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Quantitative and Qualitative Aspects of Maritime Transport Services

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Abstract: Through our study we want to approach some aspects of maritime transport services market in the current global crisis. This approach takes into account, firstly in determining how transportation fleet reacts to the evolution of world trade and on the other hand to clarify the tendency of increasing transport capacity even in crisis conditions. Therefore we intend to address in detail the evolution of the global fleet and world trade. Research conducted by econometric models at different times, as fleet capacity is a reaction at different times, due to a production cycle of about two years in shipbuilding. I used the software Eviews because it allows easy data processing.

Keywords: world fleet; the maritime world trade; world fleet performance indicators

Jel Classification: L91; R48

Presentation

Offer of shipping increasingly evolved during 1990-2010, as you can see in the graphic number 1, the tendency in which the global fleet responded to the increases in world trade carried by sea.

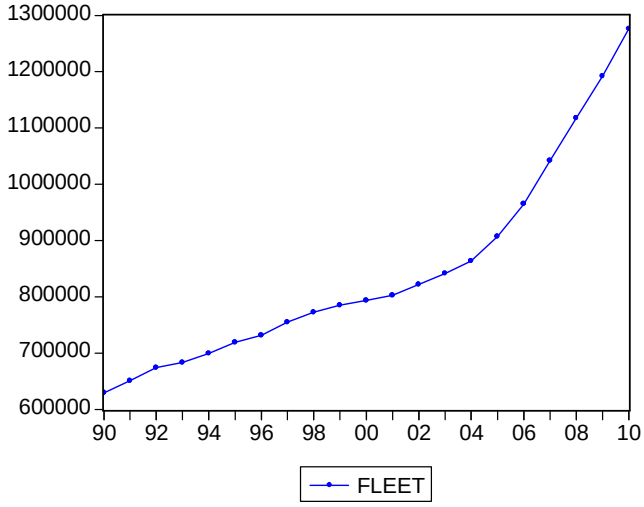

Figure 1. World fleet evolution during 1990-2010 - in tons dwt[3]

In terms of dimensional fleet in a year (t) is depended on the fleet from a previous year (t-1), the new transport capacity in exportation entered when (t-1) and the decline in exportation due to various

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[3] UNCTAD Review of Maritime Transport 2011

reasons, such as sales for scrap, losses caused by maritime accidents, etc. Thus, for the period under consideration was recorded the following situation:

FLEET(t) = 1.092323475*FLEET(-1) + 0.4914855472*DELIVERES(-1) - 0.9697285654*SCRAP (-1) - 46.28292488; (1)

FLEET- represents the fleet in year(t)
FLEET(-1) represents the fleet in year (t-1)
DELIVERES(-1) new transport capacity entered into service in year(t-1)
SCRAP(-1) transport capacity out of operation in year (t-1)

Table 1. Results obtained on the Eviews program

Dependent Variable: FLEET
Method: Least Squares
Date: 03/05/12 Time: 14:50
Sample (adjusted): 1995 2011
Included observations: 17 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FLEET(-1)	1.092323	0.062712	17.41821	0.0000
DELIVERES(-1)	0.491486	0.321752	1.527529	0.1506
SCRAP(-1)	-0.969729	0.167368	-5.793983	0.0001
C	-46.28292	33.58173	-1.378217	0.1914

R-squared	0.999447	Mean dependent var	862.3412
Adjusted R-squared	0.999320	S.D. dependent var	199.3134
S.E. of regression	5.199182	Akaike info criterion	6.337204
Sum squared resid	351.4094	Schwarz criterion	6.533254
Log likelihood	-49.86623	F-statistic	7833.600
Durbin-Watson stat	2.282353	Prob(F-statistic)	0.000000

Table 2. Empirical values, adjusted and chart residues

Actual	Fitted	Residual	Residual Plot
656.3	656.671.126.307.132	-0.371126307132528	| . * . |
668.1	671.652.404.740.135	-355.240.474.013.497	| .* | . |
686.3	683.784.578.430.662	251.542.156.933.834	| . |* . |
707.1	704.677.121.527.021	242.287.847.297.884	| . |* . |
717.3	719.917.297.319.317	-261.729.731.931.719	| .* | . |
731	728.107.132.578.115	289.286.742.188.496	| . | *. |
749	751.908.412.403.909	-29.084.124.039.091	| .* | . |
760.6	762.948.920.487.699	-234.892.048.769.929	| . *| . |
777.7	778.404.125.126.436	-0.704125126436026	| . *| . |
804.9	804.198.954.153.817	0.701045846182666	| . |* . |
849.6	848.823.957.584.145	0.776042415854839	| . |* .

			|
907.6	906.626.614.077.091	0.973385922908747	| . |* . |
969.4	97.093.903.470.545	-153.903.470.545.029	| . *| . |
1040.8	104.075.578.057.349	0.0442194265101534	| . * . |
1117.1	111.384.561.013.652	325.438.986.348.341	| . | *. |
1213.3	120.120.240.386.867	12.097.596.131.325	| . | . *|
1303.7	131.533.652.598.039	-116.365.259.803.893	|* . | . |

Table number 1 gives us information about the regression coefficients, which can tell us the following things:

- Constant term C is equal to -46.28292 and has a standard error equal to 33.58173;
- FLEET coefficient (-1) = 1.092323 express fleet growth (t) due to increased fleet of (t-1) with a unit which has a standard error equal to 0.062712;
- DELIVERES coefficient (-1) = 0.491486 express fleet growth (t) due to increased entry of operation of ships (t-1) with a unit which has a standard error equal to 0.321752;
- SCRAP coefficient (-1) = -0.969729 expression of decreased fleet(t) following the removal of ships operating (t-1) with a unit which has a standard error equal to 0.167368;

Table number 2 presents the empirical values and adjusted based on the regression and the coefficients mentioned above, and also shows the residual values and their graphic.

If this model wanted to show that the fleet is a system with inputs and outputs, the increase in transport capacity due to the fact that inputs are greater than outflows from operations. In the following, we want to establish that not the entire existing fleet in service at a time and participate in transportation services. We take in consideration that at some point fleet comprises a fleet of both active and inactive. Inactivity transport capacity is due to multiple causes, like decreased levels of the market of transport services which determinate unattractive vessel operation, the low price of scrap disposal, shipbuilding prices, etc. (Puscaciu, 1999)

Thus, in the analyzed period, the fleet on these components has evolved as shown in Table No. 3.

Table 3. World-fleet structure, involves three main types of ships at the end of the year

		1990	2000	2004	2005	2006	2007	2008	2009	2010*
Inactive fleet	mil dwt	62,4	18,4	6,2	7,2	10,1	12,1	19,0	12,0	14,4
Active fleet	mil dwt	203,8	568,0	660,8	690,7	763,7	818,6	857,2	918,3	923,1
Inactive fleet	%	23,44	3,14	99,07	98,97	98,69	98,54	97,83	98,71	98,46
Active fleet	%	76,56	96,86	0,93	1,07	1,31	1,46	2,17	1,29	1,54

- Data from April 1, 2010;
- Fleet of tankers and bulk carriers is expressed by more than 10,000 dwtsicargouri and by 5000 dwtsipeste;
- The surplus of tonnage is defined as tonnage that is not fully utilized due to partial exploits or non exploits for various reasons[1].

In the data from the table below we can observe a significantly higher share of total active fleet, phenomenon due to a favorable market situation of transport, more precisely an appropriate request, but also increase the price of new shipbuilding.

[1] UNCTAD Review of Maritime Transport 2011

Table 4. The impact of under spending on the indicator ton-miles per dwt depending on the size of the container ships in 2008-2010

Size ship in TEUs	% of services in operation in 2010	Number of ships in 2010	Number days by sea 2008	Number days by sea 2010	Miles traveled per year (% Change)	Dwt capacity used effectively (% Change)	Tons-miles per dwt 2008	Tons-miles per dwt 2010	% Change ton-miles per dwt
1000-2000	11,60 %	278	241	266	-10,40	4,10	19,00	14,70	-22,50
2000-3000	15,90 %	398	247	268	-8,50	2,80	20,90	16,70	-19,90
3000-5000	33,30 %	677	250	276	-10,40	5,80	23,30	17,80	-23,80
5000-8000	59,70 %	432	251	292	-16,30	10,20	25,30	17,30	-31,70
8000 +	80,00 %	266	259	298	-15,10	-	25,10	16,60	-33,90
TOTAL	34,80 %	2051	250	280	-12,00	7,00	22,80	16,90	-26,00

- assuming a 10% decrease in demand (tons transported) for all vessels (Cariou, 2010)

Some comments on the table number 4 is required:

- a reduction in transport demand determine under-utilization of the fleet, in this case the fleet of container vessels;
- The reduction in demand has a different impact on vessel size, as larger ships are more vulnerable to this trend;
- Reduce the amount of performance, as measured by ton-miles per dwt unit;
- Number of days at sea grows march, despite reducing the level of performance.

We analyse the dependent of the fleet and maritime tonnage, which expresses the commerce carried by sea. Hence we present results given when the fleet is analyzed as a function of tonnage from the same period, and cases where the fleet is a depending on the tonnage of shipping in the prior period. (Stopford, 2009)

After processing with the Eviews software we get:

Table 5. Results obtained on Eviews program for fleet (t) and tonnage (t)

Dependent Variable: FLEET
Method: Least Squares
Date: 03/05/12 Time: 15:33
Sample: 1990 2010
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TOTAL_COM_MARITIM	112.5602	9.437037	11.92749	0.0000
C	176816.5	57641.59	3.067516	0.0063

R-squared	0.882182	Mean dependent var	844217.9
Adjusted R-squared	0.875981	S.D. dependent var	180121.7
S.E. of regression	63432.38	Akaike info criterion	25.04373
Sum squared resid	7.64E+10	Schwarz criterion	25.14321
Log likelihood	-260.9592	F-statistic	142.2651
Durbin-Watson stat	0.360628	Prob(F-statistic)	0.000000

Table 6. Results obtained on Eviews program for fleet (t) and tonnage (t-1)

Dependent Variable: FLEET
Method: Least Squares
Date: 03/05/12 Time: 15:47
Sample (adjusted): 1991 2010
Included observations: 20 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TOTAL_COM_MARITIM(-1)	117.8905	9.462262	12.45902	0.0000
C	170534.5	56487.84	3.018959	0.0074
R-squared	0.896090	Mean dependent var		854930.0
Adjusted R-squared	0.890317	S.D. dependent var		177805.7
S.E. of regression	58886.33	Akaike info criterion		24.89924
Sum squared resid	6.24E+10	Schwarz criterion		24.99882
Log likelihood	-246.9924	F-statistic		155.2271
Durbin-Watson stat	0.486928	Prob(F-statistic)		0.000000

Table 7. Results for Eviews program the fleet (t) and tonnage (t-2)

Dependent Variable: FLEET
Method: Least Squares
Date: 03/05/12 Time: 15:52
Sample (adjusted): 1992 2010
Included observations: 19 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TOTAL_COM_MARITIM(-2)	123.7510	7.389753	16.74629	0.0000
C	160600.1	43256.49	3.712740	0.0017
R-squared	0.942845	Mean dependent var		865648.4
Adjusted R-squared	0.939483	S.D. dependent var		175914.6
S.E. of regression	43275.26	Akaike info criterion		24.28785
Sum squared resid	3.18E+10	Schwarz criterion		24.38727
Log likelihood	-228.7346	F-statistic		280.4383
Durbin-Watson stat	0.468963	Prob(F-statistic)		0.000000

Tables (5) - (7) show that as maritime tonnage shifting R-square coefficient of determination increases, which means a better quality of the model, also reduces the standard error of regression. In other words, the world fleet is better adjusted at the global maritime tonnage with a time delay, estimated in terms of two years time to build a ship. Dependence of the maritime fleet and tonnage can be analyzed as following: tons transported per dwt unit, which is an indicator for evaluating the fleet. Given the evolution of this indicator in the analyzed period of time we suggest a cubic function. Results are presented in Table number 8.

Table 8. Results obtained on Eviews program for dependent of tons transported per unit time depending dwt

Dependent Variable: TON_DWT
Method: Least Squares
Date: 03/05/12 Time: 15:40
Sample: 1990 2010
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.
T	-0.380029	0.088908	-4.274422	0.0005
T^2	0.060212	0.009277	6.490664	0.0000
T^3	-0.002048	0.000278	-7.376788	0.0000
C	6.865435	0.231217	29.69260	0.0000

R-squared	0.898693	Mean dependent var	6.975182
Adjusted R-squared	0.880815	S.D. dependent var	0.634659
S.E. of regression	0.219105	Akaike info criterion	-0.028890
Sum squared resid	0.816117	Schwarz criterion	0.170066
Log likelihood	4.303350	F-statistic	50.26870
Durbin-Watson stat	1.751534	Prob(F-statistic)	0.000000

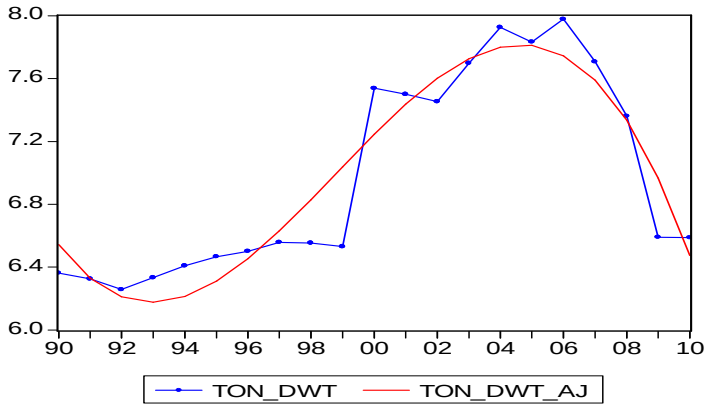

Figure 2. Evolution indicator dwt tons transported per unit

TON_DWT = -0.3800294961*T + 0.06021206382*T^2 - 0.00204776204*T^3 + 6.865434571; (2)

Graph number 2 shows a decline lately in the evolution of tones of freight transported by supply unit of the fleet, which shows a reduction in the demand for shipping. Recent years following the global crisis is affecting shipping and services[1].

For foreshadowing future trends in the market of transport services, we present in table number 9 the status of new ship orders, resulting in sharp drop in ship orders for bulk carriers and tanks and the total fleet, except other vessels like port container ships.

[1] UNCTAD Review of Maritime Transport 2011.

Table 9. Evolution of new ship orders million dwt[1]

Year	Tanks	Chemical transport ship	Bulk carriers	Combined transport ships	Other	Total
2002	17,7	1,6	21,9		8,4	49,6
2003	47,9	1,4	27,9		27,5	104,7
2004	34,0	2,2	28,8		28,1	93,1
2005	24,0	0,9	16,8		25,9	67,6
2006	74,7	6,8	39,0		25,7	146,2
2007	42,1	10,8	161,6	3,4	52,4	269,6
2008	47,4	2,7	91,4		20,4	161,9
2009	10,3	0,8	33,6		1,5	46,2
2010	38,5	1,6	83,5		10,8	134,4
2011	9,2	0,5	28		25,7	63,4

Conclusions

Following this approach can establish a set of conclusions:

- World fleet until now has seen capacity increases despite global crisis, this trend appreciate because of tendency in adjusting to the demand for transport fleet;
- World fleet segments, formed by the type of ship reacts differently to crisis;
- Certainly in the next few years could lower global fleet segments, tendency based on reducing new ship orders;
- Identification of relevant trends in the market of transport services requires the use of econometric studies.

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