The Worldwide Tanker Shipping Market (2010 – 2020) Information Model

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The aim of this paper is to provide the information model for the worldwide tanker shipping market 2010 – 2020. The evaluation and analysis of the relevant variables of the model and the resulting growth rates are used to describe the most important theoretical principles of the worldwide tanker shipping market over the observed period of time. The research produced direct growth rates of the variables on the index scale from 1 to 100: 1. Innovations in maritime shipping (37.5), 2. Global economy (25.0), 3. Shipbuilding (14.3). 4. Globalisation (12.5) and 5. Freight rates (12.5). It can be concluded that the direct growth rates of all model variables of the worldwide tanker shipping market 2010 – 2020 have realistic chances to be implemented. By 2020 it is expected that the demand on the tanker shipping market will increase more intensely than the demand in other trades.

KEY WORDS
~ Information model
~ Tanker trade
~ Global economy
~ Globalisation
~ Freight rates
~ Shipbuilding
~ Innovations in maritime shipping

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1. INTRODUCTION

Until 2000 the global economy was growing moderately and it was expected that the economic cycle would last for around ten years, depending on the growth intensity of the transport of crude oil and oil derivatives. The growth of the tanker trade was considerably affected by the development of the global economy in the early 21st century (Puljiz, 1998). However, the growth trends indicated that the crude oil cycle compared to the cycle of oil derivatives was twice longer.

Over the first ten years of this century the tanker sea-borne trade experienced major technological changes. At the same time, the discrepancy between the supplied tanker capacities and the worldwide demand for the transport of crude oil and oil derivatives decreased steadily. After 2003 the supply of tanker shipping capacities expanded due to the delivery of newbuildings that had been commissioned earlier. The supply growth stabilised after 2005. All tanker shippers had to replace their single-hull ships with double-hull tankers by 2010 (Cerović and Bašić, 2008). Tanker trade maintained high freight rates throughout 2008 and until the first quarter of 2009 when the drop in demand for crude oil, combined with the increased tanker capacities, resulted in significant reduction in freight rates. The late 2008 and the early 2009 experienced a deterioration of the global monetary system followed by a recession resulting in the devastating effects across the maritime shipping industry, including surplus shipping capacities in most trades, steep fall in freight rates, reduction in bank investment in the maritime trade, order cancellations, and bankruptcies of renowned shippers with implications for the shipbuilding industry (Vidučić, 2011).

The worldwide tanker capacities decreased in 2008, and this trend remained until 2012 when the global tanker fleet capacity increased again. The year 2010 was marked by low freights and surplus shipping capacity except in the segment of tanker trade. This segment did not experience major employment problems in 2010 because Asian economies continued to grow, somewhere even above 7 %. The economies of the USA and EU were also on their way to recovery (www.statista.com). A further development of the tanker trade was affected by the general growth of the worldwide economy during 2013. The key factors included high oil prices (averaging more than 100 USD per barrel for the third year in a row), demography, geopolitical uncertainty, energy efficient technologies, and changes in supply/demand related to the traditional consumer markets. In 2013 a lower amount of crude oil was imported in the USA, while the country exported more refined oil products at the same time (RS Platou Economic Research, 2014).

In 2014 the worldwide tanker fleet was flying the state flags of: 1. Greece (17.6 %), Japan (11.9 %), 3. Norway (6 %), China (5.1 %), 4. Germany (5.0 %), USA (4.6 %) etc. (www.unctad.org). At the end of 2014 the prices of new-buildings on tanker trade market were decreasing (three-month trend) and were about 0.5 – 1 % lower than in August 2014 (Tijardović, 2012).

Tanker freight rates decreased since October 2014 from an average of 80,000 USD/day (Suezmax and VLCC tankers) to around 44,000 USD/day for Suezmaxes and 55,000 USD/day for VLCCs, whereas in the Aframax segment the rates dropped from 60,000 USD/day to about 32,000 USD/day. Meanwhile, freight rates in the product tanker segment increased since October 2014: for MR Handymax tankers the rates increased from 20,000 USD/day to 23,000 USD/day, for Handysize tankers from 22,000 USD/day to 29,000 USD/day, and for the Panamaxes from 22,000 USD/day to 25,000 USD/day. In the segment of 20,000 DWT chemical tankers fitted with stainless steel tanks, the freight rates remained stable in 2014 and early 2015 amounting to around 14,000 USD/day. 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 (www.hb.hr). Despite the excess capacity of the world fleet, vessels of the new generation have been commissioned. The trend is likely to gradually displace standard vessels out of the market (www.dnv.com)

Recently, most shippers have started using economical sailing speeds and adjusted their shipping schedules accordingly. Reduced fuel consumption helps to mitigate huge oscillations in fuel prices on the global oil market. The economical speed is about 20 % less than the full speed used before the economic crisis. The oil prices tend to grow constantly and no major changes can be forecasted, at least for the time being. It remains unknown to what extent the current oil prices will affect the shipbuilding market, but it is well known that in similar situations on the oil market in the past the impact was great (Kunda, 2013).

The fast growing economies, like China and India, have become major oil importers with immense plans regarding the expansion of their refinery capacities.

The major issue in forecasting the development of the worldwide seaborne shipping is the intensity of global economic growth. The tanker shipping market has been under tremendous pressure due to various events associated with oil exploitation and product refinement, so that it is very unrewarding to predict future trends (www.unctad.org).

The growth of the national and international maritime trade is expected by 2017 and this should result in higher rates (Zelenika and Pupovac, 2000). Forecasts for worldwide seaborne shipping market pronounce the trend of the demand restructuring, the increased market share of tramp and liner services, and the reduced market share of tanker trade. The process of globalisation will encourage the transfer of register of vessels from national to open registries. It is assumed that half of the world merchant fleet has already been flying flags of convenience (http://ec.europa.eu/).

It is expected that the tanker shipping market will remain balanced until 2020, with oil supply mainly running through pipelines from the Middle East, Africa and Russia, and that the import into China and India will be higher in 2020 than it was in 2012 (Cerović and Bašić, 2008). It is also expected that the near future will bring a slight growth in tanker trade, with crude oil supply increased by 1.2 % and oil product supply increased by 3.6 %. The USA is likely to remain the key player on the market. Other essential aspects affecting the development of the tanker trade market include the expected reduction of export from North Africa due to relatively poor infrastructure and civil unrests. Tensions remain high across the areas that are essential for oil production and export, such as North Africa, parts of sub-Saharan Africa, West Asia, etc. (www.intertanko.com). The contribution of Iran remains uncertain regardless of the agreements achieved.

The major routes for shipping crude oil and oil derivatives are expected to change: the currently prevailing shipments from West Asia and West America are likely to be outnumbered by shipments 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.

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 (Mexico, Russia, India, China, and other Asian countries) would double by 2030 (Kunda, 2013). According to DNV Shipping 2020 report, more than 1 in 10 newbuildings will be delivered with gas fuelled engines. The newbuildings in 2020 will emit up to 10 to 35 % less CO2 than today's ships (RS Platou, Economic Research, 2014). The tanker trade is expected to grow by 2020 along with the application of new technologies. 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. TRANSvisions predicts that by 2050 the freight rates will reach higher values than in 2008 (www.dnv.com).

2. THE INFORMATION MODEL FOR THE WORLDWIDE TANKER SHIPPING MARKET FROM 2010 TO 2020

The design of the information model for the worldwide tanker shipping market 2010 – 2020 is based on the previously set variables. The variables that are considered critical are: Global economy, Globalisation, Freight rates, Shipbuilding and Innovations in maritime shipping (see Table 1). Table 1 shows the variables of the information model for the worldwide 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).

Table 1.
Values of the variables of the information model for worldwide tanker shipping market from 2010 to 2020.

Variables of the information model for the worldwide tanker shipping market from 2010 to 2020		Inputs *y*			Growth
		2010	2015	2020	2010/20
1.	Global economy	60	70	80	20
2.	Globalisation	70	75	80	10
3.	Freight rates	70	75	80	10
4.	Shipbuilding	60	65	70	10
5.	Innovations in maritime shipping	50	60	80	30

The assessment of the variables of the model takes into consideration synergetic effects of individual variables, values and the importance of variables of the model in the period observed, i.e. from 2010 to 2020. The quantification of the model variables is performed on 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 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.

It is asserted that the worldwide tanker shipping market consists of "n" inter-reliant elements. The value of an individual model variable is expressed as y_{if} and y_{it-1} of the *i* variable in the period *t* and *t-1*. An increase of the input value of the *i* variable of the model is expressed as $\Delta y_{it} = y_{it} - y_{it-1}$ (Vidučić, 2007). An indirect growth rate of the $_i$ variable in relation to *j* is defined as the relation among the input growth of the *i* variable of the information model, Δy_{it}, and the input value of the *j* variable of the model in the period *t*, that is the indirect growth rate is expressed by the equation:

$$r_{ijt} = \frac{\Delta y_{it}}{y_{it}} \quad (1)$$

where: *i, j*=1, …, n, whereas $y_{it-1} \neq 0$. The indirect growth rates can be expressed in a form of the growth matrix of the model variables:

$$r_t = \begin{bmatrix} r_{11} & r_{12} & L & r_{1nt} \\ r_{21} & r_{22} & L & r_{2nt} \\ L & L & L & L \\ r_{n1t} & r_{n2t} & L & r_{nnt} \end{bmatrix} \quad (2)$$

where $t = 1,...t$;

The variables on the main vertical refer to direct growth rates ($i = j$). The variables in the *i* row refer to the input growth in the *i* variable in relation to inputs in other variables. The variables in *i* column refer to the value growth of the input in all variables of the model in relation to the input of the *i* variable in the period *t*. Therefore, each variable in the growth matrix is represented by one row and one column, with elements expressing indirect or relative growth relationships. Other rows and columns refer to other variables of the information model for worldwide tanker shipping market 2010 - 2020.

Indirect growth rates can be defined in relation to the inputs of the j variable of the model in the period:

$$t = 1: r'_{ijt} = \frac{\Delta y_{it}}{y_{j,t-1}} \quad (3)$$

where: i, j = 1, …, n. The following inter-relation reflects the relationship among the indirect growth rates:

$$r_{ijt} = \frac{r'_{ijt}}{1 + r'_{i,jt}} \tag{4}$$

and

$$r'_{ijt} = \frac{r_{ijt}}{1 - r'_{j,jt}} \tag{5}$$

where: i, j = 1, …, n. The matrix type can be determined through the external vector of the model variable, the vector of the growth of the model variables being: $\Delta y_{it} = \Delta y_{it}, \ldots \Delta y_{m^*t}$. The vector of the reciprocal values of the model variables is defined as: $\left(\frac{1}{y_t}\right) = \left(\frac{1}{y_{1t}}\right), \ldots, \left(\frac{1}{y_{nt}}\right)$, where i, j = 1, …, n, whereas $y_{it-1} \neq 0$. The growth matrix of the model defines the external vector of the growth of the coefficients of the model variables and the vector of the reciprocal values:

$$R_{pt} = \Delta y'_t \left(\frac{1}{y_t}\right) = \left[\frac{\Delta y_{1t}}{\Delta y_{mt}}\right] \cdot \left(\frac{1}{y_t}, \ldots, \frac{1}{\Delta y_{nt}}\right) \tag{6}$$

If only the direct growth rates are analysed, then the growth of a variable is expressed irrespectively of the growth of other variables. On the other hand, an analysis of the indirect growth rates, i.e. an analysis of the growth rates of the *i* variable in relation to *j* (*i, j* = 1, …, n) allows to determine the structure of growth of the variables and express all the relationships through the growth matrix in the entire system. By expressing the direct and indirect rates, it is possible to follow both the intensity changes of the growth of variables and their structural relationships at the same time.

Here is the growth matrix of the model for worldwide tanker shipping market in relation to the current and future values for the period of 2010 – 2020.

The vector of the model growth is: $\Delta y_{2014} \begin{bmatrix} 20 \\ 10 \\ 10 \\ 10 \\ 30 \end{bmatrix}$;

The vector of the reciprocal values of the model is:

$$\frac{1}{y_{2020}} = \left(\frac{1}{80}, \frac{1}{80}, \frac{1}{80}, \frac{1}{70}, \frac{1}{80}\right);$$

$$[R_{2020}] = \begin{bmatrix} \frac{20}{80} & \frac{20}{80} & \frac{20}{80} & \frac{20}{70} & \frac{20}{80} \\ \frac{10}{80} & \frac{10}{80} & \frac{10}{80} & \frac{10}{70} & \frac{10}{80} \\ \frac{10}{80} & \frac{10}{80} & \frac{10}{80} & \frac{10}{70} & \frac{10}{80} \\ \frac{10}{80} & \frac{10}{80} & \frac{10}{80} & \frac{10}{70} & \frac{10}{80} \\ \frac{30}{80} & \frac{30}{80} & \frac{30}{80} & \frac{30}{70} & \frac{30}{80} \end{bmatrix}; \tag{7}$$

$$[R_{2020}] = \begin{matrix} 0{,}250 & 0{,}250 & 0{,}250 & 0{,}286 & 0{,}250 \\ 0{,}125 & 0{,}125 & 0{,}125 & 0{,}143 & 0{,}125 \\ 0{,}125 & 0{,}125 & 0{,}125 & 0{,}143 & 0{,}125 \\ 0{,}125 & 0{,}125 & 0{,}125 & 0{,}143 & 0{,}125 \\ 0{,}375 & 0{,}375 & 0{,}375 & 0{,}429 & 0{,}375 \end{matrix} \tag{8}$$

The research has provided the direct growth rates of the model for worldwide tanker shipping market 2010 – 2020 (Table 2). The model has provided both direct and indirect growth rates of the individual variables. Because of limited space, the indirect growth rates are not elaborated on in this paper.

According to Table 2, the direct growth rates of the model variables on the index scale 1-100 are ranked as follows: 1. Innovations in maritime shipping (37.5), 2. Global economy (25.0), 3. Shipbuilding (14.3), 4. Globalisation (12.5) and 5. Freight rates (12.5).

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

Model variables	1	2	3	4	5
1	**25.0**	25.0	25.0	28.6	25.0
2	12.5	**12.5**	12.5	14.3	12.5
3	12.5	12.5	**12.5**	14.3	12.5
4	12.5	12.5	12.5	**14.3**	12.5
5	37.5	37.5	37.5	42.9	**37.5**

Direct growth rates of the model variables have higher values than their real growth (see Table 1, growth 2010-2020) due to the synergetic interrelation of all the variables (see Figure 1), as follows: Innovations in maritime shipping (growth 30 ↔ direct growth rates 37.5), Global economy (growth 20 ↔ direct growth rates 25.0), 3. Shipbuilding (growth 10 ↔ direct growth rates

14.3), 4. Globalisation (growth 10 ↔ direct growth rates 12.5) and 5. Freight rates (growth 10 ↔ direct growth rates 12.5).

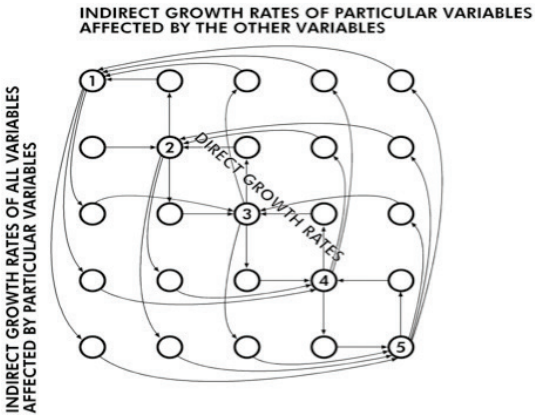

Figure 1.
Growth rates of the information model for worldwide tanker shipping market from 2010 to 2020.

It is obvious that the greatest difference between the growth value and the value of direct growth rates will change the ranking of the variables compared to the ranking according to the values of their direct growth rates: Innovations in maritime shipping (7.5), Global economy (5.0), Shipbuilding (4.3), Globalisation (2.5) and Freight rates (2.5).

3. CONCLUSION

The design of the model has been based on the most relevant variables including: Global economy, Globalisation, Freight rates, Shipbuilding, and Innovations in maritime shipping. The quantification of the model has been performed on the basis of the scientific and theoretical aspects of the mental-verbal insights into individual variables and their importance within the observed period, from 2010 to 2020. The research produced direct growth rates of the variables on the index scale from 1 to 100: 1. Innovations in maritime shipping (37.5), 2. Global economy (25.0), 3. Shipbuilding (14.3). 4. Globalisation (12.5) and 5. Freight rates (12.5). The direct growth rates of all model variables of worldwide tanker shipping market 2010 – 2020 have realistic chances to be implemented. This also means that the hypothetical values of all variables of the model have been set realistically. The present geopolitical tensions obstruct the growth of tanker shipping trade. By 2020 it is expected that the demand on the tanker shipping market will increase more intensely than the demand in the other trades. The essential feature of the global economic growth is the rationalisation of energy consumption. The trend is likely to affect the tanker shipping market after 2020.

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