Università Commerciale
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Ocean Carriers Case Study

SINGAPORE GROUP – BIEF 21

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Executive Summary

In 2001, Ocean Carriers has to evaluate whether to commission the construction of a 180,000-deadweight ton ship. The investment will prove not to be profitable under the current company policy of not operating vessels older than 15 years. The only profitable solution entails an extension of the operating period of the vessel up to 24 years coupled with the decision to set the financial headquarter in Hong Kong.

Summary of Facts

The construction of the ship would cost $39,000,000. In addition to special seaworthiness surveys, the cost of which will grow as the ship becomes older, the vessel has daily operating costs of $4,000 growing at an expected 4% annual rate. The revenues forecasts must rely upon the already agreed leasing terms for the first three years and on the estimates of the consulting firm enlisted by the company for the following years. If kept for 15 years, in line with the company policy, the vessel could be scrapped in 2017 for $5,000,000 or sold in the second-hand market at a price to be forecasted.

Statement of Problem

None of the ships in the company's fleet meets the charterer's request. Therefore, the core of the problem is the evaluation of the investment questioning the company policy and the financial headquarter location.

Evaluation of market conditions

Among the drivers which affect average daily hire rates, supply and demand for vessels play a significant role. The demand for dry bulk carriers is strictly connected to that for iron ore and coal, which accounts for the 85% of the cargo of these type of vessels. Given the interdependence of the two industries, it is reasonable to deduce that an increase in the demand for iron ore will trigger an increase in the demand for vessels, which in turn will drive up daily hire spot rates. Similarly, a decrease in fleet size, which we believe to be a reliable indicator for supply, causes the same effect. Notwithstanding these two characterizations of demand and supply, rates changes can also be caused by other striking factors, which may be bundled in two groups. The first group is composed by factors endogenous to the industry and includes the age of the fleet and the efficiency of the vessels. As the age of the vessels increases, rates

decrease. Moreover, efficiency is also an indicator for capacity improvements, technological breakthroughs and fuel efficiency. An increase in any of these factors will drive rates up. The second group includes variables exogenous to the dry bulk carrier industry, such as possible changes in trade patterns, trade barriers, extra-freight costs, transportation costs and fuel price. A rise in any of the above will inevitably increase the daily hire rates. Lastly, customer expectations and macroeconomic conditions play an indirect role in the determination of this economic context. For instance, negative iron ore production expectations will undoubtedly decrease the average daily hire rates, while interest rate, inflation or any geo-political pressure will affect this market as any other market. The charterer proposal becomes even more attractive when the trend of the spot rates is added as a supplement to the prior more general analysis for the evaluation of the investment. After a decline in 2001, the average daily charter rates in 2002 are expected to increase (Exhibit 1). Built on the assumption that when demand decreases scrapping increases, the 2001-2002 rise in charter rate (Exhibit 2), symptomatic of an increase in demand, lets us infer that scrapping will diminish. Therefore, a plausible estimate of the fleet size for 2002 is 644. Iron ore vessel shipments instead increase from 436 to 445 in 2002 (Exhibit 1). Historical data (Exhibit 2) point out that whenever there has been a situation in which iron ore vessels shipment and fleet size have driven the hire rates in opposite directions, the effect deriving from the former has been stronger than the one deriving from the latter (Exhibit 3). We support our thesis running two correlation matrices (Exhibit 4). The results clearly indicate that a stronger and more significant correlation exists between the demand and the average spot rates. Therefore, for what concerns 2002 spot rates, they are expected to increase. On the other hand, it is fundamental to analyse the long-term prospects as well. One major issue is that supply fails to quickly respond to shifts in demand. Thus, any success in identifying causes for shifts in demand is connected to the issue of assessing when and how the supply will respond. One event that will possibly trigger a shift in demand is the development of Australian and Indian ore exports expected for 2003, which will cause a permanent increase in trading volumes. Consequently, by different magnitudes, both charter and spot rates should increase in the long run. A strong wave of optimism could

in turn affect supply driving it up and if the demand fails to sustain such an increase in supply, splurging could cause the good market conditions to be soon reversed. For what concerns the supply side, we also foresee an increase in "global alliances[1]" consistent with past trends. This progressive polarization of the market on one side could improve transport efficiency, allowing the incumbents to beneficiate from economies of scale and scope, while on the other hand it could harness those who face more consistent barriers to entry the market.

Evaluation of the investment

To evaluate the investment from a financial prospective we opted for a discounted cash flow model with the purpose of calculating the NPV in 4 different scenarios. In concordance with the company policy, the first two scenarios evaluate the investment over a time period of 15 years (Table 1), while the other two contemplate the possibility of operating the vessel for 24 years instead of 25, to avoid the last massive survey capital expenditure (Table 2). The analysis is carried both for New York, where there is a 35% tax rate, and for Hong Kong, where firms are exempt to pay any tax on profits. The second-hand market price is also evaluated. Given the age of the vessel, three factors are influential in determining the value of a ship: freight rates, inflation and shipowners' expectations for the future. In normal conditions, a vessel would lose 5-6% of its value every year and we assume constant inflation and a modest growth of the market but on the other side a possible increase in freight rates, due to the opening of new sea routes. We believe that these effects will possibly balance out and that the vessel may lose value at the former rate, being valued on the market after 15 years at discount with respect to its book value (Exhibit 5).

Conclusion and recommendations

We recommend Ocean Carriers to change the company's policy in favour of an enlengthened operating period of the vessel and to settle the financial headquarter in Hong Kong. We also suggest to sell in the second-hand market as long as the vessel can be sold at a higher amount than the one obtained scrapping.

[1] Unctad, Review of Maritime Transport, 1999, Geneva

Tables and Exhibits

Table 1

15 Years Scenario

		gen-01	dic-01	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
1	**Capital Investment and disposal**	-3.900.000	-3.900.000	-31.200.000	-	-	-	-	-300.000	-	-	-	-	-350.000	-	-	-	-	5.000.000
3	**Depreciation (vessel)**				1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	-
4	**Accumulated Depreciation (vessel)**				1.560.000	3.120.000	4.680.000	6.240.000	7.800.000	9.360.000	10.920.000	12.480.000	14.040.000	15.600.000	17.160.000	18.720.000	20.280.000	21.840.000	-
5	**Depreciation CAPEX**				-	-	-	-	60.000	60.000	60.000	60.000	60.000	70.000	70.000	70.000	70.000	70.000	-
6	**Accumulated depreciation CAPEX**				-	-	-	-	60.000	120.000	180.000	240.000	300.000	370.000	440.000	510.000	580.000	650.000	-
7	**Total depreciation (3+5)**				1.560.000	1.560.000	1.560.000	1.560.000	1.620.000	1.620.000	1.620.000	1.620.000	1.620.000	1.630.000	1.630.000	1.630.000	1.630.000	1.630.000	-
8	**Total accumulated depreciation (4+6)**				1.560.000	3.120.000	4.680.000	6.240.000	7.860.000	9.480.000	11.100.000	12.720.000	14.340.000	15.970.000	17.600.000	19.230.000	20.860.000	22.490.000	-
9	**Year-end book value**				37.440.000	35.880.000	34.320.000	32.760.000	31.440.000	29.820.000	28.200.000	26.580.000	24.960.000	23.680.000	22.050.000	20.420.000	18.790.000	17.160.000	-
10	**Change in working capital**			-500.000	-15.000	-15.450	-15.914	-16.391	-16.883	-17.389	-17.911	-18.448	-19.002	-19.572	-20.159	-20.764	-21.386	734.267	-
11	**Expected daily hire rate**				20.000	20.200	20.400	18.714	17.283	17.481	17.682	17.886	18.092	17.428	17.628	17.831	18.036	18.243	-
12	**Days eligible for revenues accounting**				357	358	357	357	357	354	353	353	353	354	349	349	349	350	-
13	**Revenues**				7.140.000	7.231.600	7.282.800	6.680.898	6.170.031	6.188.274	6.241.746	6.313.758	6.386.476	6.169.512	6.152.172	6.223.019	6.294.564	6.385.050	-
14	**Daily operating costs**				4.000	4.160	4.326	4.499	4.679	4.867	5.061	5.264	5.474	5.693	5.921	6.158	6.404	6.660	-
15	**Days eligible for costs accounting**				365	366	365	365	365	366	365	365	365	366	365	365	365	366	-
16	**Operating Costs**				1.460.000	1.522.560	1.579.136	1.642.301	1.707.993	1.781.180	1.847.366	1.921.260	1.998.111	2.083.728	2.161.157	2.247.603	2.337.507	2.437.668	-
	New York																		
17	**EBIT (13-16-7)**				4.120.000	4.149.040	4.143.664	3.478.597	2.842.038	2.787.094	2.774.380	2.772.498	2.768.365	2.455.784	2.361.015	2.345.416	2.327.057	2.317.382	-
18	**Taxes**				1.442.000	1.452.164	1.450.282	1.217.509	994.713	975.483	971.033	970.374	968.928	859.524	826.355	820.896	814.470	811.084	1.750.000
19	**Net Income (17-18)**				2.678.000	2.696.876	2.693.382	2.261.088	1.847.324	1.811.611	1.803.347	1.802.123	1.799.437	1.596.259	1.534.660	1.524.520	1.512.587	1.506.299	-
20	**Depreciation tax shield**				546.000	546.000	546.000	546.000	567.000	567.000	567.000	567.000	567.000	570.500	570.500	570.500	570.500	570.500	-
21	**Operating Cash Flow (13-16-18)**				4.238.000	4.256.876	4.253.382	3.821.088	3.467.324	3.431.611	3.423.347	3.422.123	3.419.437	3.226.259	3.164.660	3.154.520	3.142.587	3.136.299	-1.750.000
22	**Net cash flow (1+10+21)**	-3.900.000	-3.900.000	-31.700.000	4.223.000	4.241.426	4.237.468	3.804.697	3.150.442	3.414.222	3.405.436	3.403.675	3.400.436	2.856.688	3.144.501	3.133.757	3.121.201	3.870.565	3.250.000
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
23	**Present Value**	-3.900.000	-3.577.982	-26.681.256	3.260.931	3.004.733	2.754.064	2.268.616	1.723.400	1.713.483	1.567.958	1.437.749	1.317.781	1.015.652	1.025.669	937.766	856.888	974.878	750.988
24	**Net Present Value**	**-9.548.683**																	
25	**IRR**	**3,86%**																	
	Hong Kong																		
17	**EBIT (13-16-7)**				4.120.000	4.149.040	4.143.664	3.478.597	2.842.038	2.787.094	2.774.380	2.772.498	2.768.365	2.455.784	2.361.015	2.345.416	2.327.057	2.317.382	-
18	**Taxes**				-	-	-	-	-	-	-	-	-	-	-	-	-	-	
19	**Net Income (17-18)**				4.120.000	4.149.040	4.143.664	3.478.597	2.842.038	2.787.094	2.774.380	2.772.498	2.768.365	2.455.784	2.361.015	2.345.416	2.327.057	2.317.382	-
20	**Depreciation tax shield**			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
21	**Operating Cash Flow (13-16-18)**				5.680.000	5.709.040	5.703.664	5.038.597	4.462.038	4.407.094	4.394.380	4.392.498	4.388.365	4.085.784	3.991.015	3.975.416	3.957.057	3.947.382	-
22	**Net cash flow (1+10+21)**	-3.900.000	-3.900.000	-31.700.000	5.665.000	5.693.590	5.687.751	5.022.206	4.145.155	4.389.705	4.376.469	4.374.049	4.369.364	3.716.212	3.970.857	3.954.653	3.935.671	4.681.649	5.000.000
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
23	**Present Value**	-3.900.000	-3.577.982	-26.681.256	4.374.419	4.033.483	3.696.648	2.994.577	2.267.542	2.203.045	2.015.048	1.847.646	1.693.272	1.321.242	1.295.209	1.183.416	1.080.491	1.179.166	1.155.366
24	**Net Present Value**	**-1.818.668**																	
25	**IRR**	**8,07%**																	

Table 2

[6]

25 Years Scenario

		gen-01	dic-01	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
1	**Capital Investment and disposal**	-3.900.000	-3.900.000	-31.200.000	-	-	-	-	-300.000	-	-	-	-	-350.000	-	-	-	-	-750.000	-	-	-	-	-850.000,00	-	-	-
3	**Depreciation (vessel)**				1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000	1.560.000
4	**Accumulated Depreciation (vessel)**				1.560.000	3.120.000	4.680.000	6.240.000	7.800.000	9.360.000	10.920.000	12.480.000	14.040.000	15.600.000	17.160.000	18.720.000	20.280.000	21.840.000	23.400.000	24.960.000	26.520.000	28.080.000	29.640.000	31.200.000	32.760.000	34.320.000	35.880.000
5	**Depreciation CAPEX**				-	-	-	-	60.000	60.000	60.000	60.000	60.000	70.000	70.000	70.000	70.000	70.000	150.000	150.000	150.000	150.000	150.000	170.000	170.000	170.000	170.000
6	**Accumulated depreciation CAPEX**				-	-	-	-	60.000	120.000	180.000	240.000	300.000	370.000	440.000	510.000	580.000	650.000	800.000	950.000	1.100.000	1.250.000	1.400.000	1.570.000	1.740.000	1.910.000	2.080.000
7	**Total depreciation (3+5)**				1.560.000	1.560.000	1.560.000	1.560.000	1.620.000	1.620.000	1.620.000	1.620.000	1.620.000	1.630.000	1.630.000	1.630.000	1.630.000	1.630.000	1.710.000	1.710.000	1.710.000	1.710.000	1.710.000	1.730.000	1.730.000	1.730.000	1.730.000
8	**Total accumulated depreciation (4+6)**				1.560.000	3.120.000	4.680.000	6.240.000	7.860.000	9.480.000	11.100.000	12.720.000	14.340.000	15.970.000	17.600.000	19.230.000	20.860.000	22.490.000	24.200.000	25.910.000	27.620.000	29.330.000	31.040.000	32.770.000	34.500.000	36.230.000	37.960.000
9	**Year-end book value**				37.440.000	35.880.000	34.320.000	32.760.000	31.440.000	29.820.000	28.200.000	26.580.000	24.960.000	23.680.000	22.050.000	20.420.000	18.790.000	17.160.000	16.200.000	14.490.000	12.780.000	11.070.000	9.360.000	8.480.000	6.750.000	5.020.000	3.290.000
10	**Change in working capital**			-500.000	-15.000	-15.450	-15.914	-16.391	-16.883	-17.389	-17.911	-18.448	-19.002	-19.572	-20.159	-20.764	-21.386	-22.028	-22.689	-23.370	-24.071	-24.793	-25.536	-26.303	-27.092	-27.904	-28.742
11	**Expected daily hire rate**				20.000	20.200	20.400	18.714	17.283	17.481	17.682	17.886	18.092	17.428	17.628	17.831	18.036	18.243	14.762	14.932	15.104	15.278	15.454	14.654	14.823	14.993	15.166
12	**Days eligible for revenues accounting**				357	358	357	357	357	354	353	353	353	354	349	349	349	350	349	349	349	350	349	349	349	350	349
13	**Revenues**				7.140.000	7.231.600	7.282.800	6.680.898	6.170.031	6.188.274	6.241.746	6.313.758	6.386.476	6.169.512	6.152.172	6.223.019	6.294.564	6.385.050	5.151.938	5.211.268	5.271.296	5.347.300	5.393.446	5.114.246	5.173.227	5.247.550	5.292.934
14	**Daily operating costs**				4.000	4.160	4.326	4.499	4.679	4.867	5.061	5.264	5.474	5.693	5.921	6.158	6.404	6.660	6.927	7.204	7.492	7.792	8.103	8.427	8.764	9.115	9.480
15	**Days eligible for costs accounting**				365	366	365	365	365	366	365	365	365	366	365	365	365	366	365	365	365	365	365	365	365	366	365
16	**Operating Costs**				1.460.000	1.522.560	1.579.136	1.642.301	1.707.993	1.781.180	1.847.366	1.921.260	1.998.111	2.083.728	2.161.157	2.247.603	2.337.507	2.437.668	2.528.248	2.629.378	2.734.553	2.851.726	2.957.692	3.076.000	3.199.040	3.336.116	3.460.081
	New York																										
17	**EBIT (13-16-7)**				4.120.000	4.149.040	4.143.664	3.478.597	2.842.038	2.787.094	2.774.380	2.772.498	2.768.365	2.455.784	2.361.015	2.345.416	2.327.057	2.317.382	913.690	871.890	826.743	785.574	725.754	308.246	244.187	181.434	102.853
18	**Taxes**				1.442.000	1.452.164	1.450.282	1.217.509	994.713	975.483	971.033	970.374	968.928	859.524	826.355	820.896	814.470	811.084	319.792	305.162	289.360	274.951	254.014	107.886	85.466	63.502	35.998
19	**Net Income (17-18)**				2.678.000	2.696.876	2.693.382	2.261.088	1.847.324	1.811.611	1.803.347	1.802.123	1.799.437	1.596.259	1.534.660	1.524.520	1.512.587	1.506.299	593.899	566.729	537.383	510.623	471.740	200.360	158.722	117.932	66.854
20	**Depreciation tax shield**				546.000	546.000	546.000	546.000	567.000	567.000	567.000	567.000	567.000	570.500	570.500	570.500	570.500	570.500	598.500	598.500	598.500	598.500	598.500	605.500	605.500	605.500	605.500
21	**Operating Cash Flow (13-16-18)**				4.238.000	4.256.876	4.253.382	3.821.088	3.467.324	3.431.611	3.423.347	3.422.123	3.419.437	3.226.259	3.164.660	3.154.520	3.142.587	3.136.299	2.303.899	2.276.729	2.247.383	2.220.623	2.181.740	1.930.360	1.888.722	1.847.932	1.796.854
22	**Net cash flow (1+10+21)**	-3.900.000	-3.900.000	-31.700.000	4.223.000	4.241.426	4.237.468	3.804.697	3.150.442	3.414.222	3.405.436	3.403.675	3.400.436	2.856.688	3.144.501	3.133.757	3.121.201	3.114.271	1.531.210	2.253.359	2.223.313	2.195.830	2.156.204	1.054.057	1.861.630	1.820.027	1.768.113
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
23	**Present Value**	-3.900.000	-3.577.982	-26.681.256	3.260.931	3.004.733	2.754.064	2.268.616	1.723.400	1.713.483	1.567.958	1.437.749	1.317.781	1.015.652	1.025.669	937.766	856.888	784.391	353.822	477.698	432.411	391.804	352.966	158.300	256.498	230.060	205.044
24	**Net Present Value**	**-7.340,743**																									
25	**IRR**	**5,78%**																									
	Hong Kong																										
17	**EBIT (13-16-7)**				4.120.000	4.149.040	4.143.664	3.478.597	2.842.038	2.787.094	2.774.380	2.772.498	2.768.365	2.455.784	2.361.015	2.345.416	2.327.057	2.317.382	2.063.690	2.021.890	1.976.743	1.935.574	1.875.754	478.246	414.187	351.434	272.853
18	**Taxes**				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	**Net Income (17-18)**				4.120.000	4.149.040	4.143.664	3.478.597	2.842.038	2.787.094	2.774.380	2.772.498	2.768.365	2.455.784	2.361.015	2.345.416	2.327.057	2.317.382	2.063.690	2.021.890	1.976.743	1.935.574	1.875.754	478.246	414.187	351.434	272.853
20	**Depreciation tax shield**				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	**Operating Cash Flow (13-16-18)**				5.680.000	5.709.040	5.703.664	5.038.597	4.462.038	4.407.094	4.394.380	4.392.498	4.388.365	4.085.784	3.991.015	3.975.416	3.957.057	3.947.382	2.623.690	2.581.890	2.536.743	2.495.574	2.435.754	2.038.246	1.974.187	1.911.434	1.832.853
22	**Net cash flow (1+10+21)**	-3.900.000	-3.900.000	-31.700.000	5.665.000	5.693.590	5.687.751	5.022.206	4.145.155	4.389.705	4.376.469	4.374.049	4.369.364	3.716.212	3.970.857	3.954.653	3.935.671	3.925.354	1.851.002	2.558.521	2.512.673	2.470.781	2.410.217	1.161.944	1.947.096	1.883.529	1.804.111
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
23	**Present Value**	-3.900.000	-3.577.982	-26.681.256	4.374.419	4.033.483	3.696.648	2.994.577	2.267.542	2.203.045	2.015.048	1.847.646	1.693.272	1.321.242	1.295.209	1.183.416	1.080.491	988.678	427.717	542.390	488.689	440.864	394.548	174.503	268.274	238.087	209.219
24	**Net Present Value**	**311.530**																									
25	**IRR**	**9,14%**																									

[2] We reasonably assume that:

i. The charterer's default risk is close to zero
ii. Every survey is made at the beginning of the year and there is no accounting for the last survey due to the burden it will pose on the firm
iii. The 9 % discount rate is constant, i.e. WACC does not change over 25 years
iv. The analysis is carried in nominal terms
v. Working capital is entirely recovered at the end of the operating period
vi. The vessel is always depreciated over its entire useful life
vii. CAPEX is depreciated over 5 years
viii. The scrapping value at the end of the 25th year is zero

Exhibit 1[3]

Age of Ship	Event Year	Calendar Year	Iron Ore Shipments (Millions of Tons)	% Growth	Avg Daily Charter Rate	% Growth
	0	2000	440	7.3%	15,344	21.5%
	1	2001	436	-0.9%	14,747	-3.9%
	2	2002	445	2.0%	15,072	2.2%

Exhibit 2[4]

	1994	1995	1996	1997	1998	1999	2000	2001E
Iron ore vessel shipments	375	397	385	424	420	410	440	436
Fleet size	NA	NA	NA	540	523	523	552	612
Avg. spot rate	$16,851	$20,149	$11,730	$14,794	$10,105	$9,427	$22,575	
Avg. 3-yr charter rate	$18,250	$18,544	$14,079	$16,063	$13,076	$12,626	$15,344	

Exhibit 3[5]

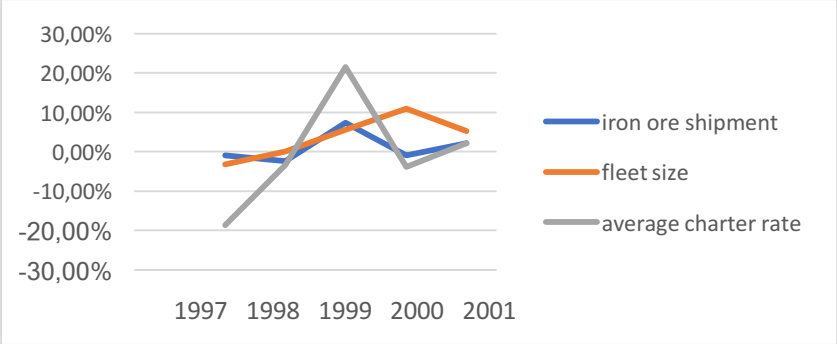
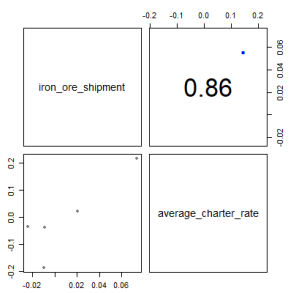


Exhibit 4[6]

```
Variables: iron_ore_shipment, average_charter_rate
Null hyp.: variables x and y are not correlated
Alt. hyp.: variables x and y are correlated

Correlation matrix:
                      iron_ore_shipment
average_charter_rate 0.86

p.values:
                      iron_ore_shipment
average_charter_rate 0.06
```




```
Variables: fleet_size, average_charter_rate
Null hyp.: variables x and y are not correlated
Alt. hyp.: variables x and y are correlated

Correlation matrix:
                      fleet_size
average_charter_rate 0.49

p.values:
                      fleet_size
average_charter_rate 0.40
```

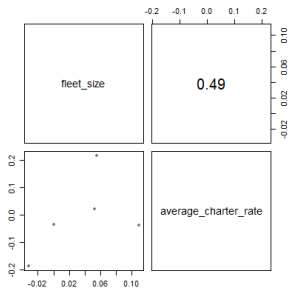
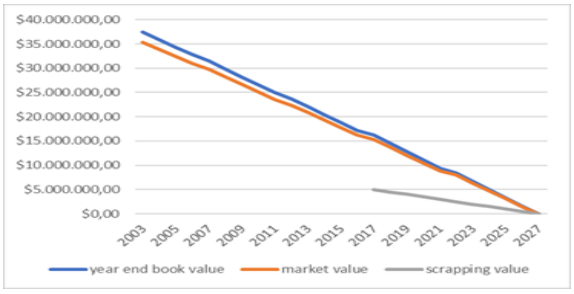


Exhibit 5[7]



[3] Forecasted daily time charter rates for new capesize vessel
[4] Worldwide iron ire vessel shipments, fleet size and average daily hire rates for capesize charters, 1994-2001
[5] 1994-2001 trend of iron ore shipments, fleet size and average charter rates
[6] The data used for the analysis is provided in Exhibit 2. The Correlation matrix, generated with Radiant, explains the growth rate of the dependent variable (average_charter_rate) as a function of the growth rate of the independent variables (iron_ore_shipments, fleet_size)
[7] Long term trend of second hand market price and comparison with the scrapping value and the book value