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ANALYSIS OF THE ECONOMIC DYNAMICS OF THE FUNCTIONING OF SHIPPING AND MARITIME TRANSPORT CHARTERING IN UKRAINE

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Summary. *Today, the war between Russia and Ukraine has been going on for the third year, which has a rather negative impact on the country's maritime industry, as well as maritime logistics shipping routes. It is a well-known fact that shipping is an industry that is associated with dangers and risks for human resources, this is due, first of all, to the presence of an aggressive component of the business environment during the operation of vessels and the dangers of navigation as such. This is one of the peculiar properties of production processes associated with maritime transportation, and distinguishes them from other types of transport. Therefore, speaking of risks in shipping, the first association is the danger of sea and ocean transportation. This aspect of shipping is given considerable attention at the institutional world level. Over the past decades, the structure of world trade at sea has led to an increase in the share of exports and imports of traditional cargoes for the merchant fleet - grain, ore, coal. In turn, it leads to the need to change the structure of the merchant fleet of shipping companies and replenish them with ships. The influence of natural conditions is also manifested in the high level of complexity of clearly defining and ensuring time parameters during the operation of ships of shipping companies, as this is necessary in the context of economic globalization. The formation of national logistics systems, the existence of which, in many countries and cases, is impossible without maritime transport, even during the uncertainty of stable economic processes, and the influence of active hostilities.*

Key words: *shipping, strategies, freight rates, shipping companies, economics of maritime transport, uncertainty.*



Introduction. The main determining factor of maritime trade in goods, and therefore of the demand for shipping, is the world economy. Russian military aggression in Ukraine, challenging both domestic and global maritime security, accumulates new challenges for shipping companies. The logistics routes for delivering products have changed significantly, both for the domestic and foreign transport market, sales costs have increased while sales volumes have decreased, and the cost of products has increased. Therefore, the question arises of finding further vectors for the development of shipping. In a war period, the localization of market reproduction processes is a prerequisite for the stable functioning of transport markets. As a result of the destruction of a number of enterprises in the transport sector, the termination of logistics supply routes, one of the primary tasks of management is the adjustment of new traffic. The fierce competition for dominance in the global transport services market encourages the leaders of the maritime industry to widely implement economic strategies in their activities and invest in the development of high technologies that strengthen competitive advantages through efficiency, speed, safety and environmental friendliness of shipping. The overall impact of economic variables leads to an increase in demand for maritime transport in Ukraine. The problem of uncertainty in managerial decision-making is devoted to a number of modern publications, the analysis of which allows us to conclude that the opinions of specialists are divided and reflect two positions. According to the first, three situations are distinguished - certainty, risk, uncertainty.

Analysis of previous studies and statement of the problem. This article is a series of studies in the field of ship chartering under conditions of uncertainty. Despite the significant number of works and the relevance of this issue in scientific research, developments for water transport enterprises, namely shipping companies. In [4] the authors believe that: "The sources of uncertainty in economic systems are: the lack of sufficient information about economic processes and the conditions of their occurrence, accidental or intentional opposition from other economic entities, the action of random factors that cannot be predicted due to the unexpectedness of their occurrence." Pavlenko O., Guo X., Hunsaliuk O., Laiko, O. [1:5-7] and other authors. Solving the existing complex problems of the development of maritime transport, in particular, shipping enterprises, is possible only by implementing a comprehensive mechanism for chartering ships on international exchanges, which is an effective organizational and economic approach to the development of maritime transport in Ukraine in the post-war period.

Research goal and objectives. Analysis the current state of chartering and the level of strategic development of leading shipping companies in the world and Ukraine in conditions of uncertainty.

Main part. Military conflicts around the world and economic shocks are negatively affecting the international maritime industry and shipping market in particular. Considering the international aspects of maritime chartering practices, it can be stated that if a shipper waits until the last moment to book a slot, he may be offered a freight rate equal to the marginal cost of transporting one container, in order not to leave the slot empty. This approach, which assumes only marginal costs,

can ultimately reduce the overall structure of ship chartering for a particular maritime route [2].

All these factors create high volatility in operators' income. To reflect their success, liner shipping operators have also started vertical integration to provide these services. Large operators such as (MAERSK LINE, MSC, COSCO, EVERGREEN, HYUNDAI) have joined terminal management to reduce port handling costs and increase vessel productivity, thereby reducing costs. For the sake of financial survival, operators who previously competed for market share in the transport market enter into slot sharing agreements.

Under such an agreement, an operator allows another operator to use a free rate slot on its vessel in exchange for the right to use a similar number of slots on another operator's vessel. There are also slot or space agreements, which are common in the liner and specialty trades. For a shipowner, this can be insurance against a decline in spot markets or when they have cargo contracts that they cannot fulfil with their existing fleet of vessels. For example, the parties may adhere to profit-sharing instruments regarding the freight structure [7].

The real equity market is relatively small, probably not attractive enough for the large players in the wholesale or liner trades, with a few exceptions. In addition, as in any other market, there are market speculators who charter a vessel only to sub-charter it to third parties at a higher rate. It is practically impossible to give examples of other areas of activity, including other types of transport, where price changes would be as volatile as in the freight market [3].

Finally, there are “non-shipowner transport service providers” – better known as freight forwarders – who provide services for the transport of goods without being a party to the ownership of the goods or the vessel. Charter agreements are agreements for the carriage of cargo by ship or for the hiring of ships for the carriage of cargo. All arrangements in the ship charter sub-sectors are made on a time charter basis. In the case of charters for drilling rigs and vessel maintenance fleets, the period may last for the entire project.

However, in the case of heavy cargo and livestock, a voyage charter may be required. As mentioned earlier, the demand for shipping is a derivative of the demand for ship chartering. Freight is paid per tonne of cargo carried on board the ship. Undoubtedly, the main driver of this demand is maritime safety and trade in goods. Subject to the terms of the tax allocation to the previously agreed fixed rental rate, the shipowner is entitled to a floating rate profit [4].

Today, ship freight rates look quite high compared to pre-war levels. Mainly due to the sharp increase in fuel prices, the cost of which in Istanbul until February 24 was about 650-750 USD/t, and today is 900-1050 USD/t. Conversely, even in favorable conditions, some shipping companies may not be provided with the necessary cargo base to cover all costs of achieving the main objectives of vessel operation. It is practically impossible to give examples of other areas of activity, including other types of transport, where price changes would be as volatile as in the freight market.

The production cycle of a seagoing vessel is a voyage, which consists of stationary and moving operations. Time losses on each of the components of a



voyage can lead not only to a decrease in the efficiency of a separate voyage, but also, in aggregate, over the planning period (usually a year) to a decrease in carrying capacity.

There are several reasons for this. First: cargo flows traditionally served by sea vessels, even with stability, are the object of fierce competition. Therefore, the management of shipping companies needs a high level of professionalism and reliable connections with brokers, forwarders and cargo owners to provide the fleet with a cargo base. Another aspect of “uncertainty” and “risks” in shipping is manifested in the variability and, in many cases, unpredictability of the freight market, that is, the market in which maritime transportation services are sold and purchased or, in the case of the time charter section, the services of using ships (ship rental) for a specified period of time.

That is, shipping is characterized by a high level of market risks [1], which are determined by the significant variability of the freight market (Fig. 1.) and the difficulty of predicting the dynamics of its situation.

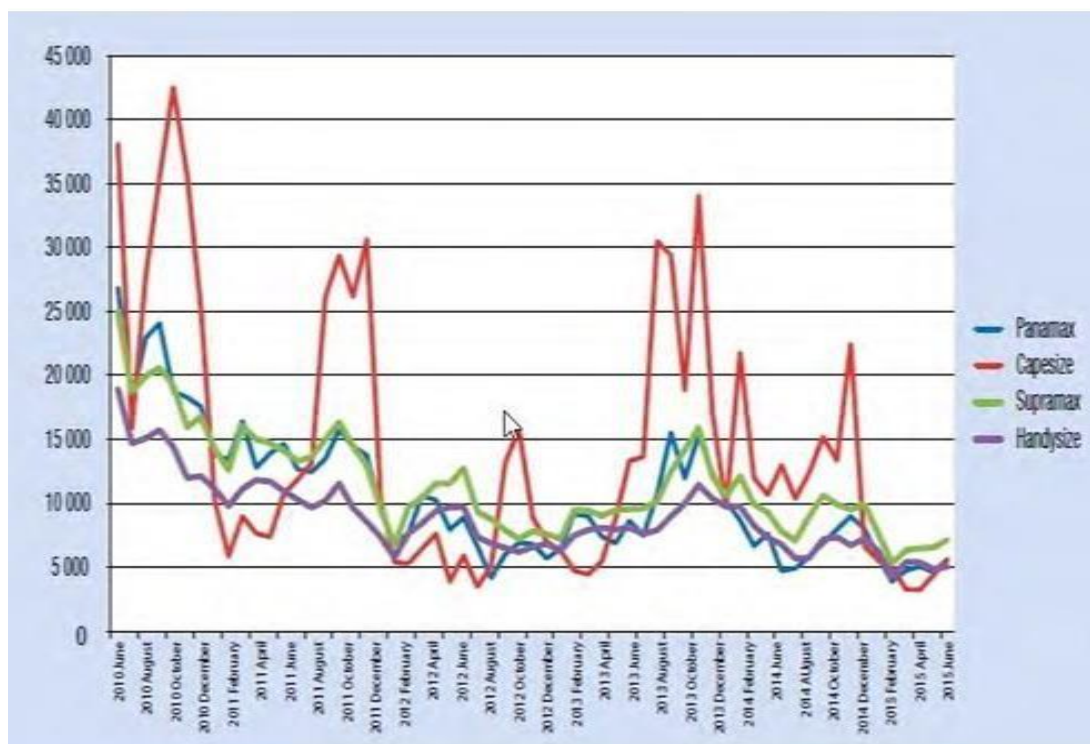


Fig. 1. **Change in time charter rates for the ship freight market**
data generated from [9]

During the war period, the prerequisite for the stable functioning of the transport market of Ukraine is the localization of market processes for the restoration of the transport sector. As a result of the destruction of a number of transport sector enterprises and the termination of logistics supply routes, one of the priority tasks is the development and implementation of organizational and economic mechanisms and measures for the formation of freight strategies by shipowners [5].

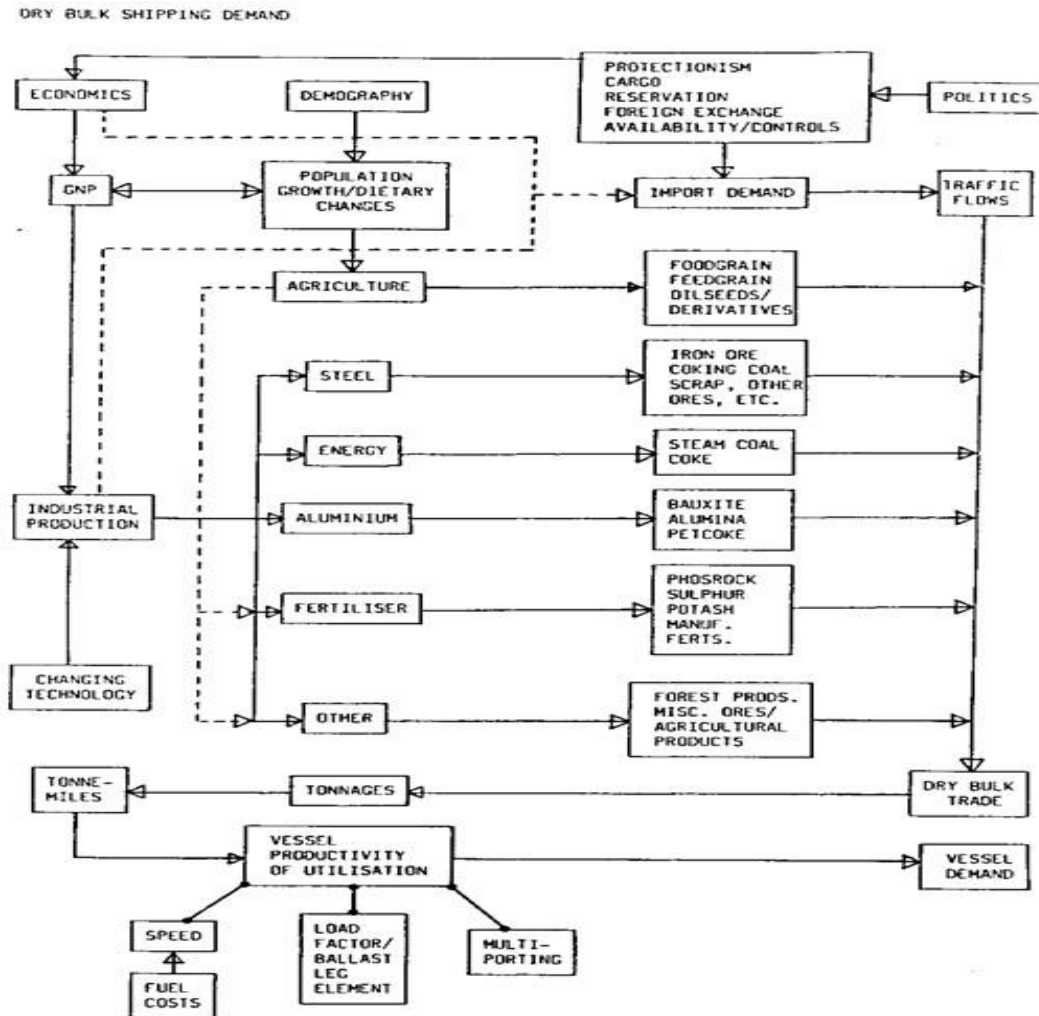


Fig. 2. Flowchart of the functioning of trading market segments and the shipping system
data generated from [9]

The main concepts of the general strategies are: updating the rolling stock of sea and river transport and fixed assets of water transport infrastructure enterprises of Ukraine; formation of production and transport clusters consisting of: transport engineering enterprises, carriers by external sea and inland water ports, sea and river ports, digitization and electronic document flow in the implementation of cargo transportation by water transport of Ukraine; reorientation of cargo transportation to sea and inland water transport, including by creating "dry ports", increasing the level of shipping safety, including by integrating into the European system of exchange of information on vessel traffic; development of the national segment of the European maritime navigation monitoring tool [8].

The main types of fleet renewal projects have been identified, which correspond to the following options: shipbuilding, ship acquisition, leasing (bareboat charter), short- and medium-term ship rental (time charter).

1) The basic types of dependences of income and elements of expenses for a vessel (freight rate, fuel consumption, port dues) in a voyage on the carrying capacity and distance of transportation were established [10].

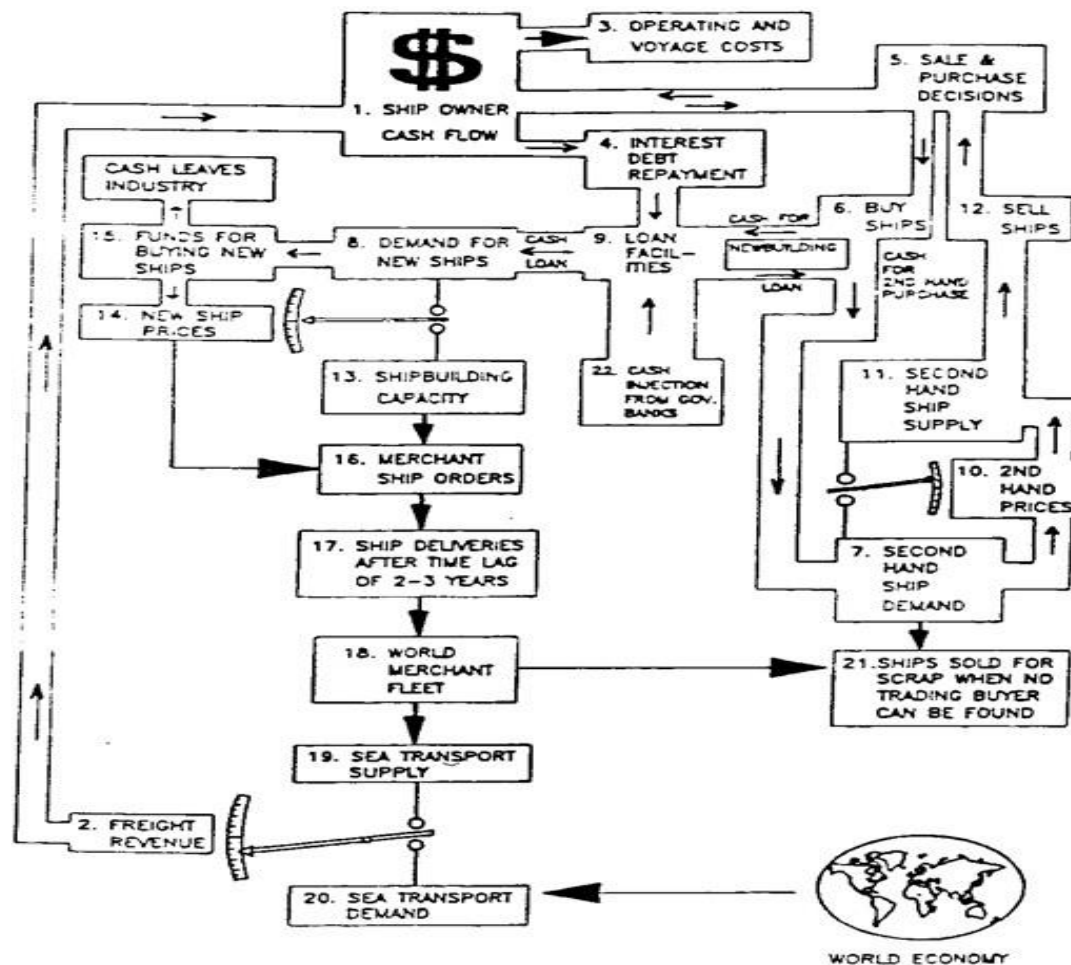


Fig. 3. Scheme of management of vessels under charter by operator companies
data generated from [9]

Specific types of dependencies for vessels with a carrying capacity.

2) The obtained regularities allowed us to formulate an expression for the deviation of the efficiency indicator of the vessel's voyage performance as a function of the characteristics of the vessel and the voyage.

3) Conclusions were drawn about the influence of the vessel size and transportation distance on possible deviations of voyage efficiency, in particular, it was established that with an increase in the duration of the voyage, the possible decrease in the time charter equivalent becomes less significant than at shorter distances [11]. It was also determined that the level of the freight rate has a significant impact, along with the standard deviation of the voyage time - even its slight increase entails a considerable difference in the "loss" of efficiency [12].

In turn, this may lead to a greater potential risk of loss of profit from the operation of vessels, as the carrying capacity of the vessel is a source of income for the shipping company. But not only the reduction in the carrying capacity of a vessel due to various circumstances is a source of potential threats to the planned efficiency. As noted above, the dynamics of the market situation (freight, marine fuel, port services, intermediary services in the field of maritime transport) also contributes to possible economic losses - from a decrease in freight rates to an increase in the cost of a vessel's call at the port [13].

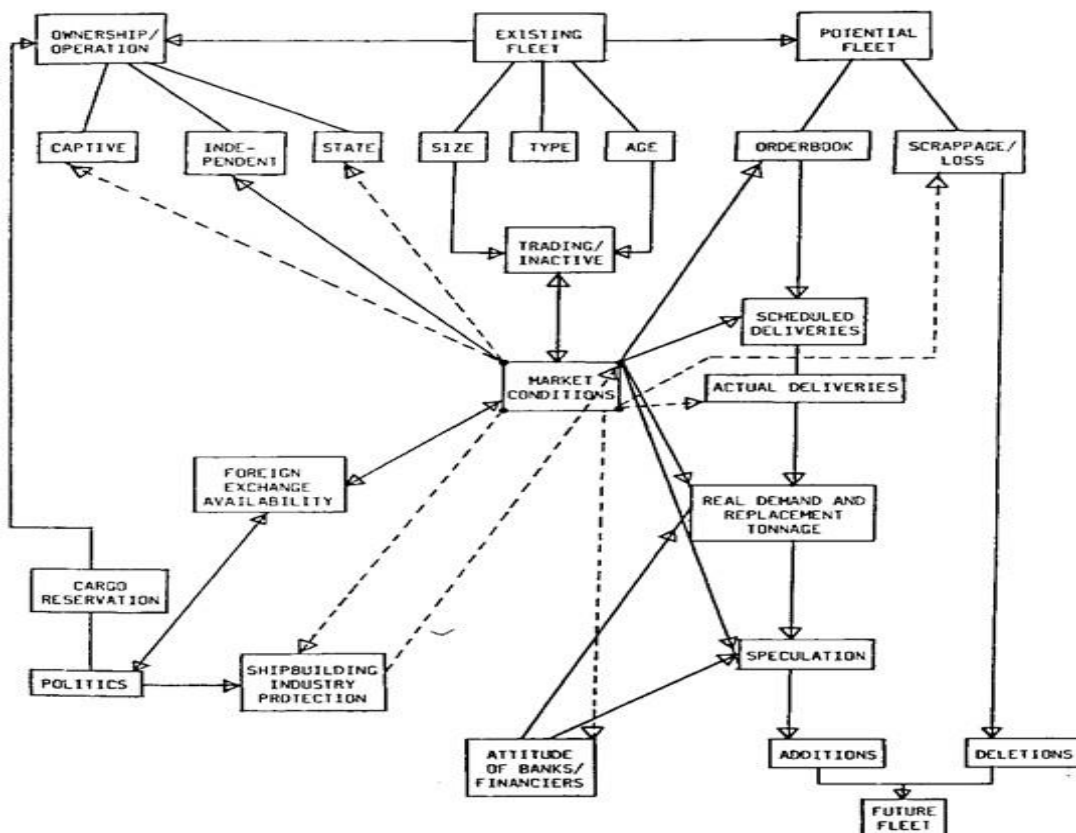


Fig. 4. Scheme of functioning of freight operations in maritime transport in Ukraine
data generated from [9]

Schematic justification of "risk situations" in the management of vessel operations within the framework of a voyage and an annual period of time, and the ranges of possible knowledge of the main parameters of vessel operations (time and cost), which justifies the legitimacy of considering vessel operation management under risk conditions as a special form of uncertainty [14]. Thus, in accordance with the practice of the maritime transport industry, this, in turn, necessitates the need to take into account risk situations when making decisions on managing the operation of the vessel using appropriate economic and management tools [15].

Variable: Var1, Distribution: Normal (Spreadsheet1_(Recovered)) Chi-Square = 3,07702, df = 1 (adjusted) , p = 0,07941									
Upper Boundary	Observed Frequency	Cumulative Observed	Percent Observed	Cumul. % Observed	Expected Frequency	Cumulative Expected	Percent Expected	Cumul. % Expected	Observed-Expected
<= 3,20000	1	1	2,94118	2,9412	0,573618	0,57362	1,68711	1,6871	0,42638
3,30000	4	5	11,76471	14,7059	2,111835	2,68545	6,21128	7,8984	1,88817
3,40000	7	12	20,58824	35,2941	5,533454	8,21891	16,27486	24,1733	1,46655
3,50000	10	22	29,41176	64,7059	8,922954	17,14186	26,24398	50,4172	1,07705
3,60000	8	30	23,52941	88,2353	8,859557	26,00142	26,05752	76,4748	-0,85956
3,70000	4	34	11,76471	100,0000	5,416304	31,41772	15,93031	92,4051	-1,41630
3,80000	1	35	2,94118	102,9412	2,037795	33,45552	5,99352	98,3986	-1,03780
< Infinity	0	35	0,00000	102,9412	0,544483	34,00000	1,60142	100,0000	-0,54448

Fig. 6. Fragment of a statistical study of data on the sailing time of
10,000 MT vessels on the route from port O to port S.
development authors



A probabilistic approach to assessing deviations in vessel operation process parameters under the influence of uncertainty in operating conditions is described, and corresponding experimental studies are conducted, empirically confirming the validity of the proposed approach [16; 17].

Variable: Var4, Distribution: Normal (Spreadsheet1_(Recovered)) Chi-Square = 2,08529, df = 1 (adjusted) , p = 0,14872									
Upper Boundary	Observed Frequency	Cumulative Observed	Percent Observed	Cumul. % Observed	Expected Frequency	Cumulative Expected	Percent Expected	Cumul. % Expected	Observed-Expected
<= 3,20000	1	1	2,85714	2,8571	0,474254	0,47425	1,35501	1,3550	0,52575
3,30000	2	3	5,71429	8,5714	1,216574	1,69083	3,47592	4,8309	0,78343
3,40000	4	7	11,42857	20,0000	2,960027	4,65086	8,45722	13,2882	1,03997
3,50000	6	13	17,14286	37,1429	5,369086	10,01994	15,34025	28,6284	0,63091
3,60000	8	21	22,85714	60,0000	7,261209	17,28115	20,74631	49,3747	0,73879
3,70000	7	28	20,00000	80,0000	7,322353	24,60350	20,92101	70,2957	-0,32235
3,80000	4	32	11,42857	91,4286	5,505876	30,10938	15,73108	86,0268	-1,50588
3,90000	2	34	5,71429	97,1429	3,086801	33,19618	8,81943	94,8462	-1,08680
4,00000	1	35	2,85714	100,0000	1,290155	34,48633	3,68616	98,5324	-0,29016
< Infinity	0	35	0,00000	100,0000	0,513665	35,00000	1,46761	100,0000	-0,51367

Fig. 7. A fragment of a statistical study of the data on the parking time of the 10,000 MT vessels in the direction from the port O to port B.
development authors

Thus, based on the average deviations, possible deviations of time parameters characterizing the vessel's voyage performance under conditions of uncertainty and risks can be established.

Conclusions. The influence of the above factors on the time and cost parameters characterizing the operation of the vessel on the voyage has been established, and as a result, their influence on individual items of vessel costs. to ensure the efficiency of the vessel's voyage, taking into account the impact of risk factors on the maritime transportation process. In shipping practice, specific conditions are usually formulated in the maritime carriage contract that ensure that shipowners cover the costs associated with forced downtime of vessels in the port, however, such situations are only part of the possible cases.

The time charter equivalent is used both at the stage of preliminary consideration of the commercial conditions of the voyage and upon its execution. As noted above, the specifics of shipping are the influence of a significant number of factors on the production process (vessel operation) and on the results of the vessel's operation.

The expression of the daily profit of the vessel has been obtained, taking into account possible deviations of time and cost parameters. The principal types of dependence of income and elements of vessel costs (freight rate, fuel consumption, port dues) on the voyage on the carrying capacity and transportation distance have been established.

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АНАЛІЗ ЕКОНОМІЧНОЇ ДИНАМІКИ ФУНКЦІОНУВАННЯ СУДНОПЛАВСТВА ТА ФРАХТУВАННЯ МОРСЬКОГО ТРАНСПОРТУ В УКРАЇНІ

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Анотація. На сьогодні вже третій рік перманентно триває війна між росією та Україною, що досить негативно впливає на морську індустрію країни, та морські логістичні маршрути судноплавства. Загальновідомим є факт, що судноплавство галузь, яка сполучена з небезпеками і ризиками для людського ресурсу, це обумовлено, перш за все, наявністю агресивного компонента умов бізнес-середовища в процесі експлуатації суден і небезпек мореплавання як такого. Це є однією зі своєрідних властивостей виробничих процесів, пов'язаних з морським перевезенням, і відрізняє їх від інших видів транспорту. Тому, кажучи про ризики у судноплавстві, першою асоціацією є небезпека морських і річкових перевезень. Цьому аспекту судноплавства приділяється значна увага на інституційному світовому рівні. За останні десятиліття структура світової торгівлі на морі зумовлює зростання частки експорту-імпорту традиційних для торгового флоту вантажів - зерна, руди, вугілля, тощо. В свою чергу, призводить до необхідності змін структури торговельного флоту судноплавних компаній і поповнення їх суднами. Вплив природних умов проявляється також у високому рівні складності чіткого визначення та забезпечення часових параметрів при роботі суден судноплавних компаній, адже це необхідно в умовах глобалізації економіки. Формування національних логістичних систем, існування яких, у багатьох країнах і випадках, неможливе без морського транспорту, навіть під час невизначеності сталих економічних процесів, та впливу активних бойових дій.

Ключові слова: судноплавство, стратегії, фрахтові ставки, судноплавні компанії, економіка морського транспорту, невизначеність.