



Marine Hull Product Risk Assessment at a Reinsurance Company

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Abstract. Indonesia is an archipelago that stretches from Sabang to Merauke and consists of thousands of islands. To facilitate inter-island connections, the community needs means of transportation. One of them is sea transportation using ships, both passenger ships and cargo ships, which must consider safety and security. This includes insurable risks. Insurance companies can cover ship risks in two types of protection, namely marine cargo and marine hull. Marine cargo products provide protection against those to be shipped, while marine hull products provide protection for the ship itself. This study aims to identify the risks associated with receiving marine hull insurance, especially the material for making the hull and the size of the ship. These risks are part of internal operational risks. This research is a preliminary study of the application of risk management in a reinsurance company in Indonesia. The material discussed up to the creation of a risk map of the identified risks. The data used is the company's secondary data from 2017 to 2018. The method used is a quantitative method in determining the level of risk and a qualitative method in determining risk treatment. This study identified two risks, namely the presence of wooden frame ships and the large number of medium-sized ships. Both have a medium level of risk, but the company still must mitigate these two risks, either accepting the risk or sharing the risk by reinsuring it.

Keywords: insurance, marine hull, risks, ships,

1. Introduction

Indonesia is an archipelago that stretches from Sabang to Merauke and consists of thousands of islands. To facilitate inter-island connections, the community needs transportation facilities for both passengers and goods. One mode of transportation used is the ship. The use of this mode is getting more and more massively used. Report of the Ministry of Transportation in 2021 the number of sea vessels in Indonesia is 72,313 units in 2021. This figure has increased by 13.9% from the previous year of 63,490 units.

The large number of ships and the high frequency of trips causes ship owners and those who have interests in ships to be exposed to high risks, such as collisions with other ships or with ports, bad weather, fires, and drowning. If these risks cannot be handled

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D. V. Ferezagia et al. (eds.), *Proceedings of the International Conference on Vocational Education Applied Science and Technology (ICVEAST 2023)*, Advances in Social Science, Education and Humanities Research 783,

https://doi.org/10.2991/978-2-38476-132-6_28

by the ship owner himself, then insurance plays an important role in covering some or all these risks. The obligation of ship owners to ensure the hull of their ships has also been regulated by the Ministry of Energy and Mineral Resources. Based on Law Number 17 of 2008, concerning Shipping regarding the obligation of ship owners to ensure the ship, namely in article 203 and it is also regulated regarding the obligation of multimodal transportation service providers to insure their responsibilities in article 4. In addition, there is a rule that if you do not ensure your responsibilities (ship), then it can be imprisoned for a maximum of 6 months and a fine of up to IDR 100,000,000.

Products offered by insurance companies for ship owners are marine products. Marine insurance products are the oldest insurance products. In Meril (2022) it is explained that Marine insurance is one of the most important and oldest concepts of insuring the party from damage suffered by the loss or destruction of goods or the instrument of transportation. The contract of such insurance should comply with all the essentials of the standard contracts and should not be void contract.

In general, marine insurance is divided into 2, namely Marine Hull and Marine Cargo. Marine Cargo products are protection given to goods to be shipped, while Marine Hull products are protection provided by insurance companies against ship hulls in the event of damage.

The ISO 31000 standard (2018) defines risk as “the effect of uncertainty on objectives”. The risks that occur in the company's operations are also called operational risks. In general, the risks themselves come from external and internal companies. In some situations, these risks can result in the downfall of an organization. Risk management aims to manage these risks so that the most optimal results are obtained. Risk management is basically carried out through the processes of risk identification, risk evaluation and measurement, as well as risk management.

There are three risk management models that a company can adopt, namely: 1. Risk management for compliance, which involves a regulatory set of requirements focused on keeping the company complying with regulations. 2. Risk management for value protection, which is aimed at managing expected risks as well as reducing the degree of unforeseen risks. 3. Risk management for value enhancement, which is aimed at covering all dimensions of the business as well as increasing the protection against unforeseen risk

The process of risk management in the marine field has been carried out by many researchers, including Banda et al (2015) who analyzed the risks of sea transportation in Finnish seas during winter, Chen et al (2021) analyzed the risks of underwater vehicles, Jiang et al (2023) that assesses the sea transport supply chain. However, not many studies have been found that link risk management with the acceptance factors for marine hull insurance claims. In Gupta (2008) it is explained that the factors for accepting marine hull insurance claims include the material for making the hull, and the size of the

ship. Both factors affect the size of the claims submitted by ship owners. As a result, insurance companies may incur losses if they bear several risks that exceed their limits. For this reason, it is necessary to carry out a risk management process for these factors so that the company can anticipate claims that will occur.

Claims are the fulfillment of the primary responsibility of insurance and reinsurance companies to policyholders to promptly make payments when an insured event occurs. Every claim submission is related to what risk events are associated so that the insurance company can accept the claim. Thus, the research question arises what are the risks associated with marine hull insurance so that insurance companies can accept claims?

This study aims to identify the risks associated with receiving marine hull insurance, especially the material for making the hull and the size of the ship. These risks are part of internal operational risks. This research is a preliminary study of the application of risk management in a reinsurance company in Indonesia. The material discussed up to the creation of a risk map of the identified risks. The data used is the company's secondary data from 2017 to 2018. The method used is a quantitative method in determining the level of risk and a qualitative method in determining risk treatment. In general, this paper is divided into an introduction, then a literature review in the second section, materials and methods in the third section, results and discussion in the fourth section, and finally the conclusion.

2. Literature Study

2.1 Risk and Risk Management

The definition of risk can come from several sources, including according to ISO 31000 in Hopkin (2017) risk is an effect of uncertainty on objectives. Note that an effect may be positive, negative, or a deviation from the expected. Also, risk is often described by an event, a change in circumstances or a consequence. Meanwhile risk management is the set of activities within an organization undertaken to deliver the most favorable outcome and reduce the volatility or variability of that outcome [6].

In Indonesia there are two types of risk management approaches that are often used, namely: Risk Management based on Enterprise Risk Management (ERM) created by: Committee of Sponsoring Organizations of the Treadway Commission – 2017 or known as the acronym COSO 2017. Another approach is known as Standard Risk Management ISO 31000:2018. In general, the risk management process is included in a cycle as shown in Figure 1 where the cycle starts from risk identification, risk measurement, risk mapping, risk treatment, and risk evaluation.



Figure 1 Risk Management Cycle

Risk identification is a brainstorming step to make a comprehensive list of potential risks that can threaten the achievement of goals and the continuity of the company's business. The output of this stage is a list of risks and types of risks. Risk measurement is an assessment of the risk of an event in terms of the level of risk which includes the likelihood of the risk occurring and the impact of the risk on the company. Examples of criteria for the likelihood of risks can be seen in Table 1 below.

Table 1 Likelihood Risks

Rating	Description	Probability of Occurance	Risk of Frequency
1	Rare	< 10 %	≤ 2x per year
2	Unlikely	10 % - < 20 %	≤ 4x per year
3	Moderate	20 % - < 40 %	≤ 6x per year
4	Likely	40 % - < 70%	≤ 8x per year
5	Almost Certain	>70%	> 8x per year

The impact of risk is the potential loss that can occur due to an event. Impact measurement can be based on the historical experience of a company or the possibility of future events. As with possible risks, impact measurement can be based on an impact table, for example Table 2 below.

Table 2 Impact of Risk

Rating	Description	Impact
1	Insignificant	Very small
2	Minor	Small
3	Moderate	Medium
4	Major	Big
5	Catastrophic	Huge

Risk measurement is then made in the form of a matrix which contains a combination of the level of impact and the level of likelihood that shows the level of risk. Risk evaluation refers to determining whether the identified risks exceed the company's risk tolerance. The output of the risk evaluation is a risk map and risk priority list. The risk map itself is a graphical representation of risk events based on the probability and impact of the risk. Risk maps are used to show risk positions and determine risk response priorities.

Risk treatment is an action taken by the company to deal with risk. In general, there are 4 actions that can be taken, namely:

1. Accept - Accept risks that are within the limits of the company's risk appetite.
2. Share - Sharing the risk with other parties, such as insurance companies.
3. Reduce - Reducing the likelihood and/or impact of the risk.
4. Avoid - Avoid risk by not doing activities that increase risk.

Risk monitoring is to ensure effective risk control methods. If new risks arise, further steps can be taken starting from identification and so on.

2.2 Marine Hull

A marine insurance contract is an agreement where the insurer undertakes to indemnify the insured in an agreed manner against losses, namely marine-related losses. Marine Hull product itself is insurance that protects physical damage to the ship [5]. In accepting marine hull insurance claims, there are several influencing factors, including:

1. Ship's type,
The type of ship is used to determine the function of the ship used because most ships today are designed for a particular function. In the Electronic Quality Shipping Information System (2021), ships are grouped into 14 types.
2. Ship's size,
Ship size is the most basic consideration. Ship sizes can be divided into 4 categories (Electronic Quality Shipping Information System, 2021), viz
 - a. small boats 100 GT up to 499 GT
 - b. medium ships 500 GT up to 24,999 GT
 - c. large ships 25,000 GT up to 59,999 GT
 - d. very large vessels $\geq 60,000$ GT
3. Ship's Age
The age of the ship is the most important because when it reaches a certain age, the ship is vulnerable to damage.
4. Previous claim experience
If there is a report showing a consistent record of claims made against the insurer, then the insurance application is considered unfavorable because it can be assessed that the management of the ship or fleet is not good, such as perhaps an error in crew arrangements or inconsistent in carrying out ship repairs.
5. Ship Construction Materials

Each type of ship has been designed in such a way based on safety standards with load, endurance, and ship design capabilities. The following are the types of ship structures commonly used [9]. They are

- Steel, a type of steel structure used on large ships with high strength and toughness to cracking.
- Aluminum, a type of aluminum alloy structure, is widely used in small ship hulls such as cruise ships, fishing vessels, and others. In the superstructure of large commercial ships made of aluminum alloy, such as stairs, windows, doors, and others. Aluminum alloys are also used in ship anodes where they are used to protect steel hulls from corrosion.
- Titanium, this type of ship structure has great potential to be used on ships because it is lightweight, resistant to corrosion, has the potential to have high strength, especially at cryogenic temperatures, namely very low temperatures. This type of titanium structure is widely used in submarines.
- Fiber-Reinforced Plastics (FRP), formed from fibers bonded together with resins to form a strong structural material. This type of structure is commonly used in bridges, building construction, the aircraft and automobile industries, and the marine industry. The advantages of FRP are lighter than steel or aluminum, easy to manufacture, and so on. The disadvantages of FRP are that it is flammable, the cost is still more expensive than steel and aluminum, and it can be harmful to the environment in the long term because FRP cannot be recycled or decomposed over time.
- Apart from ship construction materials made of steel, aluminum, titanium and FRP, in Indonesia there are still many ships made of wooden construction, such as fishing vessels and cargo ships (Dewi et al., 2020)

3. Data and Methods

3.1 Data

The data used is secondary data originating from a reinsurance company in Indonesia. The data is in the form of data on the number of claims and the severity of the claims submitted for 5 years, namely from 2017 to 2022 which is focused on data on ship hull materials and ship sizes.

3.2 Methods

The method used is quantitative analysis in describing the average number of claims and claims size from 2017 to 2022. Furthermore, qualitative analysis is carried out in

identifying risks that arise related to shipbuilding materials and ship size. In more detail, the steps taken are as follows:

1. Conduct a descriptive study of data on ship hull materials and ship weight. The study is divided into the number of claims and the size of the claims filed.
2. Calculating the average number of claims and the severity of claims that occur on ships that are differentiated by the material of the ship hull.
3. Calculating the average number of claims and the severity of claims that occur on ships that are differentiated by the size of the ship.
4. Identify the risks that arise due to the material of the ship hull and the size of the ship.
5. Measuring the level of risks that have been identified.
6. Create a risk map of measured risks.
7. Analyze the results of the risk map

4. Results

As explained in the previous section, many factors affect the acceptance of claims, but in this study the focus will be on the material of the ship hull and the size of the ship. In addition, receipt of claims is also distinguished by the number of claims and the severity of the claims. In the following figure the number of claims and the severity of the claims are differentiated on the material of the ship hull and the size of the ship.

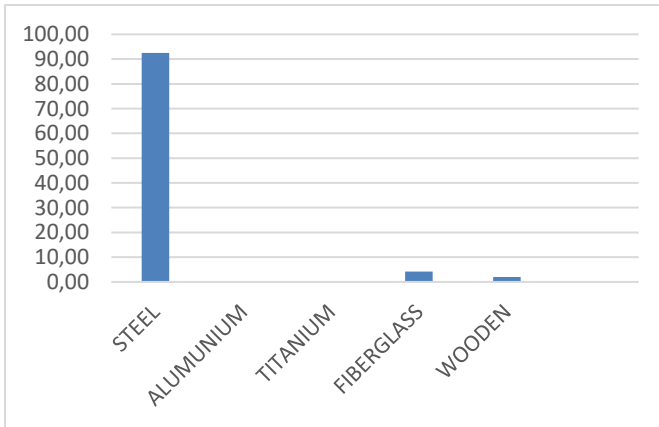


Figure 2 The Average of Claim Frequency Based on the Material

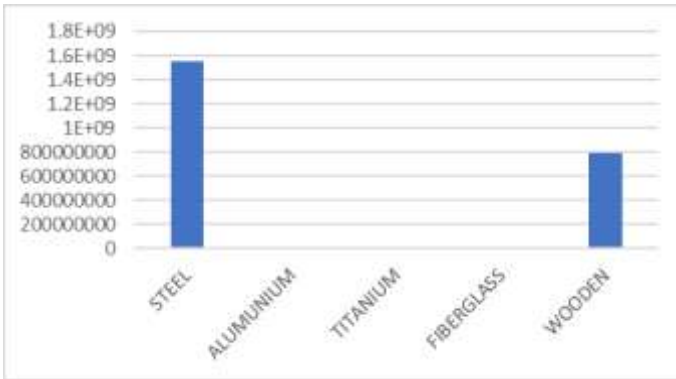


Figure 3 The Average of Claim Severity Based on the Material

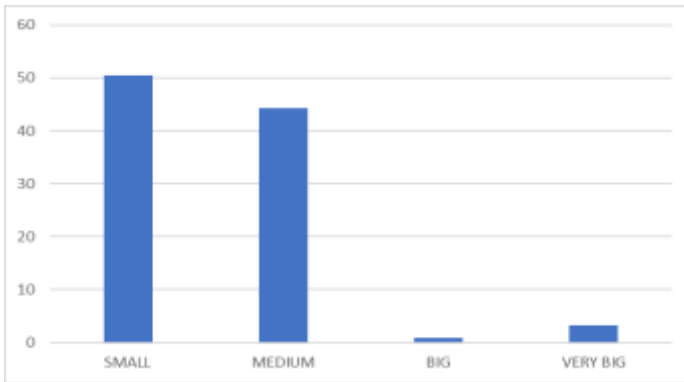


Figure 4 The Average of Claim Frequency Based on the Ship's size.

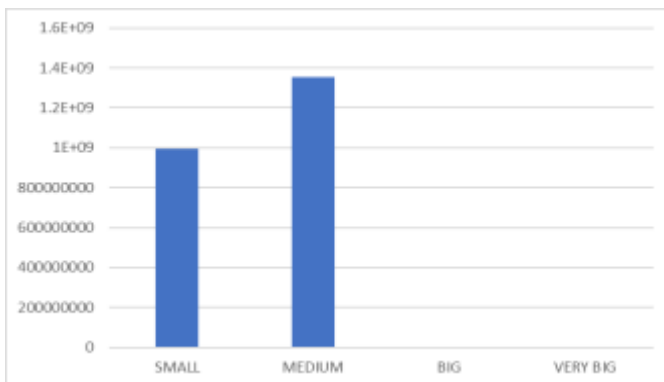


Figure 5 The Average of Claim Severity Based on the Ship's size.

From Figure 2 to Figure 5 it can be seen that ships made of steel frames submit claims more often than other frame materials. In terms of large claims, ships made of steel frames also filed more claims. However, if it is divided per unit, it turns out that ships made of wood frames have a large loss impact. In terms of ship weight, small vessels are the most frequently filed for claims, but from large claims, medium sized ships are the most frequently filed claims. If we divide per unit, medium-sized ships have a large loss impact. This can be seen in Table 3.

Table 3 Impact per Unit

Ship hull material			
	Average frequency 2017-2022	Average severity 2017-2022	Impact per unit 2017-2022
steel	92.50	IDR 1,556,413,881.28	IDR 16,826,096.01
wooden	4.17	IDR 792,451,315.70	IDR 396,225,657.85

Ship's size			
	Average frequency 2017-2022	Average severity 2017-2022	Impact per unit 2017-2022
Small	50.5	IDR 996,222,216.1	IDR 19,727,172.60
Medium	44.33333333	IDR 1,352,642,981	IDR 30,510,743.93

Thus, the risks that can be identified can be seen in Table 4.

Table 4 Risk Identification

Risk Identification		
Risk Number	Risk Events	Impacts
R1	There are still ships made of wood frames.	Larger claims are borne more.
R2	A lot of medium-sized ships	Larger claims are borne more.

Furthermore, the results of the risk assessment can be seen in Table 5.

Table 5 Risk Assessment

Risk Identification				
Risk Number	Risk Events	likelihood	impact	Risk level
R1	There are still ships made of wood frames.	1	5	5
R2	A lot of medium-sized ships	4	3	12

So that the risk map that can be made can be seen from Figure 6.

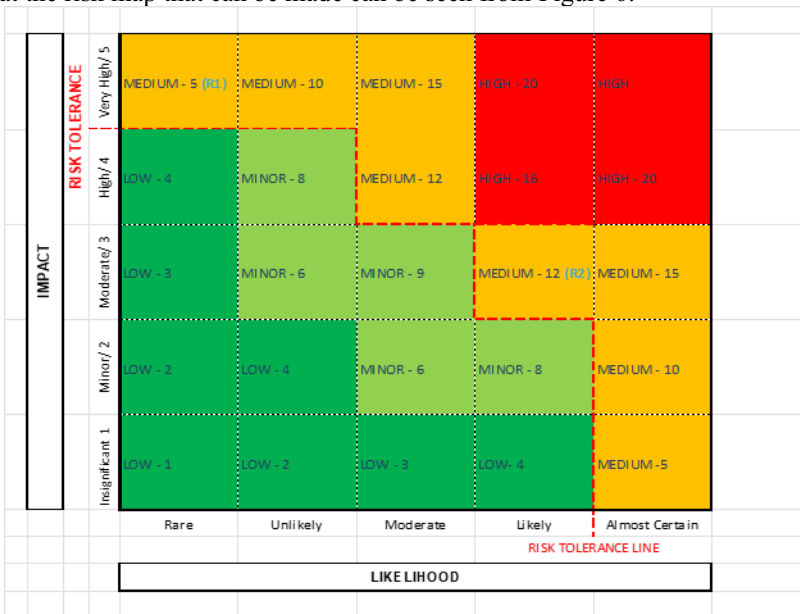


Figure 6 Risk Map

From the risk map image above, the above risks are still within medium limits. However, these risks are outside the risk tolerance line. This should be a concern so that the company is able to make treatment of these risks. For example, the company avoids the insured still using ships made of wood frames. Although the incidence of claims is small, it appears that the losses incurred are very large. Another alternative, for ships made of wood frames, the company reinsures the sum insured so that the company can share the risks that may occur. For the risk event that a large number of medium-sized ships submit claims, the company may accept the risk, but the company can also insure the sum insured if it feels that the loss is very large.

5. Conclusion

Marine Hull products are protection provided by insurance companies against the ship's hull in the event of damage. Factors for acceptance of marine hull insurance claims include the material for making the hull and the size of the ship. Both of these factors affect the size of the claims submitted by ship owners. The risk management process can be carried out to anticipate risk events that can harm the company. In the case of marine hull insurance, there are 2 risks that can be identified, namely the presence of wood-framed vessels and the large number of medium-sized vessels. The risk is that there are ships made of wood frames that have a medium risk level. This is known from the possibility of a small occurrence but has a big impact. The risk of many medium-sized ships also has a medium risk level. However, the company still has to mitigate these two risks, either accepting the risk or sharing the risk by reinsuring it.

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