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ECONOMIC COMPONENT EFFECTIVENESS OF CHARTERING AND IMPACT OF UNCERTAINTY ON COMMERCIAL&OPERATIONAL EXPLOITATION OF VESSELS UNDER MODERN CONDITIONS

SCIENTIFIC RESEARCH GROUP:

Serhii Kramskyi

PhD in Engineering, associate professor,
associate professor of the Department of Public Management and
Administration

Odesa National University named after I. I. Mechnikova, Ukraine

Researcher fellow of Transport Services Market Department

*SO "Institute of Market and Economic and Environmental Research of the
National Academy of Sciences of Ukraine", Ukraine*

Oleksandr Darushin

PhD in Economics, Doctoral student,
Institute of Economics, Management&Business
Odessa National Technological University, Ukraine

Oleg Zakharchenko

Doctor of Economic Sciences, Professor,
Professor of the Department of Marketing, Finance, Banking and Insurance
East European University named after Rauf Ablyazov, Ukraine

Oleksandr Manita

Teacher of the cycle commission
economics of entrepreneurship and organization of production
East European University named after Rauf Ablyazov, Ukraine

Summary. Today, Russia's military aggression against Ukraine, namely, the military influence of martial law on the vulnerable segments of maritime transport and infrastructure of Ukraine, still create uncertainty in terms of the global economic and political security of the world. One of the key sources of uncertainty in the commercial operation of vessels is the level of freight rates. It is worth noting that most foreign authors consider the issue of uncertainty and risk in the commercial operation of vessels precisely in the context of fluctuations in freight rates. One of the main sources of uncertainty in the commercial operation of vessels is the level of freight rates. It is worth noting that most foreign authors consider the issue of uncertainty and risk in the commercial operation



of vessels precisely in the context of fluctuations in freight rates. The "market" aspect of uncertainty (conjuncture of the freight market) also dominates domestic research in this area. In particular, it is about market risk in shipping and its consideration in the decision-making process regarding the commercial operation of vessels and investment activities of shipping companies. It is natural that the production process of marine and river vessels is carried out under the influence of the external environment, as well as the management process.

Thus, the assessment of market risk (based on the dynamics of freight rates) in order to take it into account in the decision-making process regarding the commercial operation of vessels and investment activities of shipping companies formed a separate economic task. However, the very production (operational) activity in the shipping industry is also associated with specific categories of risks caused by the uncertainty of various factors that are practically not taken into account. The authors of the study focus on the operational and technical phase of trade vessel operations.

Key words: maritime business, vessel, economic conditions, uncertainty, risks, shipping company, freighting.

Introduction. In addition to military challenges and risks in the field of security of free navigation on sea and river routes. In particular, it is about market risk in shipping and its consideration in the decision-making process regarding the commercial operation of ships and investment activities of shipping companies. As mentioned above, one of the main factors of uncertainty that determines the risk of shipping as a specific product is natural and climatic conditions. The research presents the results of the current state, trends and problems related to the growth of the share of international and domestic trade volumes, which is accounted for by maritime transportation. Special attention is paid to conceptual approaches to the study of the economic, natural and resource potential of the marine environment and the prospects of modernization of man-made and military risk factors on the surrounding marine business environment [2]. As a complex technical system, ships must meet certain requirements for safety, reliability and other seaworthy qualities in a variety of possible natural and climatic conditions, which are provided by design and technical solutions. Therefore, vessel operation planning within the framework of fleet (vessel) operation management must take into account the possibility of deviations from predicted conditions. At this level, researchers focus on the technical and economic operation of vessels.

Analysis of previous studies and statement of the problem. Vessels as investment projects are considered from the point of view of project management methods. Studies of the risks associated with investment projects in shipping are presented in the publications of O. Pavlenko [1] and T. Boldyreva [2]. The "market" aspect of uncertainty (conjuncture of the freight market) also dominates domestic research in this area. The minimization of risks from the point of view of shipping safety determines another direction in the scientific work of H. Egorov [3], the main task of which is to improve the design solutions of ships to ensure shipping safety, taking into account the possibilities of modern technical solutions O. Hutsaliuk [8]. The design of ships under conditions of uncertainty is also considered in works [4-7].

Optimization of the fleet structure under conditions of uncertainty is considered in [11]. The uncertainty of the operating conditions of marine engines, which are part of the "ship" technical system, is taken into account to minimize the risk of their failure, which is described in the works of V. Yarovenko [10], and investigated in their works, as well as in other publications.

Research goal and objectives. Analysis and formalization of the impact of uncertainty within the framework of commercial terms of long-term freight contracts on the operation of merchant vessels, parameters of the operational process and their consideration for economically efficient operation of vessels in modern realities.

Main part. Vessels as objects of commercial operation also determine the appropriate level of consideration. In this context, the subject area is the management of the operation of ships not as technical or human-machine systems, but as objects that directly participate in transport production, providing transport services in the relevant conditions of uncertainty, associated not only with weather and climate conditions, but also with the specifics of transport and technical processes, as well as with the specifics of the commercial situation [1].

Thus, the assessment of market risk (based on the dynamics of freight rates) in order to take it into account in the decision-making process regarding the commercial operation of ships and investment activities of shipping companies formed a separate economic task. However, the very production (operational) activity in the shipping industry is also associated with specific categories of risks caused by the uncertainty of various factors that are practically not taken into account [4]. Studies of classification societies on uncertainty and risks in shipping are presented in [5]. The multidimensional nature of uncertainty, and therefore of the risks associated with maritime transportation, determines their research at different subject and object levels (Fig. 1.).

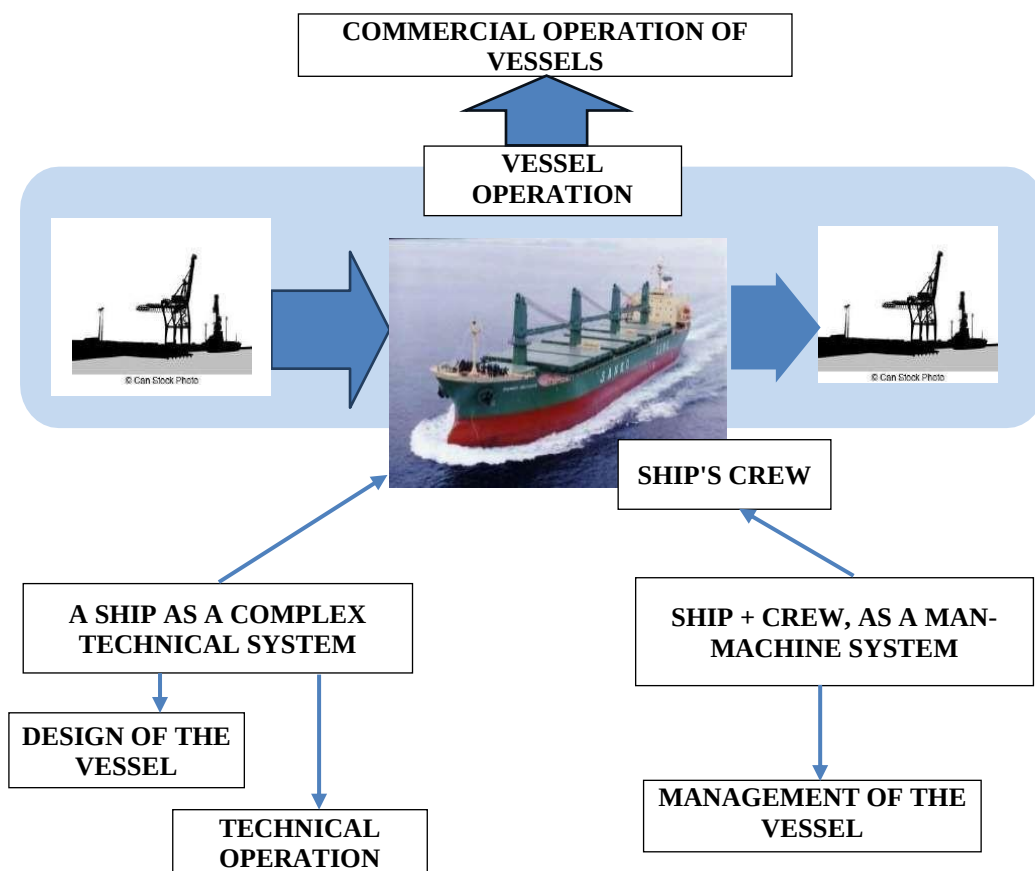


Fig. 1. Objects of research determined by different levels of consideration trade vessel
data generated from [16]

Also presented in publications [4]. Vessels together with the crew form a "man-machine system", but the subject of research is the management of ships as technical systems, and one of the central problems is ensuring the reliability of this system, especially in different operating conditions, for example, due to natural and climatic conditions. At the same time, the operation of individual mechanisms and equipment, as well as the human factor, are taken into account in the complex. Thus, at this level, an "ergonomic system" is formed, which functions in conditions of uncertainty [6].

It should be noted that in shipping, commercial and production risks are very closely related. As mentioned above, the commercial activity (chartering) precedes the production activity, since the chartering contract is concluded first (i.e. the sale of goods for transportation), and the production takes place after that (the transportation process). Uncertainties and risks related to the production activity (operation) of vessels are mentioned only in fragments.

Therefore, consideration of the influence of risk factors on the results of production activity (ship operation) of the vessel is differentiated and depends on the level of consideration of the issue - within the annual period or within a specific voyage [3]. In shipping practice, voyage charter contracts usually include special conditions for compensating the shipowner for costs associated with the ship being forced to stay in port, but such situations are only part of the possible cases that may arise. Given in fig. 2.

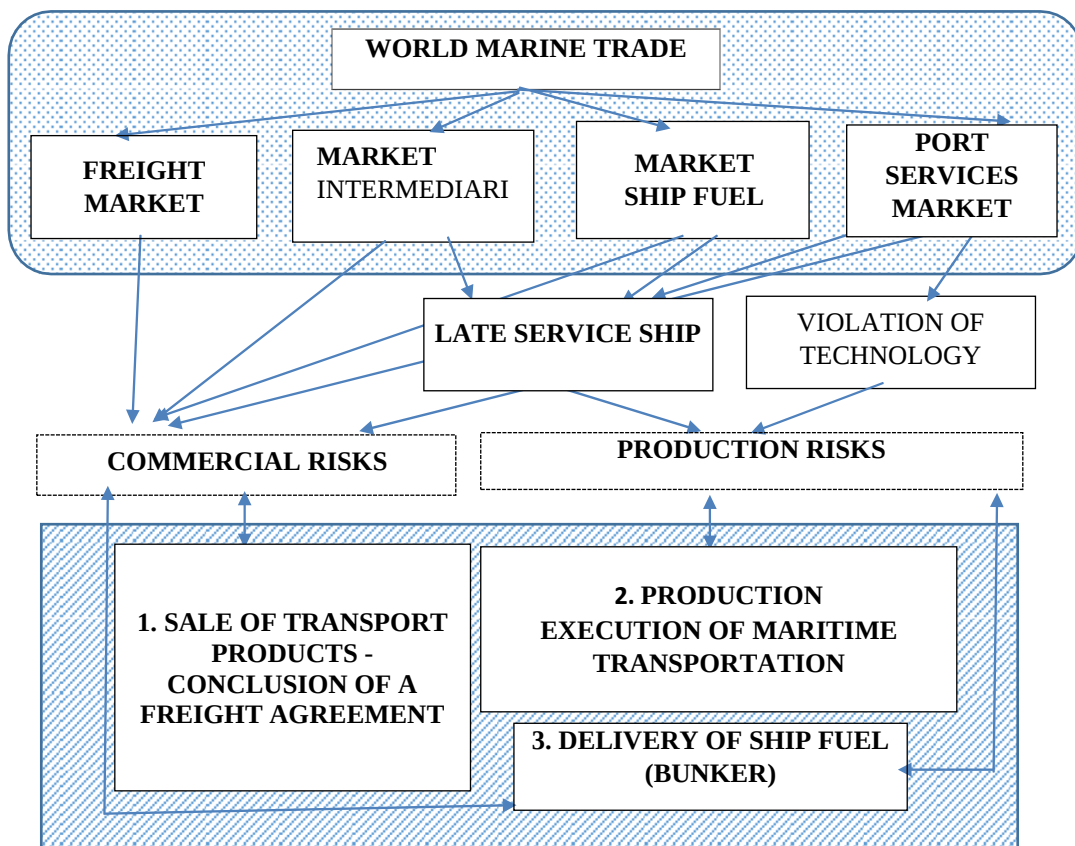


Fig. 2. Specifics of the relationship between production and commercial operations in shipping
 data generated from [16]

Any contract of carriage, be it a voyage charter, a non-stop sailing contract or a general contract, contains elements of uncertainty that lead to the occurrence of the risky situations described above. Accordingly [9], it can be said that in sea transportation, commercial risks are formed when concluding a transportation (transport service) contract and are manifested at the stage of transportation (transport service), i.e., in the production process. The scheme (Fig. 2) illustrates the relationship of the same factors with both commercial and production risks.

For example, if the maintenance of the vessel in the port is poor and untimely, this can lead to an increase in the vessel's parking time. On the basis of a complex study, conceptual provisions regarding the consistent formation of freight strategies for the effective operation of shipping companies in conditions of uncertainty are proposed, which include an algorithm structured on the management decisions of the division into elements of the external and internal influence of uncertainty. Considerable attention is paid to the justification of the decomposition of the potential capabilities of the transport fleet by distinguishing precautionary measures against uncertainty in the field of vessel chartering by their types [11].

In Ukraine, there is also a network of ferry connections, sea container lines connecting Ukraine with the ports of the Black Sea basin countries and is a component of international transport corridors: Traceca, "New silk road", Pan European No. 9 and others. Considering the state of the port industry of Ukraine in pre-war times, it is necessary to analyze the main indicators of its activity. The analysis of cargo processing dynamics of maritime ports of Ukraine for 2018-2022 is presented in table 1.

Table 1

Volumes of cargo processing by sea ports of Ukraine, (2018-2022)

<i>Cargo processing, thousand tons</i>	2018	2019	2020	2021	2022	<i>Growth rate 2022/2018, %</i>
Total cargo processed, in including	144687,99	131746,91	132579,44	135172,07	160003,22	110,58
Export	103983,45	100202,47	98517,44	99034,65	120988,55	116,36
Imports	17958,76	15976,46	20417,97	23783,77	25849,89	143,95
Transit	15904,24	10328,85	11804,97	10221,38	11024,55	69,33
Internal combination	6840,57	5238,16	1838,08	2131,29	2138,27	31,27

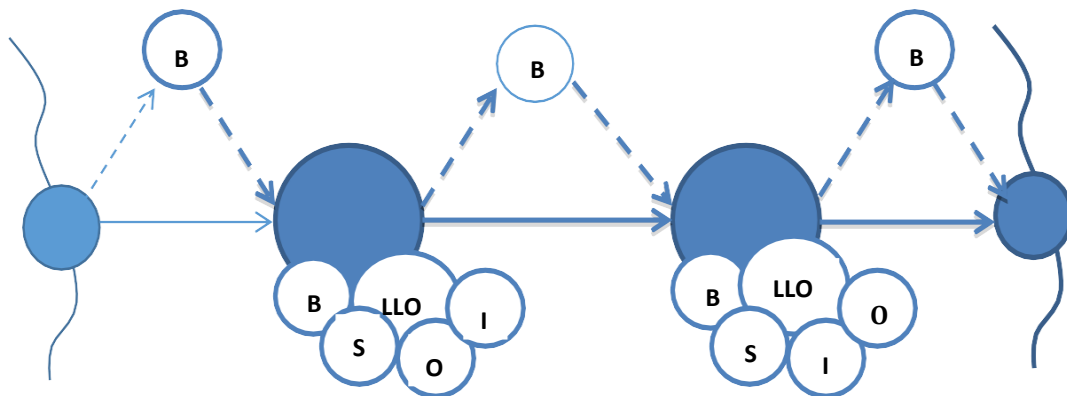
data generated from [16]

Investment financing of maritime ports is carried out to a greater extent at the expense of own funds and is distributed according to the following directions - dredging, mooring infrastructure, land infrastructure, specialized fleet [12].

In this case, there is a production risk. (If such a situation is not provided for by the sea transportation (transport service) contract, then it is already a commercial risk, since the costs of the shipowner due to the increase in parking time are not covered in any way. Secondly, the supply of ship fuel (bunkering). Bunkering is a



"supply" in the shipping industry [13]. Fluctuations in bunker prices create commercial risks and disruptions in bunkering (as a technical process) create production risks, is presented in Fig. 3.



When, B – bunker; LLO - loading and unloading operations; S - supply of the ship (water, food); I - inspection of the vessel; O – others.

Fig. 3. The composition of operations of the technological process of the vessel's operation
[author's development]

Taking into account the specifics of this study, the composition of tasks and their main sequence of technical processes of ship operation during the voyage (as a collective unit of production processes) can be presented as follows (Fig. 3.). There are many similar examples. Therefore, it can be concluded that the peculiarities of commercial and industrial operations in shipping create a significant relationship between industrial and commercial risks [14].

Therefore, these risks should be considered comprehensively when managing vessel operations. Therefore, even at the level of consideration of individual voyages, people who make decisions within the operational management of the vessel (fleet) must take into account possible deviations of various parameters characterizing the process of sea transportation and their impact on the efficiency of the vessel. This approach to accounting will make it possible to make more informed decisions and increase the efficiency of the shipping company as a whole [15].

Summarizing the existing approaches, it was established that the "risk situation" is a special form of "uncertainty", that is, it is one of the options for the possession of the subject of information management when making decisions about the managed object [18]. At the same time, "risk" means the possibility of deviation of the state of the object of management from the planned as a result of the implementation of management influences. Such a deviation is associated with the lack of complete and reliable information about the management object and the external environment at the decision-making stage [19].

Note that this fig. 4, shows fragments of ship operations. The shows, in particular, possible options for bunkering ships (loading ports, unloading ports and routes). From the point of view of management theory, the production activity of the ship is "subject to management", which, in turn, is subject to the management system of the shipping company. In a certain sense, technical management and crew management are processes that provide support within the framework of vessel

operation management, since their main goal is to create the conditions necessary for the effective commercial operation of the vessel [20].

At the same time, the external environment includes everything: from the market and political situation at the global level, to the weather and climate conditions of a specific region, to the features and customs of a specific port. In particular, loading and unloading operations are carried out by stevedore companies, which face the following problems when organizing the process of loading and unloading trade vessels [22].

However, all these processes are sub-processes of "ship operation management", and only their inseparable unity guarantees the functioning of the management object (Fig. 4.).

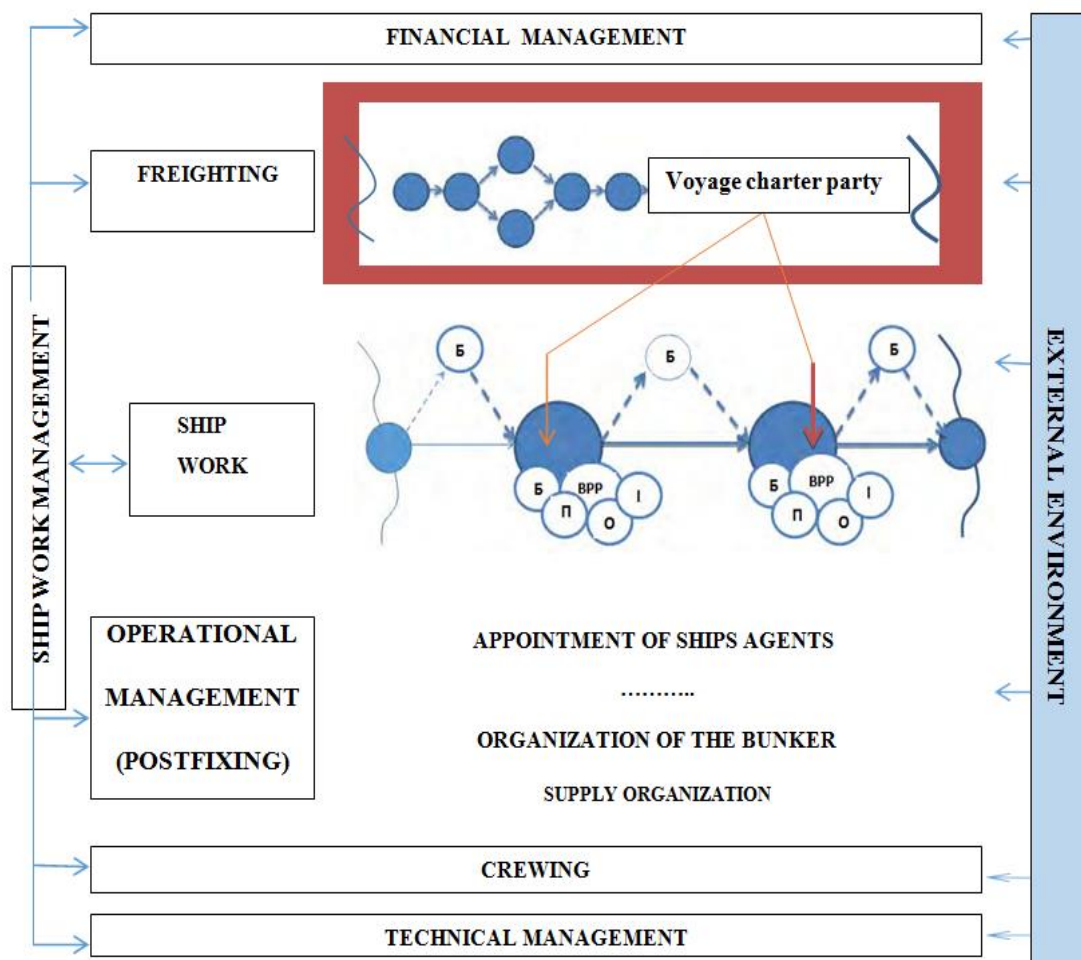


Fig. 4. Unity of technological processes in managing the operation of the fleet (vessels) under the conditions of a voyage charter

[author's development]

Each process highlighted in the framework of "ship operation management" can be represented in the form of a corresponding technical process, which is schematically illustrated by the example of "chartering" (chartering of a ship for a voyage). For example, let's formulate a number of consecutive tasks within the framework of the technical process "Chartering" (chartering a vessel for each voyage) (according to [14, 17]).



- 1) "receive instructions from the ship owner and request to find a suitable offer";
- 2) "transfer of the shipowner's request to freight brokers and other interested parties";
- 3) receiving information on request, including "counteroffers";
- 4) "negotiations with the shipowner regarding the agreement of the charter terms";
- 5) "negotiations with potential charterers on the agreement of freighting conditions" and etc. [17].

In particular, the result of this process is the conclusion of a voyage charter contract, the terms of which form the limiting system of the production process on this specific voyage. After concluding the voyage charter contract, an agent is appointed as part of operational management, bunkering, delivery, etc., are organized on the vessels. Taking into account possible deviations of the parameters of the vessels' operation under the conditions of the voyage charter within the framework of the annual period of time on the basis of the corresponding modification of the time-charter equivalent, which ensures compliance of the evaluation of the efficiency of the vessels' operation with real processes due to the systematic consideration of the possible negative impact of the conditions of the vessels' operation [21].

Shipowners, through their business development strategies, are bound by long-term freight contracts that take into account the interval uncertainty of the parameters of the transport process and the possibility of simultaneous operation of vessels on the open freight market. This approach most fully reflects the real production and commercial conditions of operation of vessels under long-term freight contracts and ensures increased efficiency of management processes.

Conclusions. In the study, the authors carried out a specific analysis of the production and commercial activity of shipping companies, which made it possible to establish that commercial risks are formed during the conclusion of a transportation (transport service) contract and are manifested at the stage of transportation (transport service), that is, in the production process.

As mentioned in the study by the authors earlier, weather conditions are also an important factor that can negatively affect the course of production processes in maritime transport, both during the voyages of vessel and during their parking in ports. During the year, all identified factors of uncertainty and risk are comprehensively considered, and certain factors of ship chartering are prioritized at the level of ship voyages in order to obtain profits by shipowners.

An marine agency company (representing the interests of shipowners in the port) and a transport and forwarding company (representing the interests of cargo owners) participate in loading and unloading operations. Due to the specificity of commercial and production operations in the shipping industry, production and commercial risks are closely interrelated. Therefore, these risks should be considered comprehensively when managing ship operations.

Decentralized shipping companies – implementation of blockchain technologies to create decentralized organizations where decisions are made collectively and transparently, without centralized management. Artificial intelligence

in decision-making - using AI for analysis of large volumes of data and strategic decision-making, which will increase management efficiency and reduce risks.

Thus, by breaking down the production activities of ships and the management systems of shipping companies, it is possible to distinguish various factors that affect the operational efficiency of the ships of their owners:

- conditions of the marine environment;
- professionalism and work of the ship's crew;
- the technical and economic condition of the fleet of ships;
- professionalism and efficiency of the chartering management system;
- the equivalent expected freight rate in case of uncertain conditions at the ports of loading of ships;
- professionalism and work of participants in the business process of transportation and processing, cargo handling by ships in ports of shipment and destination of cargo. Further vectors of research exploration may be related to the consideration and study of the comprehensive diversification of cargo transportation by ships and the universality of the classification of maritime and river vessels.

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ЕКОНОМІЧНА СКЛАДОВА ЕФЕКТИВНОСТІ ФРАХТУВАННЯ І ВПЛИВ НЕВИЗНАЧЕНОСТІ НА КОМЕРЦІЙНО-ОПЕРАЦІЙНУ ЕКСПЛУАТАЦІЮ СУДЕН В СУЧАСНИХ УМОВАХ

Крамський Сергій Олександрович

кандидат технічних наук, доцент

доцент кафедри публічного управління та адміністрування

Одеський національний університет ім. І.І. Мечникова, Україна

науковий співробітник відділу ринку транспортних послуг
ДУ «Інститут ринку та економіко-екологічних досліджень НАНУ», Україна

Дарушин Олександр Володимирович

кандидат економічних наук, докторант,
інституту економіки, управління та бізнесу
Одеський національний технологічний університет, Україна

Захарченко Олег Володимирович

доктор економічних наук, професор,
професор кафедри маркетингу, фінансів, банківської справи та страхування
Східноєвропейський університет ім. Рауфа Аблязова, Україна

Маніта Олександр Олександрович

Викладач циклової комісії
економіки підприємництва та організації виробництва
Східноєвропейський університет ім. Рауфа Аблязова, Україна

Аннотація. На сьогодні військова агресія росії проти України, а саме, військовий вплив військового стану на вразливі сегменти морського транспорту та інфраструктури України, досі створюють невизначеність з глобальної економічної, політичної безпеки світу. Одним з ключових джерел невизначеності в комерційній експлуатації суден є рівень фрахтових ставок. Варто зазначити, що більшість зарубіжних авторів розглядають питання невизначеності та ризику в комерційній експлуатації суден саме в контексті коливання фрахтових ставок. Одним з основних джерел невизначеності в комерційній експлуатації суден є рівень фрахтових ставок. Варто зазначити, що більшість зарубіжних авторів розглядають питання невизначеності та ризику в комерційній експлуатації суден саме в контексті коливання фрахтових ставок. У вітчизняних дослідженнях у цій сфері також домінує «ринковий» аспект невизначеності (кон'юнктура фрахтового ринку). Зокрема, йдеться про ринковий ризик у судноплаванні та його урахування в процесі прийняття рішень щодо комерційної експлуатації суден та інвестиційної діяльності судноплавних компаній. Природно, що виробничий процес морського і річкового судна здійснюється під впливом зовнішнього середовища, як і процес управління.

Таким чином, оцінка ринкового ризику (на основі динаміки фрахтових ставок) з метою його врахування в процесі прийняття рішень щодо комерційної експлуатації суден та інвестиційної діяльності судноплавних компаній сформуло окреме економічне завдання. Однак сама виробнича (операційна) діяльність у судноплавній галузі також пов'язана зі специфічними категоріями ризиків, зумовлених невизначеністю різних факторів, які практично не враховуються. На операційно-технічній фазі експлуатації торгових суден, автори дослідження саме зосереджуються.

Ключові слова: морський бізнес, судно, економічні умови, невизначеність, ризики, судноплавна компанія, фрахтування.