Indirect Growth Rates of the Information Model for the Global Tanker Shipping Market from 2010 to 2020

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Abstract. This paper examines indirect growth rates of the global tanker shipping market over the period 2010 – 2020. The evaluation and analysis of the relevant variables of the model and the resulting indirect growth rates have been aimed at a scientific formulation of the research findings and have been used to describe the most important theoretical principles governing the worldwide tanker shipping market over the observed period of time. The basic hypothesis has been confirmed through the indirect growth rates of the selected model variables. In this way a scientific confirmation of the hypothesis has been provided: “On the basis of scientific insights into the global tanker shipping market, it is possible to calculate the indirect growth rates of the information model for the global tanker shipping market for the period from 2010 to 2020.”

Introduction

Over the first ten years of this century the tanker seaborne trade experienced major technological changes. At the same time, the divergence between the supplied tanker capacities and the global demand for the transport of crude oil and oil derivate decreased steadily. The process lasted until 2008 when the freight rates in seaborne shipping reached a record high level. In 2008, the global crisis that started shaking economies across the world was the most severe crisis since the Great Depression in the 1930s. It adversely affected the performance of tanker shippers. In 2010 it was utterly unrewarding to predict the overall effects of the globalisation on the tanker shipping trade.

Prior to calculating the indirect growth rates of the model for global tanker shipping market, the critical variables of the model need to be set. The design of the information model has been based on the following variables: Global economy, Globalisation, Freight rates, Shipbuilding, and Innovations in maritime shipping.

This research uses a number of scientific methods, among which the most relevant are analysis and synthesis, induction and deduction, descriptive, comparative, statistical and mathematical methods, method of model drawing (growth matrix), and methods of proving and refuting.

Global Tanker Shipping Market

Year 2010

The end of 2008 saw a deterioration of the global financial system followed by a recession that heavily affected maritime shipping industry, resulting in surplus shipping capacities in most trades, steep fall in freight rates, reduction in bank investment in the maritime trade, order cancellations, bankruptcies and withdrawal of renowned shippers from the market [1].

The global tanker capacities gradually decreased from 2008 to 2012 [2]. Unlike other segments of seaborne shipping, the tanker trade did not experience major employment problems in 2010 because Asian economies continued to grow, somewhere even above 7% per year [3]. By 2012, the economies of the USA and EU showed the signs of recovery [4]. Further development of the tanker trade was affected by the general growth of the worldwide economy during 2013. In that year,
lower amount of crude oil was imported in the USA; at the same time, the country exported more refined oil products [5].

Figure 1. Share of flag countries in the global tanker fleet.
Source: UNCTAD Review of maritime transport 2014. [6].

Figure 1 follows percentages by country: 17.60% Greece; 11.90% Japan; 6.00% Norway; 5.10% China; 5.00% Germany; 4.60% USA; 2.90% UK; 2.90% Korea; 2.80% Hong Kong; 2.50% Denmark.

Figure 1 shows the state flags that the global tanker fleet was flying at the end of 2014. Tanker freight rates decreased since October 2014 [7].

Year 2015
In the world order book for 2015 there were 937 tankers with approximately 75 million DWT, i.e. about 15% of the current tanker fleet. Despite the excess capacity of the world fleet, vessels of the new generation have been commissioned, gradually displacing standard vessels out of the market [8].

Most shippers have recently started using economical sailing speeds and adjusted their shipping schedules accordingly. Reduced fuel consumption helps to mitigate big oscillations in fuel prices on the global oil market. The economical speed is about 20% lower than the full speed used before the economic crisis [9].

Fast growing economies like China or India have become major oil importers, with immense plans regarding the expansion of their refinery capacities, which considerably affects the business efficiency of the tanker fleet.

Year 2020
It is expected that in 2017 the market share of tanker trade within the global maritime shipping market will decrease [10]. However, it is also expected that the tanker shipping market will remain balanced until 2020, with oil supply mainly running through pipelines from the Near East, Africa and Russia, and that the import into China and India will be higher in 2020 than it was in 2012 [11]. Moreover, forecasts say that the near future will bring a slight growth of the tanker trade, with crude oil supply increased by 1.2% and oil product supply increased by 3.6% by 2020.

The major routes for shipping crude oil and oil products are expected to change by 2020: the currently prevailing shipments from West Asia and West America are likely to be outnumbered by shipments carried by tankers from North America towards Asia, especially to China and India. Such forecasts imply the shifting of tanker trade growth from the developed towards the developing economies.
Tanker market development has been adversely affected by high tensions and civil unrests in crucial oil production and export areas such as parts of West Africa, North Africa, Sub-Saharan Africa, etc [12].

A study carried out by the Finnish Ministry of Transport and Communications in January 2005 predicted that the import of energy products to the fast growing economies, including China, India, Russia, Brazil, Mexico, etc., would double by 2030 [10]. According to the forecasts of the World Research Institutes from New York, oil production will continue to grow until 2020. After that, the production will be decreasing. TRANS visions predicts that by 2050 the freight rates will reach higher values than in 2008 [8].

The major issue in predicting the trends in world maritime shipping is the intensity of the overall global growth of economy. Tanker market is particularly sensitive to oil-related events and it is therefore difficult and unrewarding to predict future trends [6].

**Designing the Information Model for the Global Tanker Shipping Market from 2010 to 2020**

Quantification of the information model for the global tanker shipping market from 2010 to 2020 has resulted from the qualitative research. The assessment of the model’s variables takes into consideration synergetic effects of the following scientific aspects: scientific, theoretical and information features of the individual model variables, mental-verbal aspects, values and importance of the model’s variables over the observed period, i.e. from 2010 to 2020. It is necessary to quantify the variables the index scale from zero to 100. Zero is the value of the model variables which corresponds to the situation on the seaborne shipping market in 2008, when the global crisis – the most severe crisis since the Great Depression in the 1930s – shook worldwide economies. The value 100 corresponds to the situation on the maritime shipping market before 2008, i.e. when the freight rates index reached its record high. The model comprises the variables quantified for the year 2010, as well as the expected values of the variables for 2015 and 2020.

The design of the information model for the global tanker shipping market from 2010 to 2020 has been based on the previously set variables. The variables that are considered essential are: Global economy, Globalisation, Freight rates, Shipbuilding, and Innovations in maritime shipping (Table 1).

<table>
<thead>
<tr>
<th>Variables of the information model for the global tanker shipping market from 2010 to 2020</th>
<th>Inputs y</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2010</td>
<td>2015</td>
</tr>
<tr>
<td>1 Global economy</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>2 Globalisation</td>
<td>70</td>
<td>75</td>
</tr>
<tr>
<td>3 Freight rates</td>
<td>70</td>
<td>75</td>
</tr>
<tr>
<td>4 Shipbuilding</td>
<td>60</td>
<td>65</td>
</tr>
<tr>
<td>5 Innovations in maritime shipping</td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>

Source: Authors

Table 1 shows the variables of the information model for the global tanker shipping market 2010 – 2020, and the ranking of their growth values: 1. Innovations in maritime shipping (30), 2. Global economy (20), 3. Globalisation (10.0), 4. Freight rates (10.0) and 5. Shipbuilding (10.0). Here is the growth matrix of the model for the global tanker shipping market with regard to the current and future values for the period of 2010–2020.

\[ \Delta Y_{2014} = \begin{bmatrix} 20 \\ 10 \\ 10 \\ 10 \\ -30 \end{bmatrix} \]
The vector of the reciprocal values of the model is: \( \mathbf{R}_{2020} = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 0.25 & 0.25 & 0.25 & 0.286 & 0.25 \\ 0.125 & 0.125 & 0.125 & 0.143 & 0.125 \\ 0.125 & 0.125 & 0.125 & 0.143 & 0.125 \\ 0.375 & 0.375 & 0.375 & 0.429 & 0.375 \end{bmatrix} \).

The research has provided the growth rates of the model for the global tanker shipping market from 2010 to 2020 (Table 2). The model has provided both direct and indirect growth rates of the individual variables. Due to limited space, the direct growth rates (diagonal values in Figure 2) will not be elaborated in this paper.

Table 2. Growth rates of the information model for the global tanker shipping market from 2010 to 2020, on the index scale from zero to 100.

<table>
<thead>
<tr>
<th>Model variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>12.5</td>
<td>12.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>12.5</td>
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<td>12.5</td>
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<tr>
<td>4</td>
<td>12.5</td>
<td></td>
<td>12.5</td>
<td></td>
<td>14.3</td>
</tr>
<tr>
<td>5</td>
<td>37.5</td>
<td></td>
<td>37.5</td>
<td></td>
<td>42.9</td>
</tr>
</tbody>
</table>

Source: Authors

Figure 2. Growth rates of the information model for global tanker shipping market from 2010 to 2020.

Source: Authors

Indirect Growth Rates of the Information Model

The analysis of the synergetic interrelation of the variables of the information model for global tanker shipping market from 2010 – 2020 has produced the following results: of all variables, the indirect growth rate of the variable Shipbuilding, amounting to 28.6%, will have the greatest impact on the variable Global economy in 2020, whereas the latter variable will be least affected by the remaining three variables having the indirect growth rates of 25.0%. The variable Shipbuilding will exert the greatest impact on the variable Globalisation in 2020 through its indirect growth rate of 14.3%, whereas the latter variable will be least affected by the remaining three variables having identical indirect growth rates of 12.5%.

The greatest impact on the information model’s variable Freight rates in 2020 will be exerted by the variable Shipbuilding and its indirect growth rate amounting to 14.3 %, while the remaining variables will have the least influence, through identical growth rates of 12.5%.
As for the influence on the variable *Shipbuilding* in 2020, all the remaining variables will clearly have the same effect owing to their identical indirect growth rates of 12.5%.

The information model’s variable *Shipbuilding*, with the indirect growth rate amounting to 42.9%, will have the largest impact on the variable *Innovations in maritime shipping*, whereas the least influence on that variable will be exerted by the remaining variables, each having the indirect growth rate of 37.5%.

The variable *Global economy*, through the indirect growth rate of 37.5%, will have the greatest influence on the variable *Innovations in maritime shipping*; the former variable will have the weakest impact on the indirect growth rates of the remaining three variables (12.5%).

The variable *Globalisation*, through the indirect growth rate of 37.5%, will have the strongest influence on the indirect growth rate of the variable *Innovations in maritime shipping*. The former variable will have the weakest impact (12.5%) on the indirect growth rates of the variables *Freight rates* and *Shipbuilding*.

According to the information model for global tanker shipping market 2010 – 2020, the impact of the variable *Freight rates* will be strongest on the indirect growth rate of the variable *Innovations in maritime shipping* (37.5%). This variable will have the weakest impact on the variables on *Globalisation* and *Shipbuilding*, through the indirect growth rates amounting to 12.5%.

The greatest influence of the variable *Shipbuilding* will be exerted on the indirect growth rate of the variable *Innovations in maritime shipping* (42.9%). On the other hand, the variable *Shipbuilding* will have the weakest influence (14.3%) on the variables *Globalisation* and *Freight rates*.

The information model for global tanker shipping market 2010 – 2020 shows that the variable *Innovations in maritime shipping* will have the greatest impact, amounting to 25.0%, on the indirect growth rate of the variable *Global economy*. The weakest effect will be reached on the remaining three variables through the identical indirect growth rates of 12.5%.

**Conclusion**

The evaluation and analysis of the interrelation of the model variables and of the resulting indirect growth rates have been aimed at a scientific formulation of the research findings and have been used to describe the most important theoretical principles governing the interrelation of the variables of the designed model. The information model has enabled calculation and insights into the indirect growth rates of the given variables and the obtained values for the year 2020. The information model has been based on the mental-verbal assumptions related to the worldwide tanker shipping market in 2010, 2015, and at the end of 2020. The basic hypothesis has been confirmed through the indirect growth rates of the selected model variables, asserting that: "On the basis of scientific insights into the global tanker shipping market, it is possible to calculate the indirect growth rates of the information model for the global tanker shipping market for the period from 2010 to 2020. The analysis of the resulting growth rates has been aimed at a scientific formulation of the research results.

The information model has determined the individual influence of indirect growth rates of the remaining variables on a selected variable. In 2020, the variable *Global economy* will be most affected by the variable *Shipbuilding* through the indirect growth rate of 28.6 %. The variable *Globalisation* will be under the strongest influence (14.3%) of the variable *Shipbuilding*. The variable *Freight rates* will be most affected by *Shipbuilding* with its indirect growth rate of 14.3%. The variable *Shipbuilding* will be under equal influence (12.5%) of all the remaining variables. In 2020, the variable *Innovations in maritime shipping* will be most affected by the variable *Shipbuilding* at the indirect growth rate of 42.9%.

The information model for global tanker shipping market 2010 – 2020 has also defined the impact of each individual variable on the indirect growth rates of the remaining variables. The variable *Global economy* exerts the strongest influence on the indirect growth rate of the variable *Innovations in maritime shipping* through the indirect growth rate of 37.5%. The variable *Globalisation* has the greatest influence (37.5%) on the indirect growth rate of the variable *Innovations in maritime shipping*. The variable *Freight rates* has the strongest impact on the
variable *Innovations in maritime shipping* through the indirect growth rate amounting to 37.5%. The variable *Shipbuilding* exerts the greatest influence on the indirect growth rate (42.9%) of the variable *Innovations in maritime shipping*, while the variable *Innovations in maritime shipping* has the strongest impact on the indirect growth rates of the variable *Global economy* (25.0%).

The above analysis and the obtained results confirm the basic scientific hypothesis set out in this research, through the indirect growth rates and the synergetic effects of the selected variables of the information model for the global tanker shipping market for the period from 2010 to 2020.

**References**

[1] V. Vidučić, Sustavi pomorskog tržišta (Maritime shipping market systems), Sveučilište u Splitu / University of Split, Croatia, 2011, pp.119.


