for continuous liquidity for its daily operation, which intensifies when turnover decreases due to seasonality or market cycle. Therefore, the demand for funds and credit lines (credit lines) is high.

For many decades the main source of funds for shipping was bank lending. If the retained earnings and new funds from the shipowners, which were the first choice for making the investments, were not enough, the companies resorted to bank lending. Bank lending was and is a relatively easy solution in raising funds as ships are used as collateral (Mortgage). Bank lending, however, is not the cheapest solution and in times of global recession and liquidity crisis, it becomes expensive and difficult. (S Albertijn, W Bessler, W Drobetz , 2011)

The other solutions that exist in finding the necessary funds are the international financial markets (Bond market) and capital markets (Stock exchanges). In recent decades, there has been a shift of shipping companies to these two markets with quite successful results. The lower cost of these funds helps to improve the company's capital leverage and reduce the Weighted Average Cost of Capital (WACC)

Access to stock market funds is implemented in the first stage with an initial public offering (IPO) and then with an increase in share capital through public offerings. An important factor for the success of the project is the choice of the right time of the market (Market Timing).

This method of raising investment funds is advantageous in the sense that the funds raised are low cost, do not require fixed cash flows to service them, as shareholders receive dividends only when the company has profits. It also contributes significantly to the improvement of the company's capital leverage. However, it exposes the company to risks (Risks) such as the aggressive acquisition in case more than 51% of the share capital is traded on the stock market. Also, the public image of the company is related to the share price, which in bad times (low price) increases the cost of other forms of raising funds. However, the most important thing is that the company must now disclose its financial statements (Balance Sheet, Income Statement and Cash Flows), and comply with the provisions imposed by the relevant capital market committee (eg the US Stock Market requires compliance with the provisions of the

Sarbanes Oxley Act). In general, the capital stock commissions of the stock exchanges, in the context of shareholder protection, require companies to apply strict risk management (Risks) and continuous information to the investing public. (MG Kavussanos, ID Visvikis, 2016)

Table 1: Capital structure and financial performance of shipping firms

Shipping firm/ market segment	Debt/equity (%)			ROE (%)			ROA (%)		
	2006	2007	2008	2006	2007	2008	2006	2007	2008
Dry Bulk									
Diana Shipping Inc	41	18	36	17	17	29	12	14	21
Dryships Inc	159	129	278	13	46	–28	5	20	–7
Excel Maritime Carriers Ltd	72	106	231	10	21	–4	6	10	–1
Navios Maritime Holdings Inc	245	156	180	8	35	15	2	14	5
TBS International Plc	80	75	74	17	31	32	10	18	18
Tankers									
Frontline Ltd	587	744	474	77	128	100	11	15	17
General Maritime Corporation	18	10	265	22	21	19	18	19	5
Nordic American Tanker Shipping Ltd	31	20	3	11	7	15	8	5	15
Overseas Shipholding Group Inc	92	129	126	18	12	18	9	5	8
Teekay Corporation	206	292	394	10	2	–23	3	1	–5
Tsakos Energy Navigation Ltd	161	176	186	26	21	22	10	8	8
Containers									
Danaos Corporation	129	232	1191	18	34	53	8	10	4
Horizon Lines Inc	499	681	708	19	3	–31	3	0.3	–4
Seaspan Corporation	81	199	342	5	–1	–27	3	–0.4	–6
LPG									
Stealthgas Inc	95	58	100	11	7	9	6	5	5

Notes: The sample shipping firms are listed on the US equity markets (NYSE, NASDAQ) and bear diversified corporate characteristics in terms of size, value, specialisation, profitability, growth prospects and capital structure. Debt = Book value of (short + long-term) liabilities;
Equity = Book value of total stockholder equity; ROE = Return on Equity; ROA = Return on assets; Profits = Net income;
Assets = Book value of total assets.
Source: Company Financial Statements

Raising funds through the bond market is also low cost, but it also requires the right choice of time (Market Timing). This form of lending requires fixed payments

(coupons) and requires compliance with the terms of issue, which depending on the changing economic environment can be beneficial or aggravating to the parties (company - bondholders). The value of the bond varies depending on the course of market interest rates, but coupon payments are stable.

The traditional method of raising funds through bank lending also has its peculiarities. In addition to the high cost of capital the company must comply with the terms (Covenants) of the bank or group of banks granting the loan. The company in the context of borrowing, sets as collateral (Mortgage) part of the ships, as well as gives rights to charter contracts, for the collection of fixed payments from the bank, from the charter of the company. Lending rates can be fixed or floating.

During the fundraising process, the company puts itself in a number of risks (Risks) such as exchange rates, interest rate fluctuations, capital leverage, cash flow, bankruptcy, compliance with the provisions of capital market legislation and contracts, etc. All these risks (Risks) require detailed and strict management to avoid the company in the difficult position of Financial Stress or Default. (A Gulnur et al., 2020)

1.7 MARITIME SAFETY, ENVIRONMENT AND ACCIDENTS

The shipping industry operates in an environment (marine), which is particularly demanding in terms of safety, both crew and ship. Dangers lurk everywhere and maritime accidents, in addition to having a great impact on international public opinion, have serious consequences for the crew, the ship, the cargo and the environment. But beyond the risk of accident, the protection of the crew, the ship, the cargo and the environment are constant concerns for the shipping company. The detailed design and implementation of shipping companies (Maritime Operations) is therefore required. (SOLAS, 1974)

At the same time, organized and detailed management is required, both in the field of prevention and deterrence, as well as in the field of immediate rehabilitation, of any possible event that endangers (Risk) the smooth and uninterrupted operation of the shipping companies (Maritime Operations). (https://olig.gr/isps/, 2021)

Workplace health and safety, as well as environmental protection are two very important issues for many industries. In the shipping industry it is a very important issue, as it can put a company at risk (Risk) and expose it, both to the loss of specialized and difficult-to-fill staff, and to legal settlement procedures, with high management and

compromise costs. It also exposes the image of the company to its social and business environment, with long-term restoration costs. (JI Havold, 2000)

1.7.1 MARITIME SAFETY

Occupational health and safety are subject to the provisions of the SOLAS International Convention. The treaty was originally signed in 1974, but has since undergone many amendments and additions, constantly raising the required levels of security. Modifications and additions are products of the evaluation and conclusions that result from the evaluation of all types of accidents or incidents in the shipping industry. Today SOLAS is followed by 162 countries and applies worldwide to 99% of all merchant shipping. (SOLAS_Convention, 2021)

The treaty contains many provisions that define the minimum permissible levels of safety in the construction, equipment and operation of a ship. Generally, includes the following:

- Ship construction, construction parts and stability, electromechanical equipment.
- Ship fire protection, detection and firefighting.
- Lifeboat of the ship.
- Radio communications.
- Navigation and safety.
- Freight and security.
- Transport of dangerous goods and safety.
- Nuclear vessels.
- Management of safe operation of the ship.
- Safety measures on speedboats.
- Special measures to increase shipping safety.
- Additional measures for the safety of dry cargo ships.

The compliance of the shipping company in the observance of the foreseen protection and safety measures is subject to the inspections that the ship receives both within the classification society and in the occasional port controls (Port State Control). (https://en.wikipedia.org/wiki/, 2021) Port State Control is the inspection carried out by special inspectors of the Port Authorities, on ships of other nationalities and aims to verify the compliance of the ship with the provisions of international treaties (SOLAS,

MARPOL, etc.). The failure of the ship in this control can have financial consequences for the company, as the ship is not allowed to set sail before correcting the points where there is no compliance with international conventions. (HP Berg, 2013)

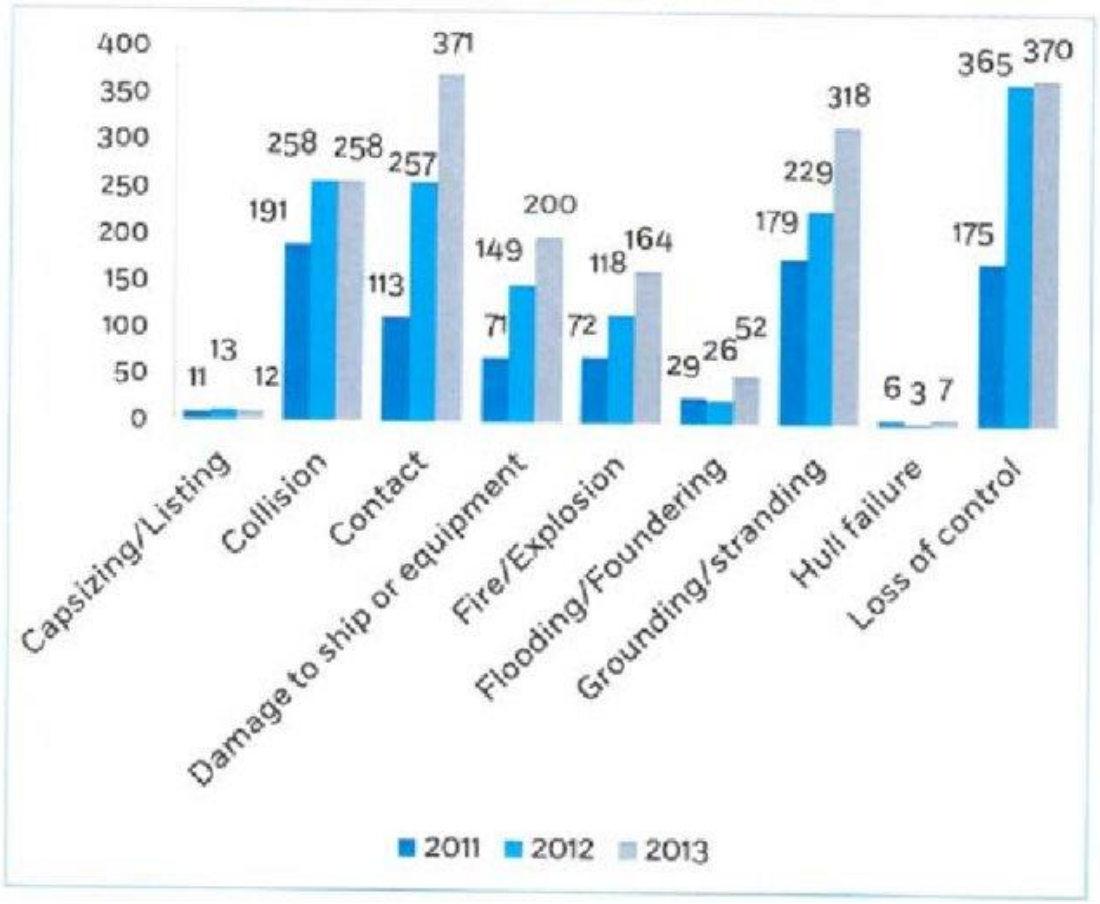


Figure 6: Statistics for casualty events from European Maritime Safety Agency (EMSA) for a three year period (Jonas W. ,Ringsberg B,. BohlmannHL Chien, 2000)

1.7.2 SHIP PROTECTION FROM TERRORISM AND PIRACY

After the terrorist attack of September 9, 2001 in the USA. but also the incidents of piracy in the Indian Ocean and the Far East, the need arose to increase and intensify the protection measures of both the Port facilities and the ships. Within SOLAS, therefore, there was the necessary amendment which regulates the obligations of the Port Authorities, the shipping companies and the ships in taking measures to protect the personnel, facilities, ship and cargo from any hostile and malicious action. The code of measures is known by the acronym ISPS Code (International Ship and Port Facility Security). (wikipedia., 2021)

The implementation of the ISPS Code is therefore mandatory by the shipping company and failure to comply has significant consequences, both financially and

criminally. The implementation of the code, therefore, must be accompanied by parallel risk management (Risk), in order to control any uncertain events, which endanger (Risk) its observance. (B Mølle, 2009)

In addition to the above, the protection of the personnel, the ship and the cargo is a constant care of the shipping company, which must take additional measures to ensure it. In addition, in the event of malicious action and the crew, ship and cargo are in danger or in a situation where there has been a partial or total loss, the shipping company is required to have an immediate recovery plan and damage reduction. They are therefore objects that must be included in the risk management planning (Risk Management) of the shipping company. (S Pristrom, KX Li, Z Yang, J Wang, 2013)

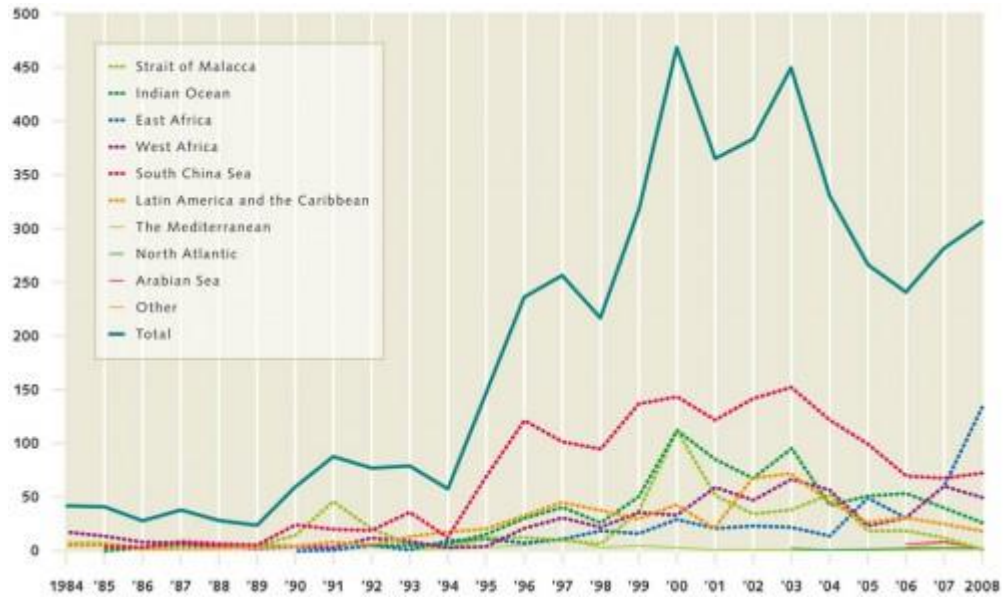


Figure 7: Modern piracy: Following a steep increase in piracy at the start of this century, the number of attacks has now declined again worldwide. The exceptions are the waters off East Africa, and particularly Somalia. (World of The Ocean, 2010)

1.7.3 SHIPPING AND ENVIRONMENT

Marine space is an important and most of the environment. Environmental pollution is a constant human concern, as it is directly related to human survival and quality of life. This concern has increased in recent years and as a result there has been a partnership of states in the direction of environmental protection. Pollution caused at sea affects both the liquid element and the atmosphere. (K Andersson, F Baldi, S Brynolf, JF Lindgren, 2016)

The Convention for the Protection of the Sea against Pollution has been in existence since 1973, which was revised and improved in 1978, and is now the International

Convention for the Prevention of Pollution from Ships 13, known by the acronym MARPOL.

MARPOL aims to prevent the pollution of the marine environment from the discharge of hazardous substances such as oil and other harmful substances, which are discarded during the operation of the ship. It aims at the complete elimination of voluntary pollution of the sea by petroleum and other toxic substances and the reduction of oil pollutants, as a consequence of pollution from a marine accident.

The provisions of MARPOL contain the obligation to apply stricter control measures in "special areas" and ensure that petroleum products are disposed of at low levels in the event that it is not possible due to the circumstances to eliminate dumping. The contract consists of different annexes for each type of pollutant that include the following:

- Petroleum products
- Waste General
- Gaseous emissions
- Effluent
- Chemical substances

The contract is valid for each type of ship and their requirements and equipment are determined, for its compliance with its provisions. It also establishes a system of certificates and inspections, and establishes an inalienable obligation on the ports of the Contracting States to have reception facilities for the collection of solid and liquid waste from ships.

Although maritime transport is considered the most environmentally friendly, increasing environmental protection leads to the integration of shipping as a risk and a factor in global climate change. This has the effect of reducing emissions and imposing an emission tax to reduce emissions. (Ma, S. , 2010)

The cost of implementing MARPOL is significant but also the sanctions, financial and criminal for the company, the ship and the crew, are higher. Therefore, special attention is required from the management of the shipping company, both its diligent implementation, and the management of the risk of its deficit implementation.

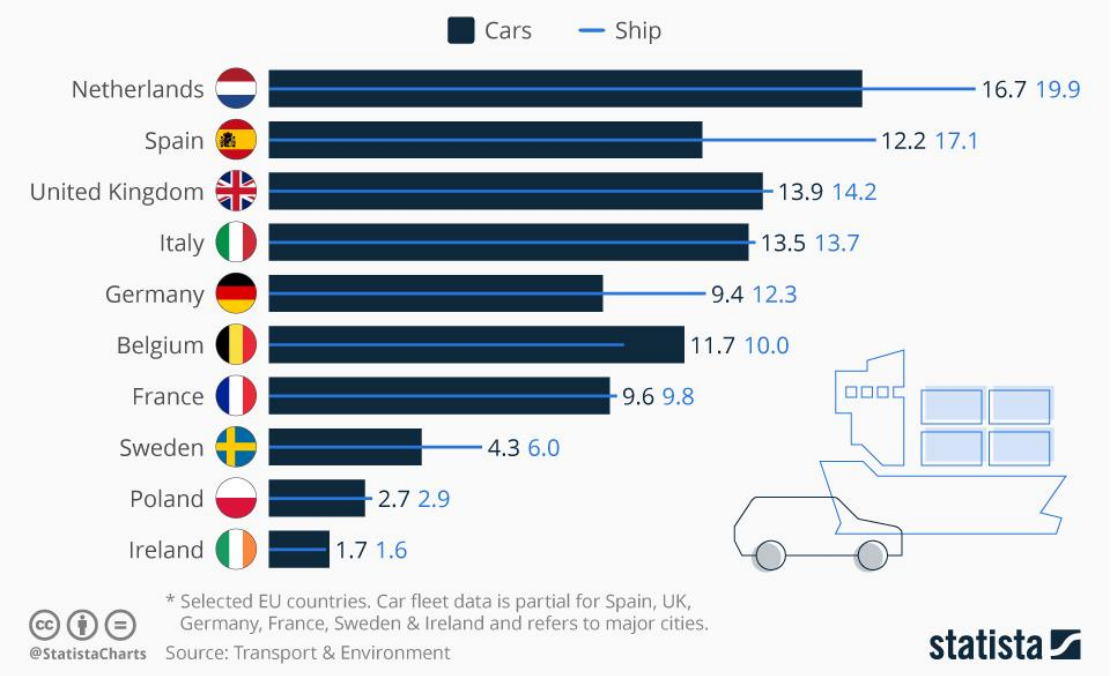


Figure 8: How Maritime Emissions Compare To Cars In Europe (statista, 2019)

1.7.4 SHIPPING AND MARINE ACCIDENTS

Maritime accidents are another risk factor for the shipping company. Maritime accidents are due to a number of causes, including failure to comply with international conventions, reduced competition crews due to competition, ship age, poor quality steel in construction, reduced maintenance, etc. However, it is not the only cause of an accident, but it is a series of causes. (Talley, W. K., 2010) Marine accidents are categorized into three categories:

- Human error
- Weather conditions
- Hardware Failure (Concerning the ship)

The cost of a maritime accident includes loss of crew, damage to the ship, damage to cargo, any nearby coastal facilities, the marine environment and logistics. In addition, the costs include compensation and the legal costs of handling and settling the case. But beyond the financial implications, there is also the possibility of criminal liability to the shipping company, the ship and the crew. (N Akten, 2006)

Accident Risk management is an important task for a shipping company and should include both prevention and remediation. Prevention is achieved by the application of standard operating procedures (Standard Operating Procedures), while rapid recovery

requires prior planning, the implementation of which reduces as much as possible the financial loss of the company and restores its image in society. (S Kum, B Sahin, 2015)

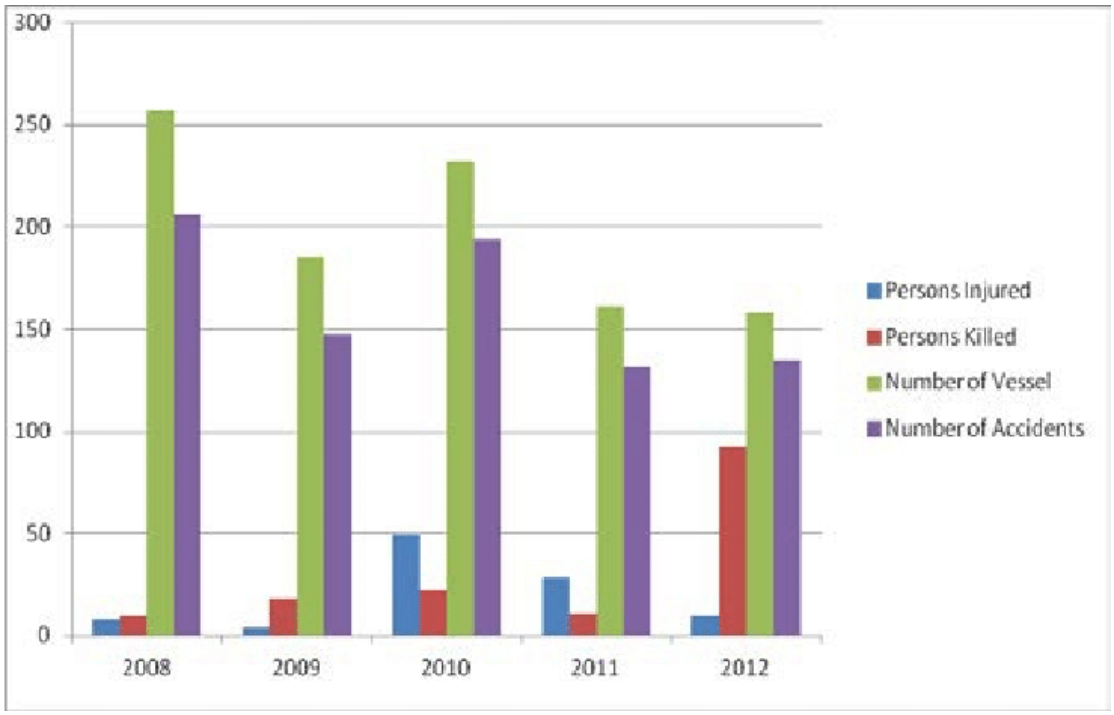


Figure 9: Marine accidents by year, number and injuries. (Gökçe Ceyhun, 2014)

1.7.5 POLLUTION AND CONTROL METHODS

The main threat to shipping is the pollution of the environment and in particular the leakage of oil in the sea area. The decision on which method to use to fight an oil spill depends on specific factors such as:

- The quality and type of pollutant
- The distance from the shores and the risk of attacking sensitive areas
- The prevailing and expected weather conditions
- The availability of combat equipment
- The time of detection of pollution

The main methods of combating pollution, which can be selected taking into account the above factors are: (W Shi, Y Xiao, Z Chen, H McLaughlin, 2018)

- The trapping of the stain, with floating dams and the extraction of oil by mechanical means
- The installation of floating dams to prevent the invasion of sensitive sea areas and coasts
- The use of chemical dispersants

- The mechanical dispersion of the stain, in cases where no surgery is required
- The cleaning of the polluted coastline by various mechanical or manual means

The achievement of the objectives is ensured by the pollution prevention activities achieved by:

- Carrying out inspections and inspections of land facilities throughout the territory
- Carrying out inspections or inspections of ships
- Training of the staff of the central Services and the Port Authorities

The above activities are carried out so that any pollution incident can be dealt with in a timely and effective manner, exercises can be carried out to check the readiness of the staff and to modernize the means and materials for the fight against pollution. (H Liu, ZH Meng, Y Shang, ZF Lv, XX Jin, ML Fu, 2018)

Table 2: Examples of air pollution control-technologies for maritime shipping (Øyvind EndresenMagnus S., EideMagnus S., EideStig B. ,DalsørenStig B., DalsørenShow , 2010)

Stage	Control-technology	Target pollutant
Pre-combustion	Fuel water emulsification	NO_x
	Humid air motor	NO_x
	Combustion air saturation system	NO_x
In-engine	Aftercooler upgrades	NO_x
	Engine derating	NO_x
	Injection timing delay	NO_x
	Engine efficiency improvements	NO_x, SO_x, PM, CO_2
Post-engine	Selective catalytic reduction	NO_x
	Seawater scrubbing	SO_x
	Diesel particulate filters	PM
	Diesel oxidation catalysts	PM
Vessel designs	Hull form	CO_2, energy ratio pollutants
	Propeller	CO_2, energy ratio pollutants

Source: Corbett and Winebrake (2008).

1.7.5 CARGO PROTECTION

The cargo of ships, due to the specialized transport conditions must be protected with various additional means to avoid damage, crushing, wetting, sweating, poor ventilation, etc. Such means are mainly wood coatings or other similar materials placed in the space between cargo and metal surfaces of the floors and side walls of the hulls of the ship. Different loads should be avoided in the same hull, especially when some emit strong odors or some others on the contrary absorb odors such as smoke, etc.

Measures such as banning smoking inside the huts, good ventilation systems and good lighting are required. In particular, during loading and unloading, the changing behavior of the ship should be extensively monitored by constantly taking measurements of bow, middle and stern draft, in order to avoid any deformation of the ship or any unwanted lateral slope. (AN Kinkead, 1980)

Much of the ship's cargo damage comes from mechanical defects in the loading equipment or from the negligence of employees and from poor suspensions that can even cause accidents. Therefore loading-unloading safety measures must be observed. As far as the hull facilities of the ships are concerned, they must function properly and without interruption. It is noted that heat, impregnation, wetting, and even the interaction of loads can cause loads to deteriorate. Likewise, poor ventilation can cause:

- Cargo sweating
- Humidity change
- Euroization
- Self-heating
- Possible ignition
- Oxidation of metal parts

Finally, "natural" damage to the cargo can be caused by the presence of mice or various other parasites. For the latter, the ship must be provided with a "rodenticide certificate". (M Arvidson , 2014)

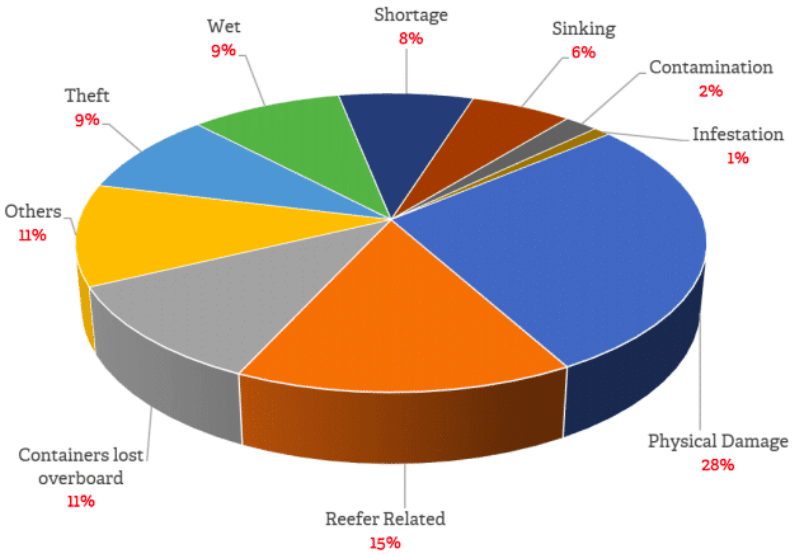


Figure 10: Types of Cargo Damage (Stefan Reidy, 2020)

2. RISK DETERMINATION

2.1 RISK – DEFINITION

Businesses, in the context of their activities, plan their future actions. This plan is long-term, medium-term and short-term, depending on the time horizon of its implementation. During the design, certain assumptions (conditions) are taken into account, based on which it is determined that the company will achieve the goals, which it sets for the respective period of time. The goals, as well as the conditions, are determined according to the past operation of the company. They are based on statistics of previous years, where the operation of the company was carried out under Normal Conditions. (S Kaplan, BJ Garrick, 1981)

During the implementation of a company's plans, in several cases, there are unexpected changes in the internal and external environment of the company, which are due to unbalanced factors, often not due to the company itself. This differentiation jeopardizes the achievement of the objectives and the expected results. The possibility of the above event occurring, is a risk (Risk) of the planning and implementation of the company's business activities, and must be addressed both at a precautionary level and during its occurrence.

Uncertainty, therefore, which is due to the dynamic environment of a company is the basis and source of all uncertain facts, which are the risks (Risks) of the company, in terms of achieving the expected results. The degree of risk (Risk) is calculated based on the probability that this uncertain event will occur in part and the extent of its effects in the other part. In calculating this probability, data from previous years of the company are used. The historical data in question are used to calculate the expected results (eg Expected Return for financial results) which is essentially the weighted average of historical data. The use of Statistics calculates various parameters such as variance, standard deviation, variance at risk (Variance at Risk - VaR) which give us a picture of the probability of achieving the expected result. (M Adler, B Dumas, 1984)

Statistically, the lower the probability of achieving the expected result, the greater the risk. However, the amount of the expected result (Expected Return) is proportional to the degree of risk (Risk), i.e., the higher the risk, the greater the expected result (Expected Return). No company assumes a high risk if it is not compensated

accordingly. Generally, a company in the choice between two projects with the same expected result (Expected Return), prefers the one with the lowest risk.

So, in the deviation from the expected result (Expected Return), as a risk is considered only the result which is worse and less beneficial for the company. In case of a result that is better and more beneficial for the company, this deviation is an opportunity. (C Chapman, W Stephen, 2003) As we will see below, a company acts to reduce its exposure to risk while maintaining as much as possible the opportunity to seize the opportunity. (YY Haimes, 2009)

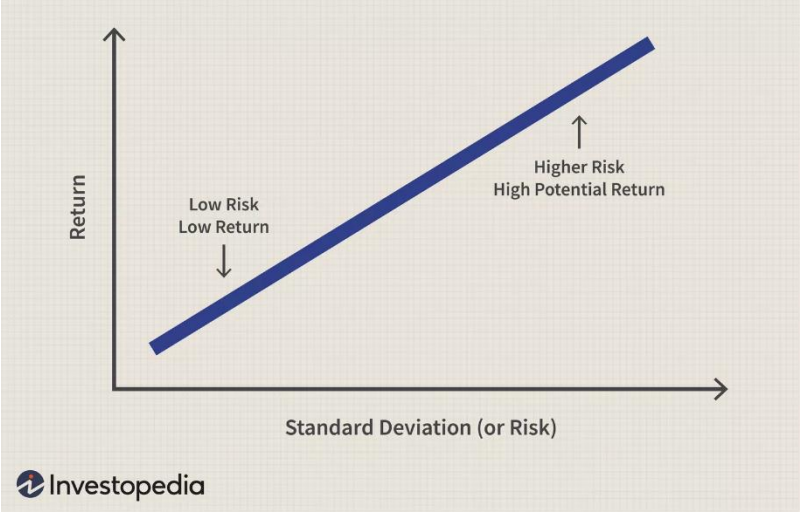


Figure 11: Risk / Return Tradeoff (Sabrina Jiang © Investopedia, 2020)

2.2 RISK CATEGORIES

Risk varies depending on the environment in which it occurs. (MHN Bakker, ZW Kundzewicz, C Green et al., 2016) The risks that appear in the internal environment of a company are different from those that occur in its external environment. In the internal environment of a company, the risk is also characterized by the tolerance of the management in taking it or the will to take additional risk. There are mainly small companies that knowingly take on the additional risks in order to maximize the desired profits. Depending on the degree of risk exposure (Risk Aversion) a company is classified as: (R Dandage, SS Mantha, SB Rane , 2018)

- Risk Averted,
- Risk Tolerant, or
- Risk Appetite - Speculator.

The nature of the risks (Risks) is multidimensional and different on a case-by-case basis. Therefore, it is necessary to separate the risks (Risks) into categories in order to be easier and more effective to deal with them. The risks (Risks) that a company usually faces are the following: (J Hampton, 2009)

- Business Risk. It is the probability that an uncertain event will occur, which modifies the company's business environment and jeopardizes the achievement of the planned results (businessdictionary, 2021), including the Environmental Risk[1], the Health and Safety Risk, and the Political Danger.
- Financial Risk. It is the possibility of financial loss contained in the financial methods used by the company and jeopardizes the company's ability to achieve sufficient profitability. (businessdictionary, 2021) Financial risk is related to the financing of the company, including financial transactions, which are at risk of default (Default Risk), and relate to the company's loans. It also includes the company's financial transactions with suppliers and customers. Divided into Currency Risk, Commodity Risk[2], Credit Risk, Liquidity Risk and Market Risk[3]. (MHN Bakker, ZW Kundzewicz, C Green et al., 2016)
- Hazard Risk. It is the possibility of exposing the company to a catastrophic event which concerns cases of natural disasters and large-scale accidents.

2.3 KEY RISK INFORMATION

Risks of all kinds consist of four basic elements in common. (CJ Alberts, 2006) The following four key elements of risk are taken into account in their assessment analysis: (J Davies, M Finlay, T McLenaghen, D Wilson, 2006)

2.3.1 GENERAL RISK FRAMEWORK (CONTEXT)

It consists of the environment and the background of the created danger, and gives it specific characteristics that separate it in terms of handling. It essentially provides the prism through which it must be analyzed. If the general context of the risk (Risk) is not

[1] It concerns incidents in which the company causes environmental pollution and violates international and domestic laws.

[2] It concerns commodities that are traded on Commodity Markets on a daily basis such as oil, gas, sugar, etc.

[3] It refers to losses in the value of the company's assets from the fluctuations of the stock market.

specified correctly, the actions required to resolve it cannot be properly defined. (HS Birkel, JW Veile, JM Müller, E Hartmann, KI Voigt, 2019)

2.3.2 ACTION

It is the energy that triggers this particular danger. Without some actions there is no possibility of danger. It is the active element of risk and is combined with the next element.

2.3.3 CONDITIONS

It is the passive element of risk. These are the conditions that prevail in the environment (Context) when the action (Action) that triggers the risk (Risk) occurs.

2.3.4 CONSEQUENCES

It is the consequence of the appearance of danger. The effects of the appearance of danger. They are of great importance in risk assessment (Risk), as they are taken into account, their importance, their size and their rehabilitation costs.

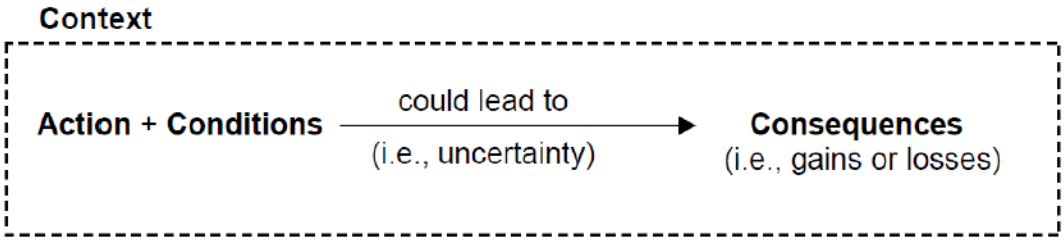


Figure 12: The Four Elements of Risk (CJ Alberts, 2006)

3. RISK MANAGEMENT

3.1 RISK MANAGEMENT DEFINITION

Risk Management is defined as a corporate process, performed by the management and staff of the company, during the design, in order to determine the uncertain but possible events, which may affect the achievement of its objectives and the outcome of the results of the year (Income). (G Dionne , 2013) Risk Management, as a corporate action, is characterized by certain elements, which are important in its implementation by the company. (MHN Bakker, ZW Kundzewicz, C Green et al., 2016)

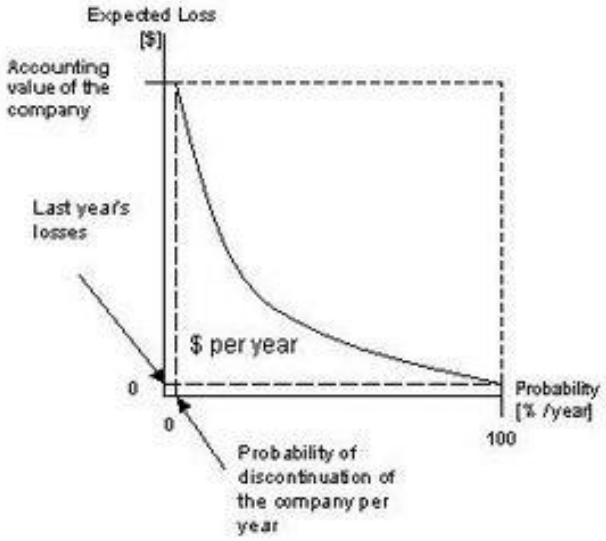


Figure 13: Risk assessment from a financial point of view.

3.1.1 BUSINESS PROCESS

It is a process of the company and means that it is a specific series of actions with a beginning and an end.

3.1.2 HUMAN ELEMENT

As a process it is performed by people. Human resources are necessary at every organizational level, and by whose actions, the process is achieved.

3.1.3 PLANNING COMPONENT

It is part of the design, as during the process of setting the company's goals, the potential risks are identified. Along with recording the way in which the objectives will be achieved, the ways of dealing with the risks are recorded.

3.1.4 HEDGING

Provides the required assurance to the company's management, as to the certainty of achieving results and goals.

3.2 RISK MANAGEMENT PROCESS

Risk Management Process is defined as a series of actions implemented by a company, through which the analysis, evaluation, taking preventive measures, and design and implementation of mitigation measures to address its risks are achieved. (CL Culp, 2002)

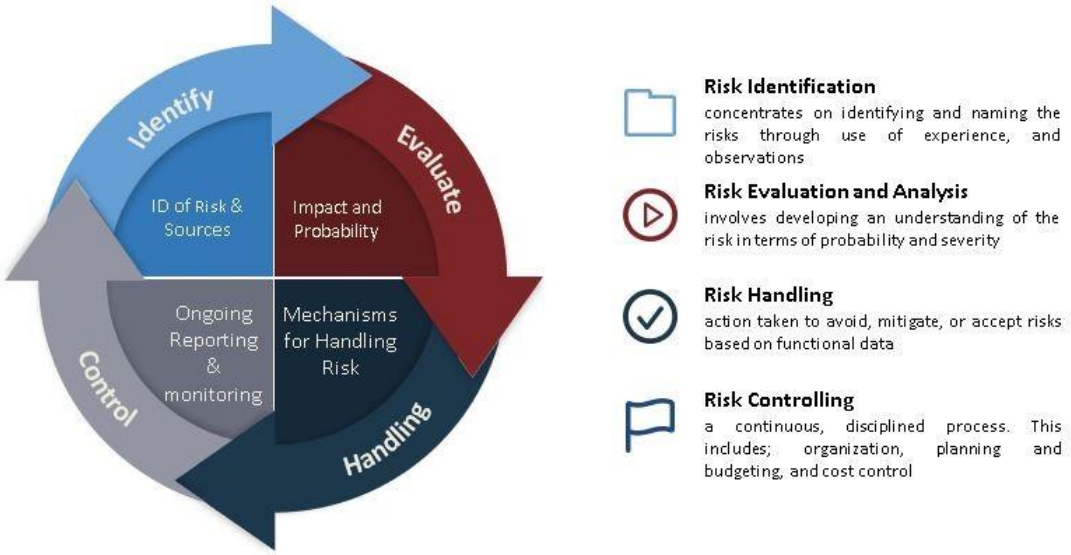


Figure 14: The Risk Analysis Process (Kaplan & Mikes , 2012)

3.2.1 RISK ASSESSMENT

At this stage of the process, three basic actions are envisaged to record the risk profile. (MHN Bakker, ZW Kundzewicz, C Green et al., 2016)

3.2.1.1 RISK IDENTIFICATION

In this action, the risk is identified (Risk), by recognizing its basic elements. The environment (Context) in which it is likely to occur is specified, as well as the action that trigger it, the conditions required for its occurrence and the consequences of its occurrence. The purpose of the identification is to create a list of potential risks of the company, which have a significant impact on the achievement of the company's results. The list includes risks that are controlled by the company and risks that are beyond its control. It includes risks (Risks) that have appeared in the past and other young people who were identified during the identification process. This action seeks to record the

entire sequence of events - consequences from the appearance of each risk (Risk) to the full manifestation of all its consequences. (RJ Chapman, 1998)

3.2.1.2 RISK ANALYSIS

In doing so, the staff involved seeks to analyze in detail the causes and sources of risk, the effectiveness of existing risk control measures (Risk), the probability of occurrence, and the consequences (negative and positive) of the event. (MHN Bakker, ZW Kundzewicz, C Green et al., 2016) In calculating the probability, specific criteria are required by the company, as they are important elements for the next action, the determination of risk priority (Risk). The company is also required to have defined quantitative or qualitative methods for conducting the risk analysis. (T Aven, 2015)

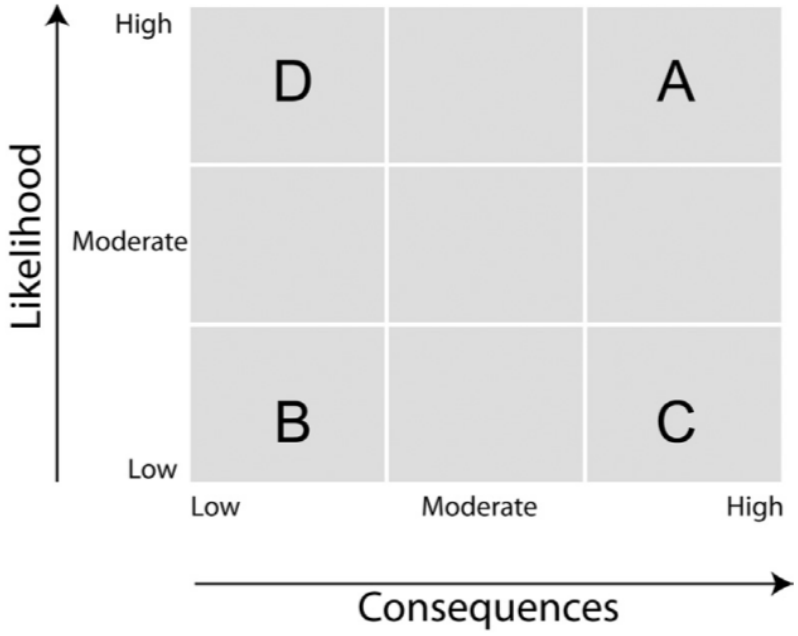


Figure 15: Example of Matrix Probability-Impact Analysis (CJ Alberts, 2006)

3.2.1.3 RISK PRIORITIZATION

During this action, it is decided which risks (Risks) will be addressed based on the completed analysis, as well as with what priority they will be managed. This action takes into account the probability and consequences as extracted from the analysis, the criteria set by the company, as well as the legal and contractual obligations of the company. (Z Zhang, X Chu, 2011)

3.2.2. RISK TREATMENT

At this stage of the process, risk management and control options are defined, options are applied, and control tools for each risk are improved. (MHN Bakker, ZW Kundzewicz, C Green et al., 2016) Risk controls are practices, mechanisms, policies, and other methods used by a company or an individual to modify a risk while reducing its negative consequences or the likelihood of its occurrence. (J Bonta, 1996)

Each Risk Control Option must be considered through a cyclical process that takes into account the following elements:

- The effectiveness of choice in controlling and managing risk
- The cost of implementing this option.
- The benefits or harms of taking the risk
- The benefit and interests of the company's shareholders.
- The rest of the risk that will remain after the application of the risk control option and if this is in accordance with the company's criteria.

The Risk Control Option that a company may implement include:

- Avoidance of risk as a whole, by not undertaking the business activity that involves it.
- Accepting the risk, or even increasing the risk in order to hunt for opportunistic profits (Speculation).
- Risk Sharing with the use of financial instruments, insurance contracts, contracts with third parties, agreements with the local community and the state.
- Change in the probability of occurrence of the risk (Risk) or change in the consequences of the risk (Risk) or both.

The Change of the probability of occurrence of the risk is realized by the application or the improvement of the already existing means of risk control (Risk Control) with the aim of:

- Prevention - Preventing the occurrence of the event and thus reducing the likelihood of danger.
- Early recognition of the event as soon as it occurs and thus timely reduction of its consequences.

- Immediate reaction as soon as the event occurs by taking immediate action to reduce the consequences and quickly restore the consequences.

Following the implementation of Risks, any residual risk should be periodically re-examined as the dynamic modern environment. As a result, the company's liabilities change from time to time and the company's risk assessment criteria change. So, at some point, the residual risk will not be tolerated and will have to be re-managed. (G Purdy, 2010)

3.2.3 MONITORING CONTROL REPORT

Risk management of a company requires constant monitoring for its success. This is done through the continuous control of the functionality of its processes. This, in turn, is achieved in two ways, through current procedures or through individual estimates. Both ways ensure that risk management is applied at all levels throughout the company. (J Hampton, 2009)

The current monitoring takes place in the normal operating activities of the company, and is carried out on a current basis. Therefore, it is more effective than the individual assessments that take place after the event. However, individual assessments complement each other and are a combination of techniques that ensure the effectiveness of risk management. The frequency of individual assessments depends on the nature and extent of the forthcoming changes, resulting from the occurrence of events associated with the risks in question both internally and externally.

Also, the management of risks (Risks) is subject to control of the internal controls (Internal Controls) of the company, in terms of the correct observance of the standard procedures (Standard Operating Procedures), and the legal and contractual obligations of the company.

The amount of information regarding the risk management (Risks) of a company varies depending on its size and complexity. Usually, a high level of information makes monitoring more effective. Continuous information on all lengths and breadths of the company is important and necessary. Any potential risk should be reported to those responsible for action, and the information should be forwarded to the appropriate management level for effective decision making. Each manager should receive information that influences the actions of the staff in charge, as well as all the necessary information needed to achieve the goals of his department. (S Larsson, 2005)

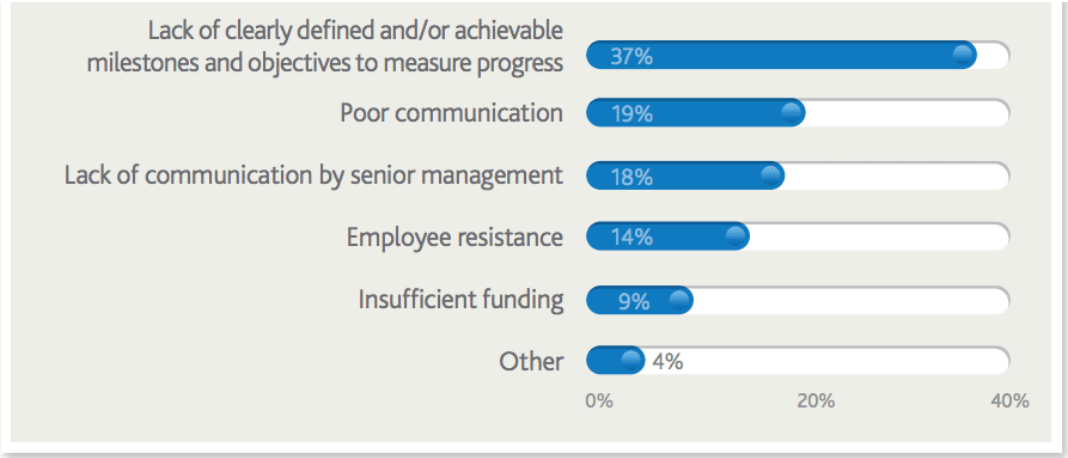


Figure 16: The primary reasons why projects of control & monitoring fail. (Mark A. Langley, 2017)

3.3 ENTERPRISE RISK MANAGEMENT

Corporate Risk Management (ERM) emerged in the late 1980s as a development of hazard risk management. Advocates that a company must holistically manage Risks, including Hazard Risk, through a syllabus that coordinates risk management with Internal Control Processes, internal Control Audit and Compliance.

The Corporate Risk Management (ERM) raised issues related to the degree of risk tolerance (Risk) in the company, what risks a company manages, which are significant and which are not, etc. At the same time, however, it increased the quality of Management, as it simplified risk management (Risk) in a highly complex, dynamic and demanding environment as it is presented today worldwide. (RE Hoyt, AP Liebenberg , 2011)

The Corporate Risk Management System (ERM) contributes with seven possibilities to the management of the company: (Harrington, S. E., Niehaus, G., Risko, K. J., 2002)

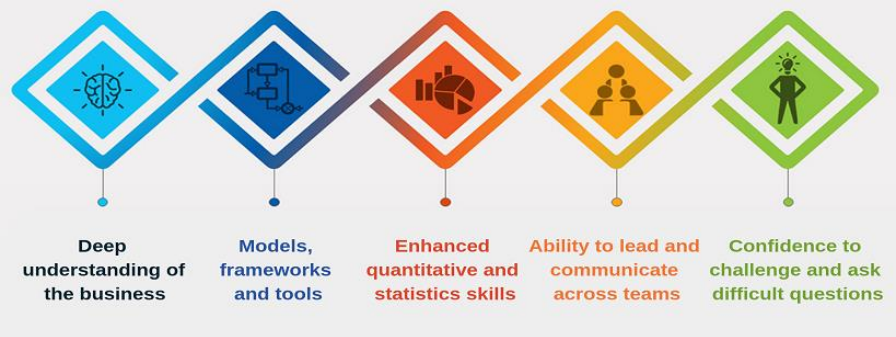


Figure 17: Needs at ERM (Global Management Accountant, 2018)

3.3.1 SEPARATION OF RISK FROM OPPORTUNITY (OPPORTUNITY RISK OR UPSIDE RISK)

Provides the company with the advantage of taking advantage of opportunities presented (Opportunities), separating them from the risks. Opportunity is more of a risk than a business failure. It also makes it possible to understand the interaction between risks, as a risk does not manifest itself as a single event, but affects and is influenced by other risks. (O Zwikael, RD Pathak, G Singh, S Ahmed , 2014)

3.3.2 DISTRIBUTION OF RISKS TO COMPETENT PERSONS WITHIN THE COMPANY

For each risk category there is a specific person with the knowledge and experience to handle it. The ERM assigns and distributes the risks to the appropriate person in charge. It is important for the management of risks to have a person responsible to the company for the management. (S Kristiansen , 2013)

3.3.3 COORDINATION OF RESPONSIBILITIES IN RISK MANAGEMENT

The ERM recognizes the importance of aligning liability with responsibility in a company, for its uninterrupted operation and to ensure it from any misunderstandings. It therefore coordinates risk management, with the business model of the company and according to its hierarchical structure and business functions. This is done by grouping the risks and assigning them to appropriate managers while the internal control department has the general control of all. (M Arena, M Arnaboldi, G Azzone, 2011)

3.3.4 CENTRAL RISK MANAGEMENT FUNCTION

An individual or department has the central control and is responsible for communication, cooperation and exchange of information between the persons in charge of risk management (Risks) but also along the length and breadth of the company to ensure continuous and uninterrupted cooperation between departments and officials. The person or department that has the central control of the operation, must be in a suitable high position in the structure of the company, and have access to the Board of Directors or the CEO of the company. (L Esch, R Kieffer, T Lopez, 2005)

3.3.5 CREATING A KNOWLEDGE MANAGEMENT DATABASE

ERM enables the creation of a knowledge management database, which is powered by Best Risk Management Practices (Risk) and is accessible to all departments and stakeholders. The ERM, in addition to promoting and enhancing cooperation and

exchange of information between individuals and departments, regarding risk management (Risk), collects all this information, as well as data from risk management accounts (Risks) and creates an electronic Knowledge Warehouse. The knowledge repository enables users to access information and data that provide them with solutions to risk management problems (Risks), in accordance with good or bad practices that the company has applied in the past. (R Hauck, H Chen , 1999)

3.3.6 INVOLVEMENT OF THE COMPANY'S BOARD OF DIRECTORS IN RISK MANAGEMENT.

It enables the company's Board of Directors to have a view of the company's risk management (Risks), which is important, especially when the company is listed on the US market, and must comply with the provisions of the Sarbanes-Oxley Act. The Board of Directors usually receives periodic reports from the Internal Audit Department. The ERM system gives the possibility of reporting to the Board of Directors. Each time a report is forwarded to the CEO, it is forwarded at the same time to the board of directors that is responsible for the supervision of risk management (Risk) by the company, on behalf of the entire Board of Directors. (A KASSAHUN, 2015)

3.3.7 IMPLEMENTATION OF A STABLE STANDARDIZED RISK ASSESSMENT PROCEDURE (RISKS)

The ERM system provides a consistently standardized troubleshooting process. This process is used by all the Risks departments, from the planning department to the design department, to the budget department in budgeting. The integrated application of the system effectively contributes to the reduction of the probability of exposure to risk of the company. (VT Covello, MW Merkhoher , 1993)

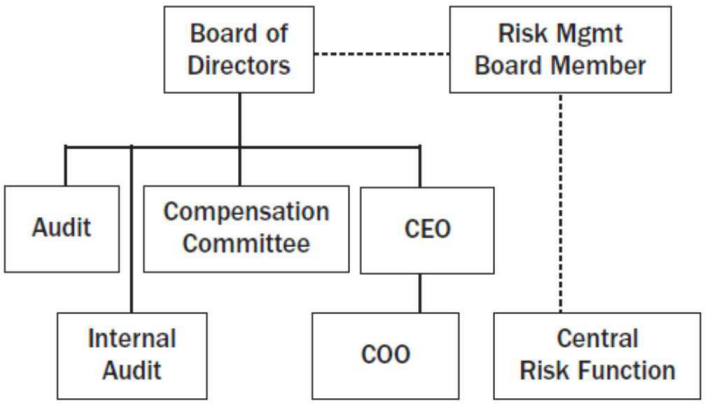


Figure 18: ERM chart (J Hampton, 2009)

4. MARITIME BUSINESS ENVIRONMENT AND RISKS

In the shipping company the requirement for the implementation of an integrated risk management system (Integrated Enterprise Risk Management System) is important and is imposed by the complexity and dynamics of its external environment. Regardless of the form of the company (family, multi-shareholder, listed company, etc.) the implementation of an effective risk management system (Risk) gives the company a substantial advantage in the highly competitive environment, as it increases the quality of services provided, improves the image of the company and consequently the confidence it inspires in the market. But the most important benefit is to increase its viability in a business environment and industry where business disaster and bankruptcy are common.

An integrated risk management system includes its structure and operation. It is also segmented according to the type of risk to achieve maximum effectiveness due to specialization. (V Slapničar, I Adum, 2017)

Figure 19: Global Maritime Issues Monitor 2020 (safety4sea., 2020)

4.1 RISK MANAGEMENT SYSTEM ORGANIZATIONAL STRUCTURE

The structure of a shipping company varies depending on its size and the market in which it operates. The implementation of a risk management system (Risk) does not require a change in the organizational structure of the company. Risk managers are

located in each related department and Business Unit and have experience and knowledge of department operation. Also, each ship requires a crew officer who also has the duties of Ship Security Officer as provided by the ISPS code. However, two important parts are required in the structure of the company for the effective operation of the Risk Management System. (Merna, FF Al-Thani, 2008)

4.1.1 The Internal Auditing department

This department is responsible for conducting internal audits in the company, for the Assurance of the operation of the company, in parts and in total according to its current policies, but also the commitments (legal or financial) that exist under applicable contracts and laws that the company must comply with. Internal Audit is an independent, objective assurance and consulting activity designed to add value and improve an organization's operations. (en.wikipedia.org, 2021) It helps the company achieve the goals, bringing a systematic and disciplined approach to assessing and improving the effectiveness of the operation of risk management (Risks), control measures (Controls) and corporate governance (Corporate Governance).[4] (KHS Pickett, 2010)

4.1.2 THE CENTRAL RISK CONTROL DEPARTMENT

This department is necessary in large companies, for the coordination of all the managers per department or Business Unit and the submission of reports to the Management of the company and to the Board of Directors. In small companies this department is omitted and the responsibilities have the Chief Financial Officer (CFO). It is important that the risk management is performed by the most experienced and specialized employees and the central control by an independent specialized manager who reports to both the CEO and the Board of Directors of the company. This department operates in parallel with the Internal Auditing department. (OECD , 2014)

4.2 OPERATION AND PROCEDURES OF THE RISK MANAGEMENT SYSTEM

The operation of a Shipping Company's Risk Management System consists of the Policy, the Standard Operating Procedures (SOPs) defined by the policy, the Culture

[4] "Corporate Governance - (CG) is a set of rules that apply to Societes Anonymes and regulate the operation of the Board of Directors, in relation to the company's shareholders. CG seeks the responsible organization, operation, administration and control of a company, with the aim of increasing its value and protecting the legal interests of all its shareholders, but mainly of minority shareholders, against major shareholders ".

and the approved risk management tools (Financial derivatives, insurance policies, etc.). Risk management tools are different per risk category and are analyzed in each risk management category of the shipping company below. (S XIA, J LV, G XIONG, D LI, 2007)

4.2.1 RISK MANAGEMENT POLICY

The Risk Management Policy is different per shipping company and is determined by the Management of the company and after the approval of its Board of Directors. The Policy determines the degree of Tolerance that is accepted by the company per sector. It also determines the levels of risk management according to their importance, which consists of the probability of their occurrence and the severity of their effects. The risks, which reach the Board of Directors of the shipping company, are determined regarding the approval of their management plan. (S Albertijn, W Bessler, W Drobetz, 2011)

The Risk Management Policy of the shipping company includes the standard operating procedures (SOPs) for their handling. Standard operating procedures (SOPs) specify: (PL Jørgensen, D De Giovanni, 2010)

- The department and the risk manager
- The departments and staff within them that require their cooperation or coordination.
- The channels of communication used for energy or information.
- Approved risk management tools
- The management steps in detail for the implementation of the process
- The management level and the person responsible for the final approval of the Risk management plan

Risk management policy is important because it sets the levels of control and maps out management processes. In this way, it sets the benchmarks for the measurement of management, but also the control by the internal auditors of the company (Internal Controls, Internal Audit). Thus, Risk Management becomes measurable and controllable, so that its proper implementation and operation can be confirmed. (INTERNATIONAL SECURITY MANAGEMENT CODE APPENDIX B, 2010)

4.2.2 RISK MANAGEMENT CULTURE

The concept of risk culture is relatively new, but it is required for the proper implementation of an effective risk management system (ERM). Risk culture can be applied to any shipping company, but its integration differs significantly, depending on the context of the already existing corporate culture that exists in the company.

The nature of the relationship between organizational culture and risk culture is important. Risk culture is perceived as a subset of organizational culture, either overlapping or expanding beyond the traditional boundaries of organizational culture. Many principles and ideas around organizational culture are the same in risk culture. (W HU, H HU, 2007)

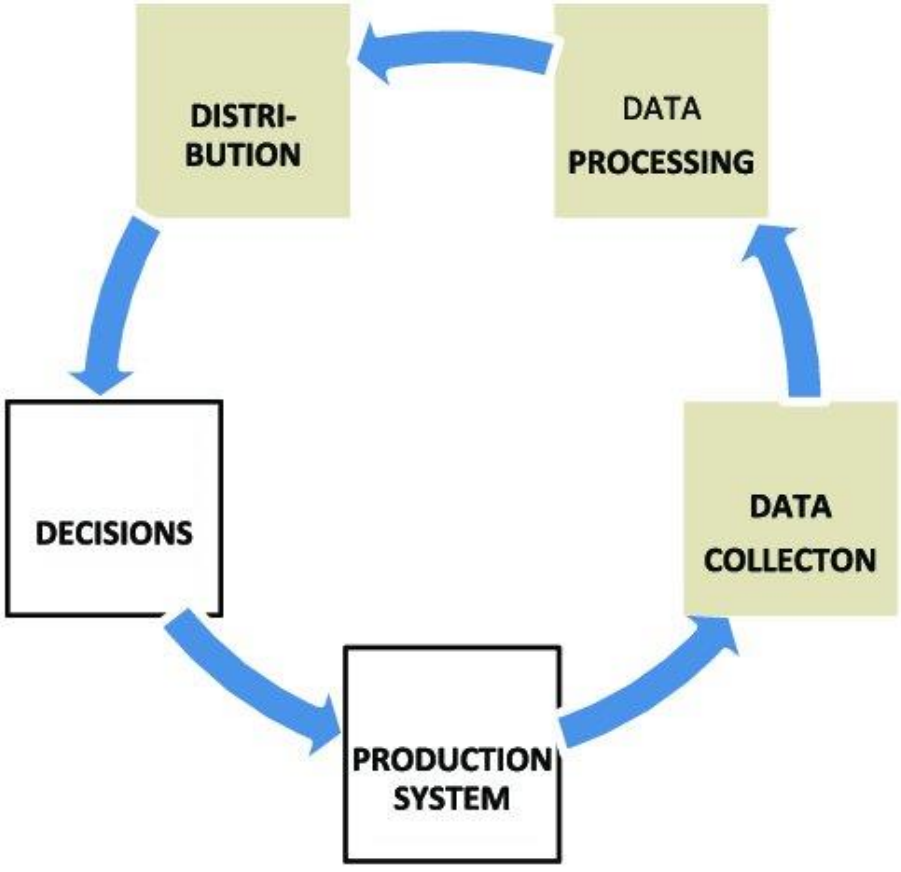


Figure 20: Safety management system (adapted from Kjellén, 2000).

4.2.2.1 IMPORTANCE OF RISK CULTURE

Risk culture plays a strong role in determining the behavior and effectiveness of a shipping company. It is considered as a critical factor that affects the behavior of staff in the workplace (JI Håvold, 2005).

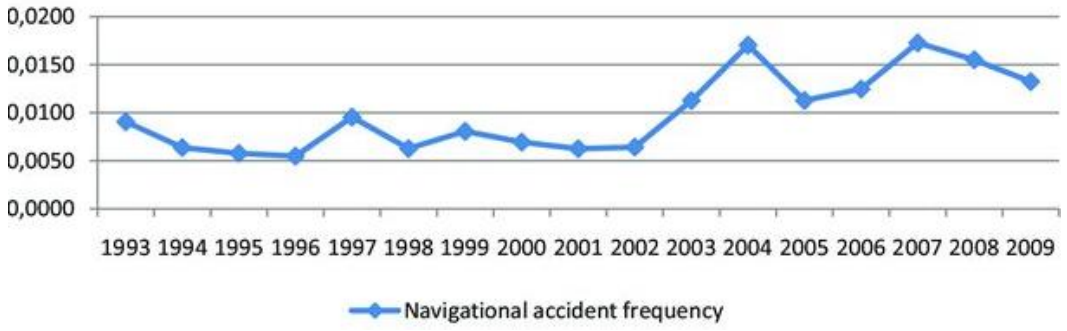


Figure 21: Navigational accident frequency 1993-2009 (Source: Lloyds' Fairplay, 2010)

4.2.2.2 INVISIBLE CULTURE OF DANGER

Although some aspects of it are quite visible (e.g. reporting lines), most of it is invisible, such as unwritten routines, informal relationships and staff attitudes and behaviors that are not obvious. (R George, 2013)

4.2.2.3 THERE IS NO EXCELLENT CULTURE OF RISK

Culture differs from company to company and is directly related to its internal and external environment. It is important that the culture is adapted to the way in which the company competes in the market. (Å Ek, M Runefors, J Borell, 2014)

4.2.2.4 RISK CULTURE CAN BE MEASURED AND MANAGED

Methods have been developed in the field of Human Resource Management that can measure it so that it can be managed.

Within the culture of a company, in addition to the necessary development of risk culture, the development of safety culture is required that concerns the safety and protection of staff and the working environment. Depending on the company's strategy, the company may accept the risk, to a predetermined degree, of making opportunistic profits (mainly in the financial sector), but the relaxation of the security measures of the staff, the facilities is not accepted at all. (CL Liu, KC Shang, TC Lirn, KH Lai, YHV Lun, 2018)

4.3 RISK MANAGEMENT PLANNING

The first activity of Risk Management is its planning. At this stage, similarities with the level of Risk Assessment are presented and can be performed in parallel. While in risk analysis the main concern is to identify the means and ways to reduce the risk, in Risk Management the emphasis is on developing actions, capable of achieving the

expected result, without the existence of side effects. The capabilities provided in Risk Management are classified into four broad categories. (G Stefan , 2011)

- Avoid danger
- Risk transfer
- Risk reduction action and
- Acceptance of risk

4.3.1. AVOID DANGER

This is the use of alternative approaches, which do not contain any risk. Although this feature is effective with Risk Management techniques, it is not always available, as in many cases it is practically impossible to adopt a strategy without any risk. The fact that risk is involved in stages and operations and that the prospect is to maintain profit should not be overlooked.

4.3.2 RISK TRANSFER

It is about transferring the risk to another party involved. In practice, the implementation of this tactic is done by transferring the risk within a contract and taking the risk from a contracting party. (B Basham , 2002)

4.3.3 RISK REDUCTION ACTION

This is the tactic to which most risk factors fall. It includes all actions aimed at reducing either the likelihood of a risk factor occurring or the consequences of the occurrence of a risk factor. Risk reduction actions cannot be further specified, as they depend on the nature and type of factor under consideration. (UN ESCAP, 1999)

4.3.4 ACCEPTANCE OF RISK

It is about accepting risk, by planning absolutely no management action. This can happen in a number of cases involving non-critical risk factors for the smooth operation of the ship, in which either any planned reaction will cost more than the consequences of the potential risk factor occurring, or the risk is controlled by full of external factors in which there is an inability to intervene.

Risk Management procedures apply to all phases and operations of the ship. The earlier they join the process of managing basic, day-to-day or non-core processes, the greater the benefits. (G Psarros, R Skjong, E Vanem, 2011)

4.3.5 RESOURCE MANAGEMENT

The Resource Management stage involves both the allocation of available resources to Risk Management and the allocation of corresponding responsibilities to specific individuals. During the allocation of resources, special emphasis should be placed on the resource needs of the ship's management and operation activities, so as to ensure that the resources available to Risk Management can indeed be allocated and are not committed to any other activity. (R Croad, K Parnell , 2002)

4.3.6 CONTROL OF RISK MANAGEMENT PROCEDURE

The Audit phase intends to ensure that progress in the design phase is compatible with all available resources and that the implementation of the Risk Management plan is coordinated with the ship's activities. The best result, of course, is achieved when the Risk Management process is not considered additional, but is fully integrated into the standard ship management process. (K Kulkarni, F Goerlandt, J Li, OV Banda, P Kujala, 2020)

4.3.7. MONITORING THE RISK MANAGEMENT PROCEDURE

The monitoring stage is the key that confirms the effectiveness of the implementation of the Risk Management plan as a whole, but also of each individual action to reduce the risk. At this stage, it is monitored and recorded which risk factors appeared and when, as well as what management actions were finally taken, by whom and what was their effectiveness. The recorded data are compared with those of the Risk Management plan and any deviations from it are examined, in combination with the reasons that led to these differences. (H Karahalios, 2014)

Based on the above data, the need to revise the Risk Management Plan is monitored. In particular, the revision of the Risk Management Plan is imperative, either when an unforeseen risk factor arises or when the existing assessment of the severity of the risk factors is shown to be systematically outside the tolerable range. Finally, either it is found that the effectiveness of the planned actions is reduced in relation to the expectations. The purpose of the Monitoring phase is therefore to ensure that: (S Athanasatos, S Michaelides, M Papadakis , 2014)

- The actions designed to reduce the likelihood of the risk factor occurring are indeed effective.
- Risks designed to reduce the risk associated with the risk factor are effective.

- All activities remain within the predetermined risk tolerance limit
- When the risk factors, for which there is no potential mitigation action, reach a point where the probability of occurrence has increased, the plan that includes this contingency applies.

4.4 RISK MANAGEMENT TOOLS

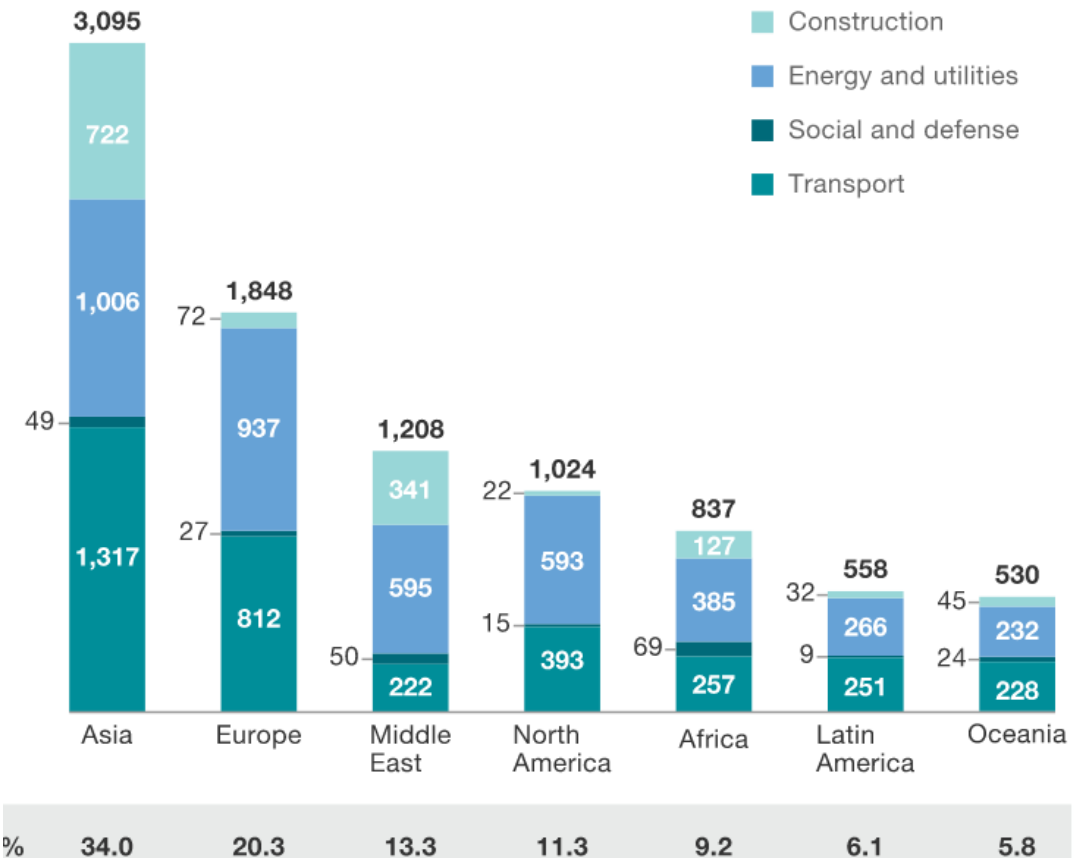
After the completion of the previous stages it is necessary to record the conclusions and the proposed solutions on a corresponding basis with that of the recording of risk factors, called the Risk Management Register. The unified coded recording of the management actions ensures the dissemination of the information contained in the Risk Management Plan and contributes to the effective monitoring of its actions, based on the timetables contained in it. (MG Kavussanos, ID Visvikis, 2006)

Specifically, the Risk Management Register:

- It refers to a specific table and lists all the necessary actions for the management of the identified risk factors
- Includes a record of data on the allocation of resources for the management of individual risk factors
- Together with the Register of Risk Factors, it is the main tool of the Risk Management process
- Requires the identification of a potential Managing Officer for each risk factor
- It is facilitated in its use with the development of a computer application, for the faster and more complete introduction of the elements in the fields and the integration with the corresponding application for the Risk Factors Register.

4.5 BUSINESS RISK MANAGEMENT IN THE SHIPPING COMPANY

The Management of Operational Risk (Risk) in the shipping company, mainly concerns the Operations department. That is, the department that deals daily with the operation of ships. Management concerns risks related to the specificities of the shipping industry, as described in a previous chapter. The main Risks they manage are Freight-rate risk, Operating-costs risk, and Pure risk. (S Albertijn, W Bessler, W Drobetz , 2011)



lFigure 22: The current global pipeline for infrastructure projects at $ trillion (Frank Beckers and Uwe Stegemann, 2020)

4.5.1 FREIGHT-RATE RISK

The price of the fares and its fluctuations significantly affect the operating profits of the shipping company. The shipping industry faces the risk of strong tariff fluctuations and constant care is required to ensure, in the face of this fluctuation, its results, at levels of sustainability. (Alizadeh, A., & Nomikos, N. , 2009) It is the most important risk for a shipping company.

Thus, the need arose to find an effective solution to offset the risk of fare fluctuations. The first attempt at this hedge was attempted using Physical Hedging Methods, ie using longer time contracts, such as contracts of period time charter and contracts of affreightment (CoA). The need, however, remained and the shift to the use of derivatives was inevitable. (L Jing, PB Marlow, W Hui, 2008)

A derivatives market to function effectively requires the underlying product (in this case the fares) to measure its value daily, through a market and an index. The solution was provided by the London Stock Exchange (Baltic Mercantile and Shipping Exchange). In this stock market, every day, thousands of shipping brokers trade,

shaping the price of fares through supply and demand. (Georgantopoulos & Vlachos, 2003)

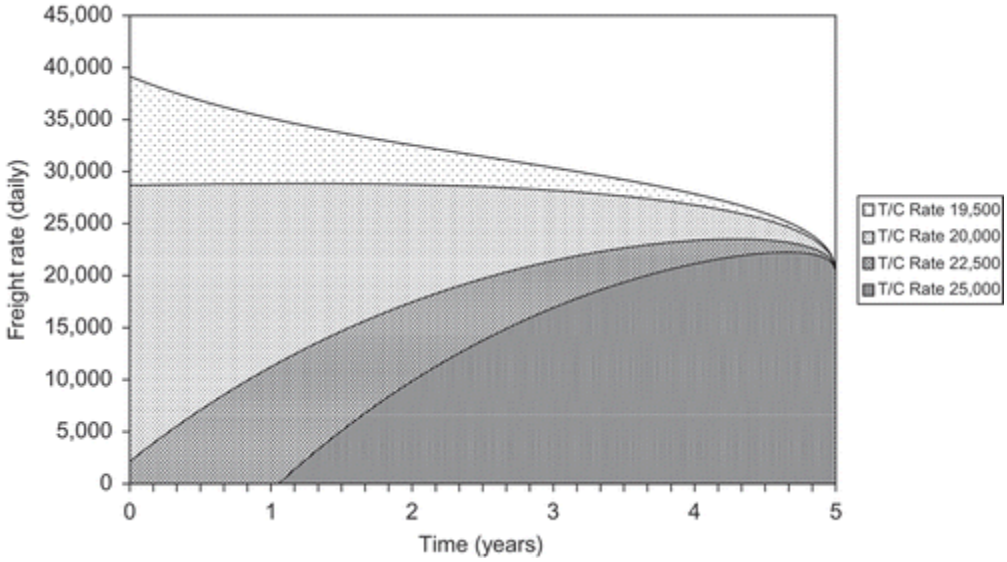


Figure 23: Critical freight rate curves for pure American T/C-POP (PL Jørgensen, D De Giovanni, 2010)

To insure the company against the risk of the freight price, a shipping company uses either Forward Freight Agreement or the following contracts in the BIFFEX market. (Alizadeh, A., & Nomikos, N. , 2009)

- Freight Futures Agreement. This is a futures contract for a specific quantity, at a predetermined future time (maturity) and at a predetermined price (delivery price) and its purchase and sale take place through BIFFEX.
- Options on Freight Rate. Option contracts are based on the optional exercise of a Call / Put right and include price-protection agreements.

Also, outside BIFFEX are the Forward Freight Agreement which are between two parties, one buys and the other sells at an agreed date, quantity, and freight price in the future.

A further analysis of the use of derivatives is presented below in financial risk management. (X Bai, JSL Lam, 2021)

4.5.2 OPERATING-COSTS RISK

In addition to the price of fares, the operating costs of the ship fluctuate sharply, which also affects the operating profits of the shipping company. The operating costs of a ship include: (S Albertijn, W Bessler, W Drobetz , 2011)

- Crew payroll

- Oil lubricants
- Spare parts
- Repairs - Maintenance
- Fuels
- Premium

The cost with the largest variation is the fuel cost (Bunker cost). Its large variation, combined with its large share of the total cost (more than 50% of the total cost per trip), is a risk factor for the shipping company and must be managed accordingly.

The shipping company is therefore required to check its exposure to fuel costs (Bunker cost) to ensure its profitability. The methods used are: (E Sambracos, M Maniati, 2013)

- The search for cheap bunkering during the voyage and the refueling of the ship from there
- Cost transfer to the charterer through the charter agreement
- With a fixed price swap of Bunker Oil, ie an exchange contract (Swap) amount of high sulfur fuel oil (Bunker oil) term (fixed time), where both parties agree to exchange it at a fixed price, with the floating value, as formed at the time of exchange. (investopedia.com, 2021) The shipping company enters into the contract in terms of fixed price. The prices of the contracts in question are formed by the prices of the forward market. As an example, suppose a shipping company seeks to offset its exposure to Asia (Bunker Oil Supply in Asia) for the month of September. It will therefore decide to buy a swap of Singapore high bunker oil (Platts 380 CST) at the current purchase price of $ 243 / MT[5]. Buying the $ 243 swap, the company will have a fixed fuel cost of $ 243 / MT in September, regardless of the spot price for Singapore high sulfur fuel oil (Bunker Oil) in September. (mercatusenergy.com, 2021)

4.5.3 PURE RISK

This category includes the management of all risks related to the reduction of the value of the shipping company, consequence of natural disasters, accidents, loss of staff

[5] Metric Tone

and facilities - ships, technical failures, human error during the operation of the shipping company. (Alizadeh, A., & Nomikos, N. , 2009) In addition, there are risks associated with ship collisions, accidents and responsibilities from oil spills and chemical pollution.

The risks they manage in this category are particularly significant in terms of their effects. Their effects can be so severe, and disproportionate to the size of the company, that they threaten its viability. They are also directly related to the specialized services offered by the shipping company and its actions. (G Alexandridis, S Sahoo, DW Song, 2018)

Risk insurance is achieved by reducing the conditions that create them. (Boyer, M., Christoffersen, P., Lasserre, P., & Pavlov, A, 2003) For example, if the company transports petroleum tanker oil in a small and well-maintained Double Hull tanker, the chances of an oil spill are small, and therefore the chance of any financial loss to the shipping company is small.

In addition, because the potential loss from the risks in question is large, it is necessary to differentiate the risk through insurance policies. The shipping company against the premium, passes the risk and the cost of restoration to the insurance company, which in turn differentiates it and shares it with other companies in the insurance industry, so that the restoration is possible. (H Yin, Z Chen, Y Xiao, S Wang, 2020)

4.6 FINANCIAL RISK MANAGEMENT IN THE SHIPPING COMPANY

Financial Risk Management addresses all the risks associated with the financial transactions of the shipping company. It aims to reduce the company's exposure to credit risk and risks, in terms of interest rate fluctuations and the price of assets (Fixed and Current). It concerns the Financial department of the company and the risk management is carried out with financial tools. (SK Mohanty, R Aadland, S Westgaard, 2021)

4.6.1 Interest-rate risk

Interest-rate risk arises from the fluctuation of interest rates, as they change, either in the international financial markets (LIBOR, EURIBOR) or change following decisions of central banks (Federal Reserve, European Central Bank, Bank of Japan, etc.). The shipping industry as mentioned above is a very capital-intensive sector. The

purchase or construction of a ship is financed by borrowing, usually a floating interest rate. Interest rate fluctuations can cause the company cash flow problems and general liquidity problems. (Alizadeh, A., & Nomikos, N. , 2009)

The raising of funds in a shipping company, in addition to the increase of share capital and the issuance of simple or convertible bonds[6], is also implemented with bank lending. Bank lending is done at either a fixed or floating interest rate. Fixed interest rate lending has a higher cost (Interest rate) than floating rate lending. The floating interest rate is based on another floating interest rate that is formed daily in the market, usually LIBOR (London Interbank Offer Rate)[7] and is expressed as units that are added to the interest rate in question to calculate the final interest rate (eg LIBOR + 1.25%). [8]

Companies prefer to finance their investments, first with equity, then with a share capital increase, then with bonds, preferably convertible, and finally borrowing. Fixed interest rate is preferred over lending because it exposes the company to less risk. Fixed interest rate lending has high interest rates. In the shipping industry, through the negotiation of the shipping company and the bank, the amount of the installments is reduced, with the determination of a large installment, total repayment of the loan (Balloon Payment), which is set at a time when the company plans to cease operation of the ship, which will either be sold on the used market or sold as scrap. Upon collection of the sale price, the Balloon Payment is executed. (B Ghiorghe, B Ana-Maria, 2011)

Hedging against floating rate risk is carried out with various financial instruments, which exist in the derivatives markets as follows:

4.6.1.1. FORWARD-RATE AGREEMENT (FRA)

"An interest rate futures contract is an over-the-counter (forward) futures contract that is entered into between two counterparties in order to lock in an interest rate for a specific future period of time. This interest rate will be used to calculate an amount that the two parties will exchange in the future. "The buyer (The shipping company) undertakes to pay to the seller (Financial Institution), at the end of the contract, a cash

[6] Convertible bonds are not repaid at maturity but are converted into company shares.

[7] "LIBOR is the offer rate at which the major international banks in London borrow funds (euro dollars) from each other. It is also used as a reference rate to set many other floating interest rates in many markets around the world. In other words, it is an interbank interest rate ".

[8] The interest rate is equal to the LIBOR interest rate as formed in the market plus 1.25 points

flow calculated at a fixed interest rate of a pre-agreed nominal amount. The seller (Financial Institution) of the interest rate futures contract respectively, undertakes to pay to the buyer (Shipping company) a loan at the end of the contract, calculated with a floating interest rate on the same nominal amount, which corresponds to the amount required by the company for the payment of the floating rate loan. (https://www.euretirio.com/prothesmiako-symvolaio-epitokiou-forward-rate-agreement-fra/, n.d.)

4.6.1.2 INTEREST-RATE FUTURES

"An interest rate futures contract is a contract with an underlying asset, a money market interest rate or a bond. This Contract is a futures contract, ie a binding agreement and obligation to buy and sell an asset, between a buyer and a seller, at a predetermined future time (Maturity) and at a predetermined price (Delivery Price). These contracts are standard futures contracts in terms of amount, interest rate, maturity date, which are traded on derivatives exchanges and are used respectively as FRAs. (https://www.euretirio.com/symvolaia-mellontikis-ekplirosis-futures-sme/, 2021)

4.6.1.3 EURODOLLAR FUTURES CONTRACTS

Eurodollar futures contracts provide an effective means for shipping companies to hedge against the risk (Risk) of LIBOR interest rate fluctuations. The contracts are based on time deposits of Dollar (USA) with interest rate LIBOR (Underline product). For example, a shipping company will need to pay $ 8,000,000 next December (after three months) to repay a floating rate loan based on LIBOR. Eurodollar Futures (PICs) represent a three-month $ 1,000,000 time deposit to LIBOR. (T Krehbiel, LC Adkins, 1996) The company is insured against the risk of an increase in LIBOR in the next three months by purchasing 8 Eurodollar Futures (PICs) in December. If LIBOR increases during this period, the PICs' profits will cover the increase in the repayment installment due to the interest rate increase. (http://www.investopedia.com/articles/active-trading/012214/introduction-trading-eurodollarfutures., 2021)

4.6.1.4. INTEREST-RATE SWAPS - IRS

Swaps are usually entered into with financial institutions, which, by collecting a premium, meet the hedging needs of other companies. IRS contracts are often used for short-term interest rate risk. It is essentially a conversion of either a liability, or the

collection of a fixed interest rate into a liability or the collection of a floating interest rate (and vice versa). (ASM Azad, 2011)

4.6.1.5 INTEREST-RATE OPTIONS

Option contracts are based on the optional exercise of a Call / Put right and include interest rate protection agreements (Interest Rate Caps). (PL Jørgensen, D De Giovanni, 2010)

4.6.2 ASSET-PRICE RISK

The need to manage the risk (Risk) of the price of the company's assets, arises from the fluctuation of the price of mainly fixed assets in the shipping industry. Specifically it concerns the price of ships. The fluctuation of the price of the ships is important for a shipping company because it affects the Balance Sheet of the company. (Alizadeh, A., & Nomikos, N. , 2009) Also, the decrease in the value of the ships reduces the creditworthiness of the company, as the borrowing arises with the ships as collateral. For the above reasons, the companies involved in the shipping industry, companies and banks monitor the course of ship prices and act accordingly in their financial activities. (AH Alizadeh, NK Nomikos, 2012)

The management of the risk in question (Risk) was traditionally done with real options (Real Options) (Boyer, M., Christoffersen, P., Lasserre, P., & Pavlov, A, 2003), i.e. in the choice by the management of the company to buy or sell ships depending on the prices and also in the time chartering of an empty ship (Bareboat Charter). (en.wikipedia.org/wiki/Bareboat_charter, 2021)

In recent years, the ability to hedge (Risk) with Futures (FOSVA), which are based on the underlying product Baltic Ship Value Assessment (BaSVA), has been developed. (Alizadeh, A., & Nomikos, N. , 2009) BaSVA is configured for four specific ship types (VLCC, Aframax, Capesize and Panamax). Twice a month, estimates are published for the value of the above types of ships (with an average age of 5 years), by 10 recognized companies and thus the BaSVA is formed. Also, the Baltic Demolition Index (BDA), which concerns the scrapping prices of ships, is used for respective futures contracts. (AH Alizadeh, NK Nomikos, 2009)

4.6.3 CREDIT RISK

Credit risk refers to the uncertainty that exists in the transactions, if the other trading party will fulfill its commitments. Such cases are the non-repayment of a loan or the

non-repayment of the price for a service (Cargo transfer) that has been performed. Credit risk exists to a large extent in the shipping industry, as traders enter into direct negotiations and agreements with each other. (Alizadeh, A., & Nomikos, N. , 2009)

Credit risk is categorized as follows: (CT Grammenos , 2013)

- Default risk: The other trading party fails to meet its commitments.
- Downgrade risk: In this case, the creditworthiness of the other party is degraded, resulting in a decrease in the value of the agreement or contract (there is no default but it may end up there).
- Credit-spread risk: In this case we have a reduction in the return on the contract or bond, due to market conditions. Here again, it is not necessary that there will be default, but there are losses of profit from this transaction

In general, in the analysis of credit risk (Credit risk), especially in the shipping industry, it is found that the main and common component is the possibility of default (Default). (Alizadeh, A., & Nomikos, N. , 2009) Credit risk is therefore measured and expressed in the following ways.

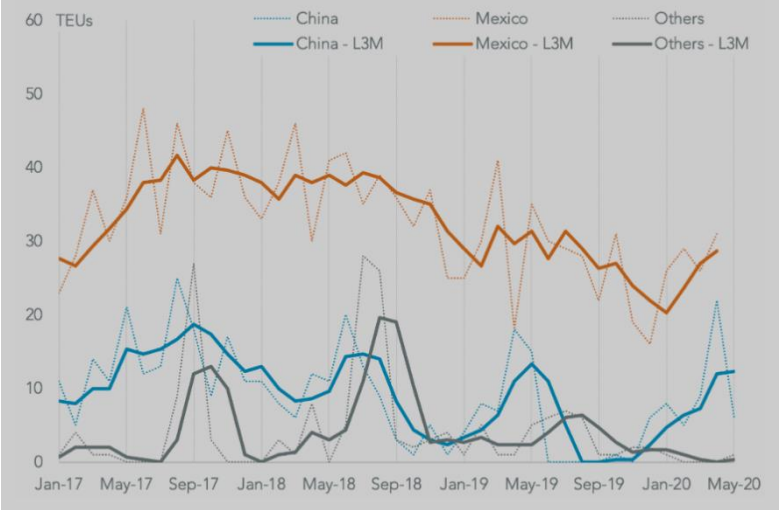


Figure 24: Chart segments U.S. seaborne imports linked to Pace Industries by origin on a monthly and three-month average basis.Source: Panjiva

4.6.3.1 PROBABILITY OF DEFAULT

It is determined by the probability that the other trading party will not be able to meet its commitments within the specified time limits.

4.6.3.2 LOSS – GIVEN DEFAULT

They are determined by the financial losses that the company will suffer if the other trading party does not comply with its contractual obligations in full and within the time limits. (A Lozinskaia, A Merikas, A Merika, 2017)

4.6.3.2 DISTANCE TO DEFAULT

It is a statistical measurement (number of standard deviations) that determines the specific level of decrease in the value of assets, from where the default begins (Default). (T Ikemoto, T Ito, A Jackson, M Shimoda, 2008)

4.6.4 CREDIT RISK HEDGING

Companies in the Credit risk analysis, using either qualitative or quantitative methods, try to reach a measurable determination of one of the above three. The methods used vary from simple estimates to multidimensional mathematical models. But they are all based on information that exists in the economic environment. The three major organizations that deal in detail with the analysis of credit risk in companies and countries are Moody's, Standard & Poor's, and Fitch. In Credit risk hedging companies use the following methods. (MG Kavussanos, MA Goulielmou, 2007)

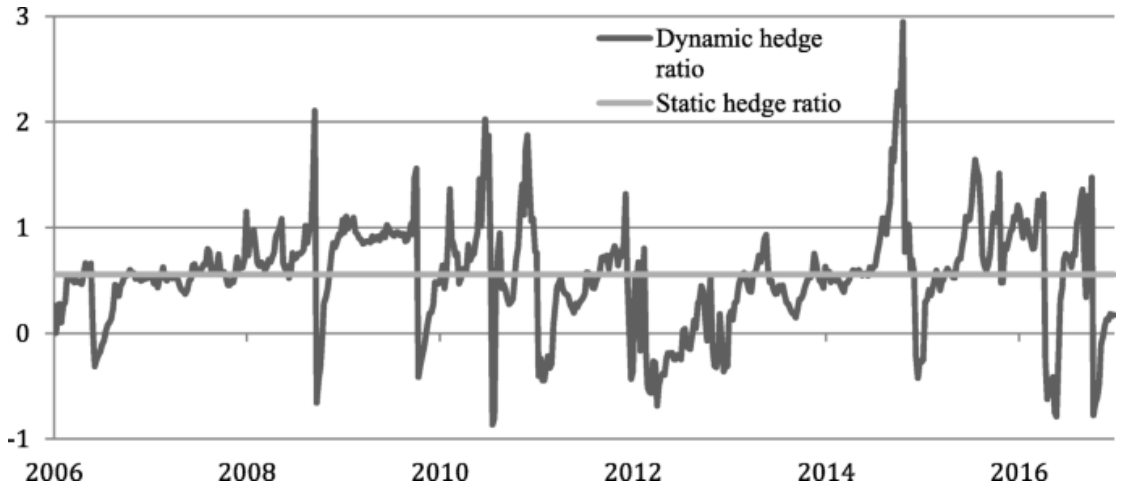


Figure 25: Dynamic hedge ratio from 2006 to 2016. Source: Authors' estimates, rolling one-year estimation

4.6.4.1 COLLATERALIZATION

Collateralization is the oldest and most effective method of credit risk hedging (Credit risk). With this method as security for the fulfillment of the commitments of the transaction, various assets, bank deposits, bonds and so on are used. The data taken as collateral are used to deal with (Compensation) the consequences of default. (X Mao, S Yu, 2012)

4.6.4.2 DOWNGRADE TRIGGERS

In Downgrade Triggers Credit rating limits are used here, which are set in the contracts and if one of the parties exceeds them, the change of specific terms of the contract is started, which concern the security of the other party. (R Ruparel , 2011)

4.6.4.3 CONTRACT DESIGN AND NETTING

The method of Contract Design and Netting introduces special terms in contracts and agreements, which in case of breach activate mechanisms relating to other contracts between the same parties, as well as additional assets as collateral. (B Finley, J Pettit , 2011)

4.6.4.4. DIVERSIFICATION

Diversification is applied in a portfolio of contracts and with this method it is sought not to sign many contracts with the same trading party, but with different ones, if possible with a different correlation coefficient (correlation). (MB Grelck, S Prigge, L Tegtmeier, 2009)

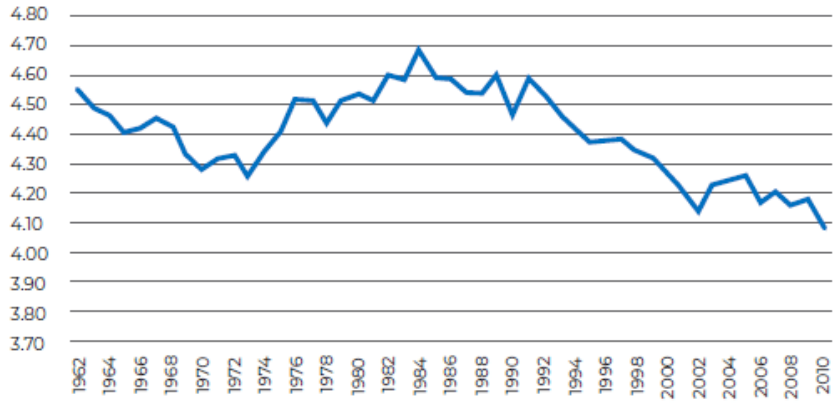


Figure 26: Diversification in Africa (Uri Dadush (Bruegel) Abdelaaziz Ait Ali Mohammed Al Doghan Muhammad Bhatti Carlos Braga Abdulelah Darandary Anabel Gonzalez, 2020)

4.6.4.5 CREDIT DERIVATIVES

Credit derivatives are hedging instruments traded in derivatives markets. The following are used in credit risk insurance. (PD Sclavounos , 2007)

- Credit default swap - CDS: Works similar to an insurance policy. For a monthly payment of a premium, the buyer is insured against the credit risk of defaulting on a bond or contract.

- Total return swap - TRS: This contract exchanges the return of the contract in question with the return of another asset of similar value at the time of signing the contract.
- Credit spread options - CSO: These contracts combine two assets related to credit risk (Credit Risk), one of which is risky (Risk) and the other is risk-free (Risk-free).

4.6.5 CURRENCY RISK

Currency Risk exists in companies that have receipts and payments in different currencies. Because the exchange rate between two currencies is not fixed but varies, a company that has payments or receipts in different currencies the exchange rate change changes the results of the year. Shipping companies face this risk (Risk) as the fares are usually in US dollars and the loan funds in different currencies depending on the country of the bank or the choice of currency when the company lends. (W Drobetz, D Schilling, L Tegtmeier, 2010)

Currency Risk management in shipping companies, as well as in other companies operating in an international environment, is performed using futures contracts and derivatives, with the underlying product being the exchange rate in question that we wish to ensure. The tools used are: (A Grath, 2013)

- Currency Forward Contracts
- Currency Futures
- Currency Options
- Currency Swaps

4.7 THE RUNNING COST OF COMPLIANCE IN RISK MANAGEMENT

Complying with risk management laws and regulations doesn't have to be expensive or time-consuming. In fact, ensuring compliance and going above and beyond your legal responsibilities can save you both time and money. (K Bichou , 2015)

However, there is a running cost of compliance that you'll need to cover before you can reap the benefits of risk management compliance — although it's likely to cost less than you think.

In this article, we'll break down the running cost of compliance in risk management and why it's worth every penny. (CF Barker, CB Campbell , 2000)

5. CONCLUSIONS

The implementation of an integrated risk management system (Integrated Risk Management System), in the shipping company, is necessary and imperative. The highly dynamic and competitive environment of the shipping industry requires

vigilance and detailed business planning. Ensuring success and achieving goals requires that nothing be left to chance. Everything must be managed with the aim of minimizing the company's exposure to the risks (Risks) arising from the cyclicality of the market, the uncertainty of the outcome of its financial transactions, human error, material failure and conflict of interest in corporate governance.

The successful operation of an integrated risk management system (Integrated Risk Management System) requires a proper organizational structure with integrated control mechanisms. The clear organization and affiliation of the internal audit departments and the central risk management department is important. Also the participation of the Board of Directors is necessary.

The performance of an integrated risk management system (Integrated Risk Management System) depends on the existence of a risk management policy (Risk Management Policy). The policy defines the risk management procedures (Risks), the Owners and custodians of the management, as well as the standard procedures (Standard Operations Procedures).

The development of the necessary risk management culture (Risk Management Culture) is the element that gives the cohesion and sustainability (sustainability) of the system. It also gives dynamism and energy to the general perception and management of risk (Risk) by staff.

The training and experience of the staff is important in the operation of the integrated risk management system (Integrated Risk Management System). The difference of the risks (Risks) between them, as well as the complexity of the methods and tools used in the management, require specialization of the staff. In particular, the use of financial instruments for hedging (derivatives market) poses a risk (Risk) in itself and requires expertise, experience and clear guidelines on risk exposure limits (Risk).

The shipping company must be open to new ideas and the introduction of new methods of risk management (Risk). Risk management is constantly evolving and new methods and tools are being discovered daily, in the struggle to reduce the cost of risk management, while increasing its compensation.

The cost of an integrated risk management system (Integrated Risk Management System) is a deterrent, often, its implementation factor. But the benefits in the medium

to long term are also significant. However, the need to secure shareholders and stakeholders in listed companies imposed mandatory risk management (Risk) through legislation. Such legislation is the Sarbanes - Oxley Act for listed companies.

It is foreseen that in the next period, for all the above reasons, the shipping companies will implement and improve their existing risk management system (Risks).

6. REFERENCES

A Gulnur et al., 2020. *Corporate financial leverage and M&As choices: Evidence from the shipping industry.* s.l.:s.n.

European Commission, 2018. *EU Transport in Figures.* s.l.:Statistical Pocketbook .

Merna, FF Al-Thani, 2008. *Corporate risk management.* s.l.:s.n.

MHN Bakker, ZW Kundzewicz, C Green et al., 2016. *Recurrent governance challenges in the implementation and alignment of flood risk management strategies: a review*, s.l.: s.n.

A Bergek, Ø Bjørgum, T Hansen, J Hanson, 2018. *Towards a sustainability transition in the maritime shipping sector: the role of market segment characteristics.* s.l.:s.n.

Å Ek, M Runefors, J Borell, 2014. *Relationships between safety culture aspects–A work process to enable interpretation.* s.l.:s.n.

A Grath, 2013. *The handbook of international trade and finance: The complete guide for international sales, finance, shipping and administration.* s.l.:s.n.

A KASSAHUN, 2015. *ASSESSMENT OF ENTERPRISE LEVEL RISK MANAGEMENT PRACTICES OF INSURANCE COMPANIES.* s.l.:s.n.

A Lozinskaia, A Merikas, A Merika, 2017. *Determinants of the probability of default: the case of the internationally listed shipping corporations.* s.l.:s.n.

AH Alizadeh, NK Nomikos, 2009. *Ship Price Risk and Risk Management.* s.l.:s.n.

AH Alizadeh, NK Nomikos, 2012. *Ship finance: Hedging ship price risk using freight derivatives.* s.l.:s.n.

Alizadeh, A., & Nomikos, N. , 2009. *Shipping Derivatives and Risk Management.* s.l.:s.n.

AN Kinkead, 1980. *A method for analysing cargo protection afforded by ship structures in collision and its application to an LNG carrier.* s.l.:s.n.

ASM Azad, 2011. *Essays in volatility and risk modelling in interest rate swaps.* s.l.:s.n.

AW Veenstra, PH Franses , 1997. *A co-integration approach to forecasting freight rates in the dry bulk shipping sector.* s.l.:s.n.

B Basham , 2002. *Industry profile: risk transfer fallacies in shipping.(Global Perspectives).* s.l.:s.n.

B Finley, J Pettit , 2011. *Creating value at the intersection of sourcing, hedging and trading.* s.l.:s.n.

B Ghiorghe, B Ana-Maria, 2011. *CONSIDERATIONS ON THE FINANCIAL RISKS IN THE SHIPPING INDUSTRY.* s.l.:s.n.

B Mølle, 2009. *Piracy, maritime terrorism and naval strategy.* s.l.:s.n.

Boyer, M., Christoffersen, P., Lasserre, P., & Pavlov, A, 2003. *Value Creation, Risk Management and Real Options.* s.l.:s.n.

businessdictionary, 2021. *Definition of Business Risk,* s.l.: s.n.

businessdictionary, 2021. *Definition of financial Risk,* s.l.: s.n.

C Chapman, W Stephen, 2003. *Project risk management processes, techniques and insights,* s.l.: s.n.

CF Barker, CB Campbell , 2000. *Risk management in total system ship design.* s.l.:s.n.

CJ Alberts, 2006. *Common Elements of risk,* s.l.: s.n.

CL Culp, 2002. *The risk management process: Business strategy and tactics.* s.l.:s.n.

CL Liu, KC Shang, TC Lirn, KH Lai, YHV Lun, 2018. *Supply chain resilience, firm performance, and management policies in the liner shipping industry.* s.l.:s.n.

CT Grammenos , 2013. *Revisiting credit risk, analysis and policy in bank shipping finance.* s.l.:s.n.

E Sambracos, M Maniati, 2013. *Financing shipping market: Special characteristics and the impact of Basel III.* s.l.:s.n.

en.wikipedia.org/wiki/Bareboat_charter, 2021. s.l.:s.n.

en.wikipedia.org, 2021. *Internal_audit.* s.l.:s.n.

Frank Beckers and Uwe Stegemann, 2020. *A risk-management approach to a successful infrastructure project.* s.l.:s.n.

G Alexandridis, S Sahoo, DW Song, 2018. *Shipping risk management practice revisited: A new portfolio approach.* s.l.:s.n.

G Dionne , 2013. *Risk management: History, definition, and critique.* s.l.:s.n.

G Psarros, R Skjong, E Vanem, 2011. *Risk acceptance criterion for tanker oil spill risk reduction measures.* s.l.:s.n.

G Purdy, 2010. *ISO 31000: 2009—setting a new standard for risk management.* s.l.:s.n.

G Stefan , 2011. *Risk management today in shipping companies.* s.l.:s.n.

Georgantopoulos & Vlachos, 2003. *Shipping Economics.* s.l.:s.n.

Global Management Accountant, 2018. *Risk Management.* s.l.:s.n.

Gökçe Ceyhun, 2014. *The impact of shipping accidents on marine environment: a study of Turkish seas.* s.l.:s.n.

H Karahalios, 2014. *The contribution of risk management in ship management: the case of ship collision.* s.l.:s.n.

H Liu, ZH Meng, Y Shang, ZF Lv, XX Jin, ML Fu, 2018. *Shipping emission forecasts and cost-benefit analysis of China ports and key regions' control.* s.l.:s.n.

H Yin, Z Chen, Y Xiao, S Wang, 2020. *Analysis of risk management performance with innovative approach: a case study of China's shipping companies.* s.l.:s.n.

Harrington, S. E., Niehaus, G., Risko, K. J., 2002. *Enterprise risk management: The case of United Grain Growers.*. s.l.:s.n.

Hellenic Shipping News, 2019. *Newbuilding Prices On the Rise as Higher-Spec Vessels Are Ordered.* s.l.:s.n.

HP Berg, 2013. *Human factors and safety culture in maritime safety.* s.l.:s.n.

HS Birkel, JW Veile, JM Müller, E Hartmann, KI Voigt, 2019. *Development of a risk framework for Industry 4.0 in the context of sustainability for established manufacturers.* s.l.:s.n.

http://www.investopedia.com/articles/active-trading/012214/introduction-trading-eurodollarfutures., 2021. s.l.:s.n.

https://en.wikipedia.org/wiki/, 2021. *Port_State_Control*, s.l.: s.n.

https://olig.gr/isps/, 2021. s.l.: s.n.

https://www.euretirio.com/prothesmiako-symvolaio-epitokiou-forward-rate-agreement-fra/, n.d. s.l.:s.n.

https://www.euretirio.com/symvolaia-mellontikis-ekplirosis-futures-sme/, 2021. s.l.:s.n.

IHS Markit, 2019. *World Shipping Encyclopaedia.* s.l.:s.n.

INTERNATIONAL SECURITY MANAGEMENT CODE APPENDIX B, 2010. s.l.:s.n.

investopedia.com, 2021. *commodityswap.asp.* s.l.:s.n.

J Bonta, 1996. *Risk-needs assessment and treatment..* s.l.:s.n.

J Davies, M Finlay, T McLenaghen, D Wilson, 2006. *Key risk indicators–their role in operational risk management and measurement.* s.l.:s.n.

J Hampton, 2009. *Fundamentals of enterprise risk management: How top companies assess risk, manage exposure, and seize opportunity*, s.l.: s.n.

James D. Hamilton, 2019. *Measuring global economic activity.* s.l.:Wiley Online Library.

JI Havold, 2000. *Culture in maritime safety.* s.l.:s.n.

JI Håvold, 2005. *Safety-culture in a Norwegian shipping company.* s.l.:s.n.

Jonas W. ,Ringsberg B,. BohlmannHL Chien, 2000. *Discussion of the QUASI-STATIC RESPONSE COMMITTEE.* s.l.:s.n.

K Andersson, F Baldi, S Brynolf, JF Lindgren, 2016. *Shipping and the Environment.* s.l.:s.n.

K Bichou , 2015. *The ISPS code and the cost of port compliance: an initial logistics and supply chain framework for port security assessment and management.* s.l.:s.n.

K Kulkarni, F Goerlandt, J Li, OV Banda, P Kujala, 2020. *Preventing shipping accidents: Past, present, and future of waterway risk management with Baltic Sea focus.* s.l.:s.n.

Kaplan & Mikes , 2012. *Harvard Business Review.* s.l.:s.n.

KHS Pickett, 2010. *The internal auditing handbook.* s.l.:s.n.

L Esch, R Kieffer, T Lopez, 2005. *Asset and risk management: risk oriented finance.* s.l.:s.n.

L Jing, PB Marlow, W Hui, 2008. *An analysis of freight rate volatility in dry bulk shipping markets.* s.l.:s.n.

L Styhre, 2009. *Strategies for capacity utilisation in short sea shipping.* s.l.:s.n.

M Acciaro, PN Hoffmann, MS Eide, 2013. *The energy efficiency gap in maritime transport.* s.l.:s.n.

M Adler, B Dumas, 1984. *Exposure to currency risk: definition and measurement.* s.l.:s.n.

M Arena, M Arnaboldi, G Azzone, 2011. *Is enterprise risk management real?.* s.l.:s.n.

M Arvidson , 2014. *Large-scale water spray and water mist fire suppression system tests for the protection of Ro–Ro cargo decks on ships.* s.l.:s.n.

M Stopford, 2013. *Shipping market cycles.* s.l.:s.n.

Ma, S. , 2010. *Using Economic Measures for Global Control of Air Pollution from Ships.* s.l.:s.n.

Mark A. Langley, 2017. *Transforming the high cost of low performance.* s.l.:s.n.

Martin Stopford, 2009. *Maritime Economics 3e.* s.l.:s.n.

MB Grelck, S Prigge, L Tegtmeier, 2009. *Diversification properties of investments in shipping.* s.l.:s.n.

mercatusenergy.com, 2021. *an-introduction-to-bunker-fuel-hedging-updated.* s.l.:s.n.

MG Kavussanos, ID Visvikis, 2006. *Derivatives and risk management in shipping.* s.l.:s.n.

MG Kavussanos, ID Visvikis, 2016. *The international handbook of shipping finance: theory and practice.* s.l.:s.n.

MG Kavussanos, MA Goulielmou, 2007. *An Investigation of the SUe of Risk Management and Shipping Derivatives: The Case of Greece.* s.l.:s.n.

N Akten, 2006. *Shipping accidents: a serious threat for marine environment.* s.l.:s.n.

O Zwikael, RD Pathak, G Singh, S Ahmed , 2014. *The moderating effect of risk on the relationship between planning and success.* s.l.:s.n.

OECD , 2014. *Risk Management and Corporate Governance, Corporate Governance.* s.l.:s.n.

Øyvind EndresenMagnus S., EideMagnus S., EideStig B. ,DalsørenStig B., DalsørenShow , 2010. *International Maritime Shipping: Environmental Impacts of Increased Activity Levels.* s.l.:s.n.

PD Sclavounos , 2007. *Modeling, Valuation and Risk Management of Assets and Derivatives in Energy and Shipping.* s.l.:s.n.

PL Jørgensen, D De Giovanni, 2010. *Time charters with purchase options in shipping: Valuation and risk management.* s.l.:s.n.

PL Jørgensen, D De Giovanni, 2010. *Time charters with purchase options in shipping: Valuation and risk management.* s.l.:s.n.

PM Panayides, R Wiedmer, 2011. *Strategic alliances in container liner shipping.* s.l.:s.n.

R Croad, K Parnell , 2002. *Proposed controls on shipping activity in the Marlborough Sounds: a review under s. 32 of the resource management act.* s.l.:s.n.

R Dandage, SS Mantha, SB Rane , 2018. *Ranking the risk categories in international projects using the TOPSIS method.* s.l.:s.n.

R George, 2013. *Deep sea and foreign going: Inside shipping, the invisible industry that brings you 90% of everything.* s.l.:s.n.

R Hauck, H Chen , 1999. *COPLINK: A case of intelligent analysis and knowledge management.* s.l.:s.n.

R Ruparel , 2011. *Abandon Ship: Time to Stop Bailing Out Greece?..* s.l.:s.n.

RE Hoyt, AP Liebenberg , 2011. *The value of enterprise risk management.* s.l.:s.n.

RJ Chapman, 1998. *The effectiveness of working group risk identification and assessment techniques.* s.l.:s.n.

S Albertijn, W Bessler, W Drobetz , 2011. *Financing Shipping Companies and Shipping Operations: A Risk-Management Perspective.* s.l.:s.n.

S Albertijn, W Bessler, W Drobetz , 2011. *Financing Shipping Companies and Shipping Operations: A Risk-Management Perspective.* s.l.:s.n.

S Albertijn, W Bessler, W Drobetz, 2011. *Financing Shipping Companies and Shipping Operations: A Risk-Management Perspective.* s.l.:s.n.

S Athanasatos, S Michaelides, M Papadakis , 2014. *Identification of weather trends for use as a component of risk management for port operations.* s.l.:s.n.

S Hamad, YH Ali, SH Shaker , 2020. *A Survey of Positioning Systems for Ships Based on New Categories.* s.l.:s.n.

S Kaplan, BJ Garrick, 1981. *On the quantitative definition of risk.* s.l.:s.n.

S Kristiansen , 2013. *Maritime transportation: safety management and risk analysis.* s.l.:s.n.

S Kum, B Sahin, 2015. *A root cause analysis for Arctic Marine accidents from 1993 to 2011.* s.l.:s.n.

S Larsson, 2005. *State of Practice Report–Execution, monitoring and quality control.* s.l.:s.n.

S Pristrom, KX Li, Z Yang, J Wang, 2013. *A study of maritime security and piracy.* s.l.:s.n.

S XIA, J LV, G XIONG, D LI, 2007. *Research on uncertainty of shipping supply chain.* s.l.:s.n.

Sabrina Jiang © Investopedia, 2020. s.l.:s.n.

safety4sea., 2020. s.l.:s.n.

SK Mohanty, R Aadland, S Westgaard, 2021. *Modelling Stock Returns and Risk Management in the Shipping Industry.* s.l.:s.n.

SOLAS_Convention, 2021. s.l.: s.n.

SOLAS, 1974. *International Convention for the Safety*, s.l.: s.n.

statista, 2019. *How Maritime Emissions Compare To Cars In Europe.* s.l.:s.n.

Stefan Reidy, 2020. *The Basics that Everyone Must Know About CARGO DAMAGE.* s.l.:s.n.

T Aven, 2015. *Risk analysis.* s.l.:s.n.

T Ikemoto, T Ito, A Jackson, M Shimoda, 2008. *Super-Long Distance International Shipping: 1314.* s.l.:s.n.

T Krehbiel, LC Adkins, 1996. *Do systematic risk premiums persist in eurodollar futures prices?.* s.l.:s.n.

Talley, W. K., 2010. *Vessel Safety and Accident Analysis.*. s.l.:s.n.

Tzelina Charlafti, Giannis Theotokas, 2007. *Greek Shipowners and Shipping Companies.* s.l.:s.n.

UN ESCAP, 1999. *Framework for the development of national shipping policies.* s.l.:s.n.

Uri Dadush (Bruegel) Abdelaaziz Ait Ali Mohammed Al Doghan Muhammad Bhatti Carlos Braga Abdulelah Darandary Anabel Gonzalez, 2020. *Diversification and the world trading system.* s.l.:s.n.

V Slapničar, I Adum, 2017. *The new paradigm of maritime contract.* s.l.:s.n.

VT Covello, MW Merkhoher , 1993. *Risk assessment methods: approaches for assessing health and environmental risks.* s.l.:s.n.

W Drobetz, D Schilling, L Tegtmeier, 2010. *Common risk factors in the returns of shipping stocks.* s.l.:s.n.

W HU, H HU, 2007. *Risk Management of Shipping Firms on the Basis of Value Chain.* s.l.:s.n.

W Shi, Y Xiao, Z Chen, H McLaughlin, 2018. *Evolution of green shipping research: themes and methods.* s.l.:s.n.

wikipedia., 2021. *https://en.wikipedia.org/wiki/International_Ship_and_Port_Facility_Security_Code*, s.l.: s.n.

World of The Ocean, 2010. *Living with the oceans. A report on the state of the world's oceans.* s.l.:s.n.

X Bai, JSL Lam, 2021. *Freight rate co-movement and risk spillovers in the product tanker shipping market: A copula analysis.* s.l.:s.n.

X Mao, S Yu, 2012. *The shipbroker's evaluation behavior study about the financing of the small and medium shipping enterprises.* s.l.:s.n.

X Zhang, B Podobnik, DY Kenett, HE Stanley, 2014. *Systemic risk and causality dynamics of the world international shipping market.* s.l.:s.n.

Y Cao, Z Jiang, S Ye, W Wu, S Liang, 2019. *Spatial pattern and heterogeneity of port & shipping service enterprises in the Yangtze River delta.* s.l.:s.n.

YHV Lun, MA Quaddus, 2009. *An empirical model of the bulk shipping market.* s.l.:s.n.

YY Haimes, 2009. *On the complex definition of risk: A systems-based approach.* s.l.:s.n.

Z Zhang, X Chu, 2011. *Risk prioritization in failure mode and effects analysis under uncertainty.* s.l.:s.n.