DOKUZ EYLÜL UNIVERSITY

GRADUATE SCHOOL OF SOCIAL SCIENCES

DEPARTMENT OF MARITIME BUSINESS ADMINISTRATION

MARITIME BUSINESS ADMINISTRATION PROGRAM

MASTER THESIS

THE EFFECTS OF CRUDE OIL PRICES ON THE TANKER MARKET IN THE SHORT RUN

Abdullah AÇIK

Supervisor

Assoc.Prof.Dr. Sadık Özlen BAŞER

İZMİR – 2016

MASTER THESIS/PROJECT
APPROVAL PAGE

University	: Dokuz Eylül University
Graduate School	: Graduate School of Social Sciences
Name and Surname	: ABDULLAH AÇIK
Title of Thesis	: The Effects of Crude Oil Prices on the Tanker Market in the Short Run
Defence Date	: 12.08.2016
Supervisor	: Assoc Prof.Dr.Sadık Özlen BAŞER

EXAMINING COMMITTE MEMBERS

Title, Name and Surname	University	Signature
Assoc Prof.Dr.Sadık Özlen BAŞER	DOKUZ EYLUL UNIVERSITY	.....
Assoc Prof.Dr.İsmail Bilge ÇETİN	DOKUZ EYLUL UNIVERSITY	.....
Assist Prof.Dr.Muhittin Hakan DEMİR	IZMIR UNIVERSITY OF ECONOMICS	.....

Unanimity (X)
Majority of votes ( )

The thesis titled as "**The Effects of Crude Oil Prices on the Tanker Market in the Short Run**" prepared and presented by ABDULLAH AÇIKis accepted and approved.

Prof.Dr.Mustafa Yaşar TINAR
Director

DECLARATION

I hereby declare that this master's thesis titled as '**The Effects of Crude Oil Prices on The Tanker Market in The Short Run**' has been written by myself in accordance with the academic rules and ethical conduct. I also declare that all materials benefited in this thesis consist of the mentioned resources in the reference list. I verify all these my honour.

23/07/2016

Abdullah AÇIK

Signature



ABSTRACT

Master Thesis

The Effects of Crude Oil Prices on The Tanker Market in The Short Run

Abdullah AÇIK

Dokuz Eylül University

Graduate School of Social Sciences

Department of Maritime Business Administration

Maritime Business Administration Program

Law of supply and demand is the one of the main economic law. As is known, world seaborne transportation demand is derived from these supply and demand. Majority of the goods that supplied and demanded are transported by sea. Hence the factors that affect supply and demand also affect sea transportation. The one of the most important factors that affect supply and demand is price of the goods.

Oil transportation has one of the highest transportation volume in sea transportation. As mentioned above, oil price will definitely affect this transportation activity. In the short run, oil prices had reached the highest levels and then they have fallen to lowest levels in the history.

Building a ship activity which is the source of ship supply takes time between 1-3 years. So the data which covers about 3 years is used in this academic study. It is assumed as short run because of changing one of the production functions in this period.

The objective of this academic study is examining the short run relationship between oil prices and tanker market. In this study, tanker market is examined via some econometric tests and share of oil price is determined in these tests. In this way the effects of crude oil prices on the tanker market in the short run is tried to find out.

Keywords: Oil Prices, Tanker Market, Short Run Effects

ÖZET

Yüksek Lisans Tezi

Ham Petrol Fiyatlarinin Tanker Piyasasina Kisa Dönemde Etkileri

Abdullah AÇIK

Dokuz Eylül Üniversitesi

Sosyal Blimler Enstitüsü

Denizcilik İşletmeleri Yönetimi Anabilim Dalı

Denizcilik İşletmeleri Yönetimi Programı

Ekonominin en temel kanunlarından biri de arz ve talep kanunundur. Bilindiği üzere dünya deniz ticareti de bu arz ve talebin türetilmiş bir talebidir. Arz ve talep edilen malların büyük bir çoğunluğu da deniz yoluyla taşınmaktadır. Dolayısıyla arz ve talebi etkileyen faktöreler deniz taşımacılığını da etkilemektedir. Arz ve talebi etkileyen en büyük faktörlerden biri de malların fiyatlarıdır.

Deniz ticaretinin en büyük hacimli ticaret kalemlerinden biri de petrol taşımacılığıdır. İlk paragrafta bahsedildiği üzere, petrol fiyatları bu ticareti muhakkak önemli derecede etkileyecektir. Kısa dönemde petrol fiyatları tarihin en yüksek seviyesine çıkmış ve bu seviyeyi koruyamayarak tarihin en düşük seviyelerine gerilemiştir.

Gemi arzının kaynağı olan gemi inşada gemi yapım süresi 1-3 yıl arasında değişmektedir. Bu yüzden bu çalışmada yaklaşık 3 yıllık veriler kullanılmıştır. Üretim fonksiyonlarından biri değiştirilebildiği için dönem kısa dönem olarak varsayılmıştır.

Bu çalışmanın amacı, petrol fiyatlarıyla tanker piyasası arasındaki kısa dönemli ilişkiyi incelemektir. Çalışmada bazı ekonometrik testler uygulanarak tanker piyasası incelenmiş ve bu testlerdeki petrol fiyatlarının payı belirlenmiştir. Böylece ham petrol fiyatlarının tanker piyasına kısa dönemdeki etkileri ortaya çıkarılmaya çalışılmıştır.

Anahtar kelimeler: Petrol Fiyatları, Tanker Piyasası, Kısa Dönem Etki

LIST OF ABBREVITIONS

BBL	Billion Barrels
DWT	Deadweight metric tons
EIA	Energy Information Administration
FOB	Free on Board
LDT	Light Displacement
MTOE	Million Tonnes of Oil Equivalent
NB	Newbuilding
SH	Secondhand
TC	Time Charter
UNCTAD	United Nations Conference on Trade and Development
US	United States
VLCC	Very Large Crude Carrier
WS	Worldscale

THE EFFECTS OF CRUDE OIL PRICES ON THE TANKER MARKET IN THE SHORT RUN

CONTENTS

APPROVAL PAGE ii
DECLARATION iii
ABSTRACT iv
ÖZET v
LIST OF ABBREVITIONS vi
TABLE OF CONTENTS vii
LIST OF FIGURES x
LIST OF TABLES xii
LIST OF APPENDICIES xiv

INTRODUCTION 1

CHAPTER ONE
WORLD OIL PROFILE AND TRANSPORTATION

1.1. WORLD OIL PROFILE 3
1.1.1. World Oil Reserves 3
1.1.2. World Oil Production 4
1.1.3. World Oil Consumption 5
1.1.4. World Oil Trade 5
1.1.5. World Oil Prices 7
1.1.6. Production Cost of Oil 8
1.2. OIL TRANSPORTATION BY SEA 8

CHAPTER TWO
TANKER INDUSTRY

2.1.TANKER SHIPPING 11
2.1.1. Supply Side 11
2.1.2. Supply and Demand Balance 13
2.1.3. Shipping Cycles 15
2.1.4. Industry Attractiveness 17
2.2.TANKER INDUSTRY 18
2.2.1. Freight Market 20
2.2.1.1.Dirty Spot Market 21
2.2.1.2.Clean Spot Market 21
2.2.1.3.Time Charter Market 22
2.2.2. Sale and Purchase Market 23
2.2.3. Newbuilding Market 25
2.2.4. Demolition Market 26
2.2.5. Stock Exchange Market 28
2.3.THE WORLDSCALE INDEX 28

CHAPTER THREE
SHORT RUN RELATIONSHIP BETWEEN OIL PRICE AND TANKER INDUSTRY: ELASTICITY ANALYSIS

3.1.METHODOLOGY 30
3.1.1. Data Collection 32
3.1.2. Limitations of the Study 32
3.2.HYPOTHESIS 33
3.3.RESULTS 35
3.3.1. Correlation Relationship between Oil and Tanker Industry 35
3.3.1.1.Freight Market 35

3.3.1.1.1. Time Charter Earnings' Relationship with Oil 35
3.3.1.1.2. Dirty Spot Earnings' Relationship with Oil 39
3.3.1.1.3. Clean Spot Earnings' Relationship with Oil 43
3.3.1.1.4. Fleet's Relationship with Oil Price 46
3.3.1.2.Newbuilding Market's Relationship with Oil Price 49
3.3.1.3.Secondhand Market's Relationship with Oil Price 51
3.3.1.4.Demolition Market's Relationship with Oil Price 55
3.3.1.5.Stock Market's Relationship with Oil Price 58
3.3.2. VLCC Tanker Price Elasticity Models 60
3.3.3. VAR Granger Causality Test for Main Markets 73
3.3.4. Secondhand Market Elasticity Simulation 76
CONCLUSION 78
REFERENCES 82
APPENDICES

LIST OF FIGURES

Figure 1	Oil Major Trade Movements in 2014 (million tons)	p.7
Figure 2	Production Cost as a Function of Available Oil	p.8
Figure 3	World Seaborne Trade in Cargo Ton–Miles by Cargo Type (billion)	p.9
Figure 4	World Tanker Fleet (000 dwt)	p.11
Figure 5	Tanker Tonnage on Order (000 dwt)	p.12
Figure 6	Short Run Supply Curve for Tanker Services	p.13
Figure 7	Modelling Tanker Demand and Supply in the Short Run	p.15
Figure 8	The Shipping Cycle Stages	p.16
Figure 9	Four Shipping Markets	p.19
Figure 10	Baltic Dirty Tanker Index, Baltic Clean Tanker Index and Oil Price	p.20
Figure 11	Worldscale Rates of Various Dirty Tanker Transportation Routes	p.21
Figure 12	Worldscale Rates of Various Clean Tanker Transportation Routes	p.21
Figure 13	Independent Tanker Fleet Trading On Time Charter and Spot	p.22
Figure 14	Various Tanker Types' 1 Year Time Charter Earnings ($)	p.23
Figure 15	VLCC 5 Years Old, 10 Years Old and Newbuilding Prices (million $)	p.23
Figure 16	VLCC 5 Years Old Ship's Price and VLCC 1 Year Time Charter Earning	p.24
Figure 17	Values of Various 5 Years Old Tanker Types (million $)	p.25
Figure 18	Newbuilding Prices of Various Tanker Types (million$)	p.25
Figure 19	Newbuilding Prices of Various Tanker Types (million$)	p.26
Figure 20	Historical Demolition Prices of India	p.27
Figure 21	Demolition Prices of Various Countries	p.27
Figure 22	Stock Exchange Values of Two Crude Oil Transport Companies	p.28
Figure 23	Oil Price and 1 Year Time Charter Earnings	p.36
Figure 24	Scatterplot Matrix of 1 Year Time Charter Earnings and Oil Price	p.37
Figure 25	Oil Price and Dirty Spot Earnings	p.40
Figure 26	Scatterplot Matrix of Dirty Spot Earnings and Oil Price	p.41
Figure 27	Oil Price and Clean Spot Earnings	p.43
Figure 28	Scatterplot Matrix of Clean Spot Earnings and Oil Price	p.44

Figure 29 Oil Price, Laid-up Tonnage, Fleet and Oil Trade p.46
Figure 30 Scatterplot Matrix of Fleet and Oil Price p.47
Figure 31 Oil Price and Tonnage on Order p.48
Figure 32 Oil Price and Newbuilding Prices of Tankers p.49
Figure 33 Scatterplot Matrix of Newbuilding Prices and Oil Price p.50
Figure 34 Oil Price and Secondhand Prices of Tankers p.52
Figure 35 Scatterplot Matrix of Secondhand Prices and Oil Price p.53
Figure 36 Oil Price and Demolition Prices of Various Countries p.55
Figure 37 Scatterplot Matrix of Demolition Prices and Oil Price p.56
Figure 38 Oil Price and Stock Exchanges p.58
Figure 39 Scatterplot Matrix of Stock Prices and Oil Price p.59
Figure 40 Normal, Logarithmic and Stationary Graphics of Secondhand Value p.61
Figure 41 Normal, Logarithmic and Stationary Graphics of Newbuilding Value p.61
Figure 42 Normal, Logarithmic and Stationary Graphics of Time Charter Rates p.62
Figure 43 Normal, Logarithmic and Stationary Graphics of Oil Price p.62
Figure 44 Normal, Logarithmic and Stationary Graphics of China Demolition Price p.63
Figure 45 Cusum Structural Change Test for Secondhand Model p.64
Figure 46 Cusum Structural Change Test for Newbuilding Model p.68
Figure 47 Cusum Structural Change Test for China Demolition Model p.70
Figure 48 Cusum Structural Change Test for 1 Year Time Charter Model p.72

LIST OF TABLES

Table 1	World Oil Reserves by Region (billion barrels)	p.3
Table 2	World Oil Proved Reserves by Countries (BBL)	p.3
Table 3	World Oil Production by Region (Mtoe)	p.5
Table 4	Oil Reserve to Production Ratios (years)	p.5
Table 5	World Oil Consumption by Region (mtoe)	p.5
Table 6	Trade Movements of Oil	p.6
Table 7	Europe Brent Spot Price FOB	p.7
Table 8	World Seaborne Oil Trade (million mt)	p.9
Table 9	World Seaborne Trade in Cargo Ton–Miles by Cargo Type (billion)	p.10
Table 10	Shipping Markets	p.19
Table 11	Worldscale Basis Tanker	p.29
Table 12	Data Descriptions for Correlation Matrix of Time Charter	p.35
Table 13	Descriptive Statistics for Time Charter Earnings and Oil Price	p.38
Table 14	Correlation Matrix for Time Charter Earnings and Oil Price	p.38
Table 15	Data Descriptions for Correlation Matrix of Dirty Spot Earnings	p.39
Table 16	Descriptive Statistics for Dirty Spot Earnings and Oil Price	p.41
Table 17	Correlation Matrix for Dirty Spot Earnings and Oil Price	p.42
Table 18	Data Descriptions for Correlation Matrix of Clean Spot Earnings	p.43
Table 19	Descriptive Statistics for Clean Spot Earnings and Oil Price	p.44
Table 20	Correlation Matrix for Clean Spot Earnings and Oil Price	p.45
Table 21	Descriptive Statistics for Laid-up Tonnage, Fleet, Oil Trade and Oil Price	p.46
Table 22	Correlation Matrix for Laid-up Tonnage, Fleet, Oil Trade and Oil Price	p.47
Table 23	Tonnage on Order and Oil Price (000dwt)	p.48
Table 24	Data Descriptions for Correlation Matrix of Newbuilding Tanker Prices	p.49
Table 25	Descriptive Statistics for Newbuilding Values and Oil Price	p.50
Table 26	Correlation Matrix for Newbuilding Values and Oil Price	p.51
Table 27	Data Descriptions for Correlation Matrix of Secondhand Tanker Prices	p.52
Table 28	Descriptive Statistics for Secondhand Values and Oil Price	p.53

Table 29	Correlation Matrix for Secondhand Values and Oil Price	p.54
Table 30	Data Descriptions for Correlation Matrix of Demolition Prices	p.55
Table 31	Descriptive Statistics for Demolition Prices and Oil Price	p.56
Table 32	Correlation Matrix for Demolition and Oil Prices	p.57
Table 33	Data Descriptions for Correlation Matrix of Stock Exchange Prices	p.58
Table 34	Descriptive Statistics for Stock Exchange Rates and Oil Price	p.59
Table 35	Correlation Matrix for Stock Exchange Rates and Oil Prices	p.60
Table 36	Data Descriptions for Models	p.60
Table 37	Unit Root Test Results of Secondhand Value	p.61
Table 38	Unit Root Test Results of Newbuilding Value	p.61
Table 39	Unit Root Test Results of 1 Year Time Charter Rate	p.62
Table 40	Unit Root Test Results of Oil Price	p.62
Table 41	Unit Root Test Results of China Demolition Price	p.63
Table 42	Johansen Cointegration Test Analysis for Secondhand Value	p.63
Table 43	Regression Model of VLCC Secondhand Value-1	p.64
Table 44	Autocorrelation Test for Secondhand Model-1	p.65
Table 45	Regression Model of VLCC Secondhand Value-2	p.66
Table 46	Autocorrelation Test for Secondhand Model-2	p.66
Table 47	Johansen Cointegration Test Analysis for Newbuilding Value	p.67
Table 48	Regression Model of VLCC Newbuilding Value	p.67
Table 49	Autocorrelation Test for Newbuilding Model	p.68
Table 50	Johansen Cointegration Test Analysis for China Demolition	p.69
Table 51	Regression Model of China Demolition Prices	p.69
Table 52	Autocorrelation Test for China Demolition Model	p.70
Table 53	Johansen Cointegration Test Analysis for 1 Year Time Charter Rate	p.71
Table 54	Regression Model of VLCC 1 Year Time Charter Rate	p.71
Table 55	Autocorrelation Test for 1 Year Time Charter Model	p.72
Table 56	VAR Granger Causality Test for SH, NB, TC, OIL	p.74
Table 57	6 Scenarios for Various Possibilities	p.77

LIST OF APPENDICIES

Appendix 1	5 Years Old Tanker Prices	ap p.1
Appendix 2	Newbuilding Tanker Prices	ap p.5
Appendix 3	Demolition Prices By Countries	ap p.9
Appendix 4	Time Charter Earnings By Ship Types	ap p.13
Appendix 5	Weekly Europe Brent Spot Price Fob	ap p.17
Appendix 6	Stock Exchange Prices Of Tanker Companies	ap p.18

INTRODUCTION

Oil has a vital role in our lives. Dependence on oil has reached the highest levels in the history. Also researches for alternative energy resources have been carried out especially recent years. A lot of hopeful new developments have been occurred, but it is a key fact that dependence on oil will not be terminated in the near future. So importance of transportation need for oil reserves its necessity.

Oil's transport takes places via 2 main transportation types; seaborne oil transportation and pipeline oil transportation. Pipeline transportation is important as seaborne transportation but in this study seaborne transportation side will be examined.

As a commodity, oil price will definitely affect its supply and demand. Because of being derived demand, oil transportation will indirectly affected by oil prices. According to the law of supply and demand, if the price of a commodity decreases, demand of this commodity increases. Also suppliers of this commodity decrease supply because of economic reasons. The balance of demand and supply determines the price. Hence oil price determines the supply and demand for oil transportation. Demand for oil transportation can increase fast but supply side of it cannot increase evenly. Because building a ship may take time between 1 and 3 years.

In economics, if one of the production functions can be changed in a limited time, this time is named as a short run. So number of ships can be changed in shipping business in term of product function. In this study, short run relationship between shipping and oil price will be examined. Hence, effects of crude oil prices to the tanker market will be studied.

There are 3 chapters in this study. First chapter includes world oil profile and oil transportation. World oil reserves, world oil production, world oil consumption and world oil trade are examined. Also world oil transportation by sea is examined. This is the introduction chapter of this study.

The second chapter has an economic approach to oil transportation. Supply and demand sides of oil transportation are examined firstly. Also shipping cycles are briefly studied. Then tanker industry is divided into 5 subdivision as freight market,

shipbuilding market, secondhand market, demolition market and stock exchange market. All of these subdivisions are also examined through statistical approach.

The last chapter is the application part. So it includes correlation coefficient analysis, scatterplot matrix analysis, regression analysis, Granger causality test analysis and a simulation. Correlation coefficients between oil price and five subdivision markets are examined. Then the regression models for each market is developed and results are analyzed. Granger causality test is implemented to understand which variable is reason for another one. Lastly, the most meaningful model is chosen according to the results and a simulation model is developed based on some scenarios.

CHAPTER ONE

WORLD OIL PROFILE AND TRANSPORTATION

1.1. WORLD OIL PROFILE

1.1.1. World Oil Reserves

World proved oil reserves by regions are showed at the table below. Proved reserves means that, the reserves are economically beneficial. The world has more oil reserve but at this oil price and technology, they are not economical to get a benefit. According to the table, Middle East has the highest level of proved reserves in the world. Then South&Central America follows it.

Table 1: World Oil Reserves by Region (BBL)

	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
World	1419,0	1490,0	1529,5	1636,6	1675,3	1697,9	1701,0	1700,1
North America	221,5	216,6	218,1	221,6	225,3	229,2	232,5	232,5
S. & Cent. America	122,9	198,3	237,0	324,2	326,9	328,8	329,8	330,2
Europe & Eurasia	160,4	159,0	158,0	157,9	158,1	158,3	157,2	154,8
Middle East	754,9	753,7	753,1	765,9	797,9	809,0	808,7	810,7
Africa	119,2	119,9	122,6	125,0	125,2	130,6	130,1	129,2
Asia Pacific	40,0	42,4	40,8	42,0	41,9	42,2	42,7	42,7

Source: BP, 2015

World oil proved reserves by countries are showed below. According to the table, Venezuela has the biggest amount of proved reserves. Then Saudi Arabia, Canada, Iran and Iraq follows it.

Table 2: World Oil Proved Reserves by Countries (BBL)

	Country	**Amount**
1	Venezuela	298,400,000,000
2	Saudi Arabia	268,300,000,000
3	Canada	172,500,000,000
4	Iran	157,800,000,000
5	Iraq	144,200,000,000
6	Kuwait	104,000,000,000
7	Russia	103,200,000,000
8	United Arab Emirates	97,800,000,000
9	Libya	48,360,000,000

	Country	Amount
10	Nigeria	37,070,000,000
11	United States	36,520,000,000
12	Kazakhstan	30,000,000,000
13	Qatar	25,240,000,000
14	China	24,650,000,000
15	Brazil	15,310,000,000
16	Algeria	12,200,000,000
17	Mexico	9,812,000,000
18	Angola	9,011,000,000
19	Ecuador	8,832,000,000
20	Azerbaijan	7,000,000,000
21	European Union	5,789,000,000
22	India	5,675,000,000
23	Norway	5,497,000,000

Source: www.cia.gov, 2016

1.1.2. World Oil Production

World oil production by region are shown below. According to the table the highest level of production took place in Middle East Region in 2014.

Table 3: World Oil Production by Region (Mtoe)

	2007	2008	2009	2010	2011	2012	2013	2014
World	3948,6	3988,6	3885,8	3975,4	4008,1	4116,4	4126,6	4220,6
North America	632,7	612,0	621,7	639,0	659,7	721,2	784,7	866,8
S. & Cent. America	374,1	379,8	375,4	376,9	379,0	376,7	376,4	391,0
Europe & Eurasia	863,8	855,0	861,3	859,0	844,2	833,2	832,6	834,3
Middle East	1213,0	1268,3	1176,0	1218,1	1324,6	1343,2	1325,2	1339,5
Africa	483,0	484,9	466,8	479,6	405,3	441,7	412,8	392,2
Asia Pacific	382,0	388,6	384,5	402,7	395,3	400,4	394,9	396,7

Source: BP, 2015

When the production durations are considered, to know how long sources will be sufficient for countries, reserve to production ratios are calculated. Reserve to production ratios show how long production will continue if production continues as current amount of production.

Table 4: Oil Reserve to Production Ratios (years)

	2007	2008	2009	2010	2011	2012	2013	2014
World	47,3	49,1	51,6	53,9	54,7	53,8	53,8	52,5
North America	44,5	45,0	44,5	43,8	43,1	40,3	37,6	34,0
S. & Cent. America	46,0	73,2	88,6	120,8	121,4	122,8	123,2	118,8
Europe & Eurasia	24,7	24,7	24,4	24,4	24,9	25,3	25,1	24,7
Middle East	81,7	78,0	83,4	81,4	77,8	77,5	78,6	77,8
Africa	32,0	32,1	34,1	33,9	40,2	38,5	41,0	42,8
Asia Pacific	13,8	14,3	13,9	13,6	13,9	13,7	14,1	14,1

Source: BP, 2015

1.1.3. World Oil Consumption

Asia Pacific had the highest consumption amount in 2014 according to the table below. Then North America follows it. When the world consumption trend is considered, it can be come out that world oil consumption has an increasing trend.

Table 5: World Oil Consumption by Region (mtoe)

	2007	2008	2009	2010	2011	2012	2013	2014
World	4017,3	3999,0	3922,9	4041,8	4085,4	4133,2	4179,1	4211,1
North America	1123,1	1068,2	1016,7	1040,0	1030,2	1012,6	1025,3	1024,4
S. & Cent. America	262,6	274,3	273,2	286,3	297,2	304,3	317,8	326,5
Europe & Eurasia	957,7	956,7	913,3	907,7	901,6	880,4	869,3	858,9
Middle East	314,1	336,3	348,1	354,2	360,2	374,8	382,5	393,0
Africa	145,0	153,1	155,9	164,3	159,3	168,3	172,2	179,4
Asia Pacific	1214,8	1210,5	1215,8	1289,5	1336,9	1392,9	1412,1	1428,9

Source: BP, 2015

1.1.4. World Oil Trade

The table below shows trade movements as thousands barrels daily. The biggest importers according to the table are US, Europe and Japan. US is also one of the big exporter at the same time.

When the exporters of oil are examined, Middle East comes first place, then Former Soviet Union follows it, Asia Pasifics comes third.

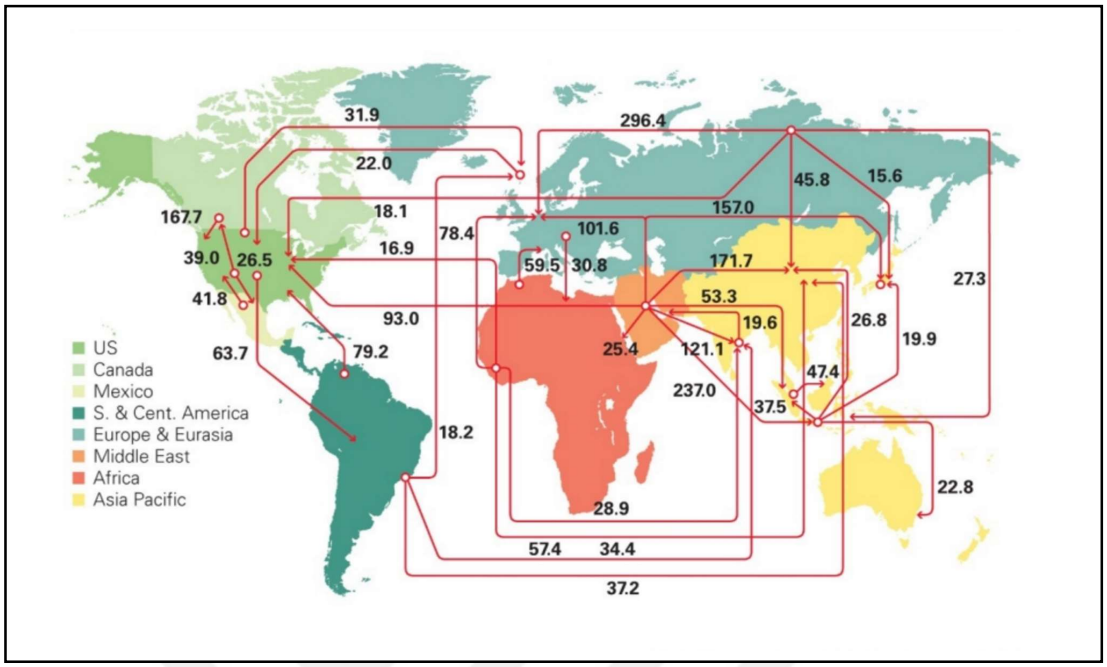
Table 6: Trade Movements of Oil

Thousand barrels daily	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	2014 share of total
Imports									
US	13632	12872	11453	11689	11338	10587	9792	9221	16.3%
Europe	13953	13751	12486	12094	12208	12488	12662	12601	22.2%
Japan	5032	4925	4263	4567	4494	4743	4573	4333	7.6%
Rest of World	22937	23078	24132	25160	26120	26930	29216	30581	53.9%
Total World	55554	54626	52333	53510	54160	54748	56243	56736	**100.0%**
Exports									
US	1439	1967	1947	2154	2495	2682	3564	4099	7.2%
Canada	2457	2498	2518	2599	2798	3056	3279	3535	6.2%
Mexico	1975	1609	1449	1539	1487	1366	1347	1290	2.3%
S. & Cent. America	3570	3616	3748	3568	3755	3830	3756	3929	6.9%
Europe	2273	2023	2034	1888	2053	2174	2356	2293	4.0%
Former Soviet Union	8334	8184	7972	8544	8569	8285	9001	8932	15.7%
Middle East	19680	20128	18409	18883	19687	19581	19787	19761	34.8%
North Africa	3336	3260	2938	2871	1945	2596	2124	1762	3.1%
West Africa	4830	4587	4364	4601	4637	4557	4417	4431	7.8%
Asia Pacifics	6004	5392	5631	6226	6088	6299	6142	6223	11.0%
Rest of World	1656	1363	1323	637	646	322	472	481	0.8%
Total World	55554	54626	52333	53510	54160	54748	56243	56736	**100.0%**

Source: BP, 2015

The figure below shows the oil trade movements between regions in 2014. Because of economic reasons, in spite of producing and exporting oil, some countries also import oil.

Figure 1: Oil Major Trade Movements in 2014 (million tons)



Source: BP, 2015

1.1.5. World Oil Prices

World oil prices as FOB are shown at the table below. In 2012, oil price had reached the highest point that it have never seen before.

Table 7: Europe Brent Spot Price FOB

Years	Oil Price	Years	Oil Price
1988	14,91	2002	24,99
1989	18,23	2003	28,85
1990	23,76	2004	38,26
1991	20,04	2005	54,57
1992	19,32	2006	65,16
1993	17,01	2007	72,44
1994	15,86	2008	96,94
1995	17,02	2009	61,74
1996	20,64	2010	79,61
1997	19,11	2011	111,26
1998	12,76	2012	111,63
1999	17,9	2013	108,56
2000	28,66	2014	98,97
2001	24,46	2015	52,32

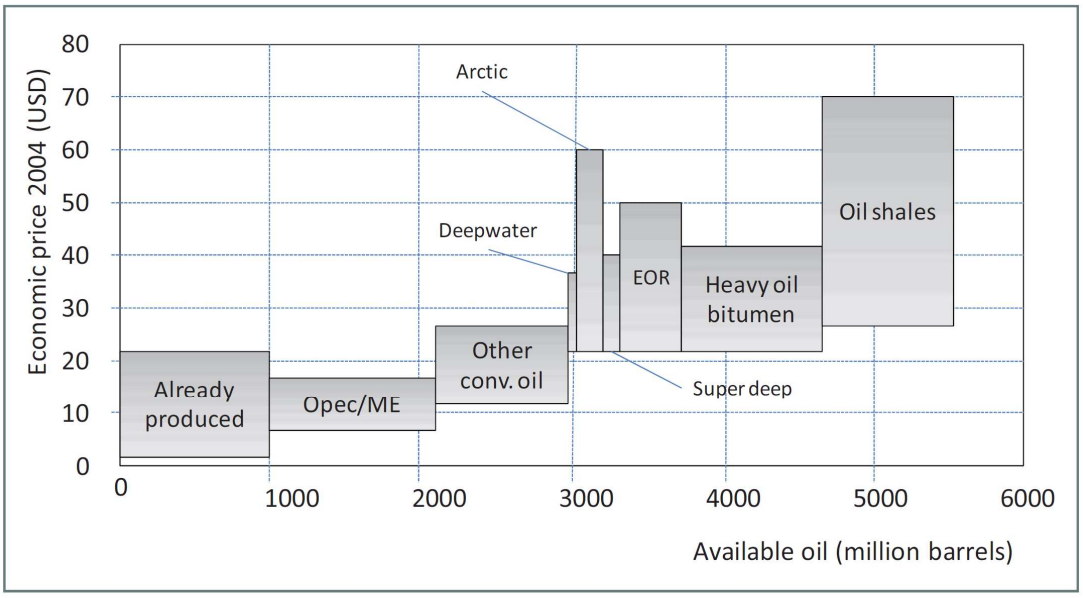
Source: EIA, 2016, Processed by the Author

1.1.6. Production Cost of Oil

Oil is tapped by different ways in order to get benefit. Of course all of these activities have different level of costs. The figure below illustrates that the world has untapped potential sources for next decades. It is mainly matter of price and technology (Wijnolst and Wergeland, 2009:119).

These costs may get reduced if new technologies are developed in order to exploit oil resources.

Figure 2: Production Cost as a Function of Available Oil



Source: (Wijnolst and Wergeland, 2009:119)

In the previous years it was economical to drill oil shales because of very high oil prices. The oil price was more than $100. But recent years it has decreased to about $35. So some players in the market have remained out of the play.

1.2. OIL TRANSPORTATION BY SEA

The table below shows the amount of seaborne crude oil loaded and unloaded by years. There is a decrease in recent years because of high oil prices and economic recession. This table doesn't cover the period of low oil prices that have started since 2014.

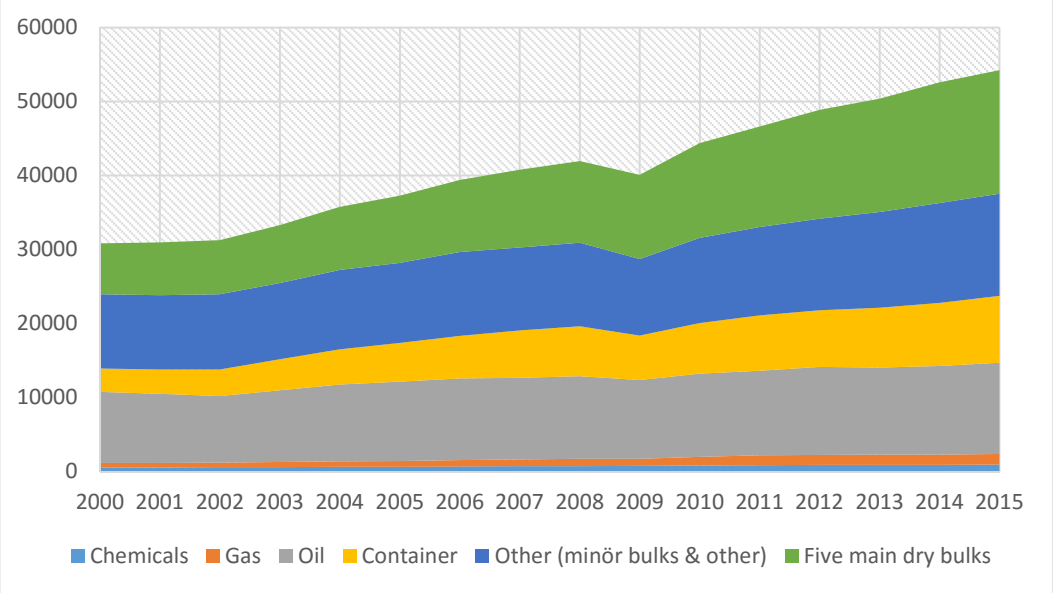
Table 8: World Seaborne Oil Trade (million mt)

Years	Crude Oil loaded	Crude Oil unloaded	Years	Crude Oil loaded	Crude Oil unloaded
1997	1626	1625	**2006**	1783	1931
1998	1548	1515	**2007**	1813	1996
1999	1553	1543	**2008**	1785	1942
2000	1605	1633	**2009**	1711	1874
2001	1678	1712	**2010**	1788	1933
2002	1637	1696	**2011**	1759	1897
2003	1690	1743	**2012**	1786	1930
2004	1770	1773	**2013**	1738	1882
2005	1857	1854	**2014**	1710	1862

Source: UNCTAD, 2015, Processed by the Author

The figure bellow shows world seaborne trade in cargo ton miles by cargo type. Ton miles can be defined as the tonnage of cargo shipped, multiplied by the average distance over which it is transported (Stopford, 2009:146).

Figure 3: World Seaborne Trade in Cargo Ton–Miles by Cargo Type (billion)



Source: UNCTAD, 2015

Five major dry bulks had the highest level of ton miles as seen at the table below. Then minor bulks follows them, Oil comes third according to this table.

Table 9: World Seaborne Trade in Cargo Ton–Miles by Cargo Type (billion)

	Chemicals	Gas	Oil	Container	Other (minor bulks & other)	Five main dry bulks
2000	552	576	9631	3170	9998	6896
2001	562	591	9352	3271	10023	7158
2002	593	611	8971	3601	10167	7331
2003	606	662	9698	4216	10275	7852
2004	625	719	10393	4785	10729	8527
2005	651	736	10729	5269	10782	9107
2006	689	833	11036	5757	11330	9745
2007	724	913	11011	6422	11186	10503
2008	736	956	11200	6734	11272	11028
2009	765	958	10621	6030	10325	11400
2010	824	1147	11237	6833	11504	12824
2011	864	1344	11417	7469	11927	13596
2012	889	1346	11890	7673	12375	14691
2013	908	1347	11779	8076	12952	15312
2014	899	1382	11969	8514	13514	16294
2015	912	1444	12339	9024	13833	16685

Source: UNCTAD, 2015

CHAPTER TWO

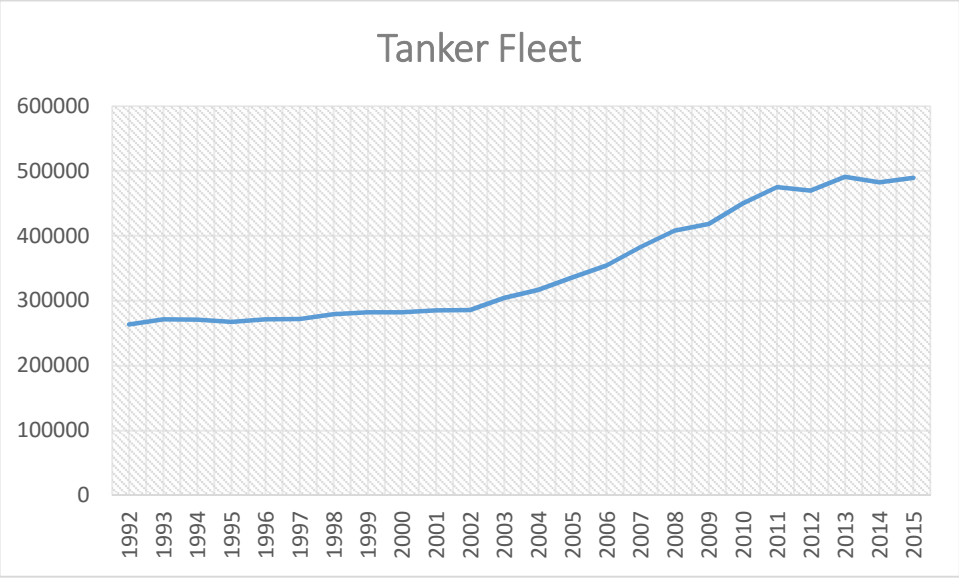
TANKER INDUSTRY

2.1.TANKER SHIPPING

2.1.1. Supply Side

The supply of ships consists of four groups of actors: shipowners, shippers/charterers, the bankers who finance shipping, and the various regulatory authorities who make rules for safety and fair trade activities. Shipowners are the primary decision-makers in the supply side of shipping. They order new ships, scrap old ones and decide when to lay up tonnage. Shippers may transform to shipowners themselves or influence shipowners by issuing time charters. Bank lending influences investment as making the market investible or exerting the financial pressure to shipowners that results to scrapping in a weak market. Regulators affect supply through safety or environmental legislation. This affects the transport capacity of the fleet such as double hull application in tanker transportation in the previous years (Stopford, 2009:150).

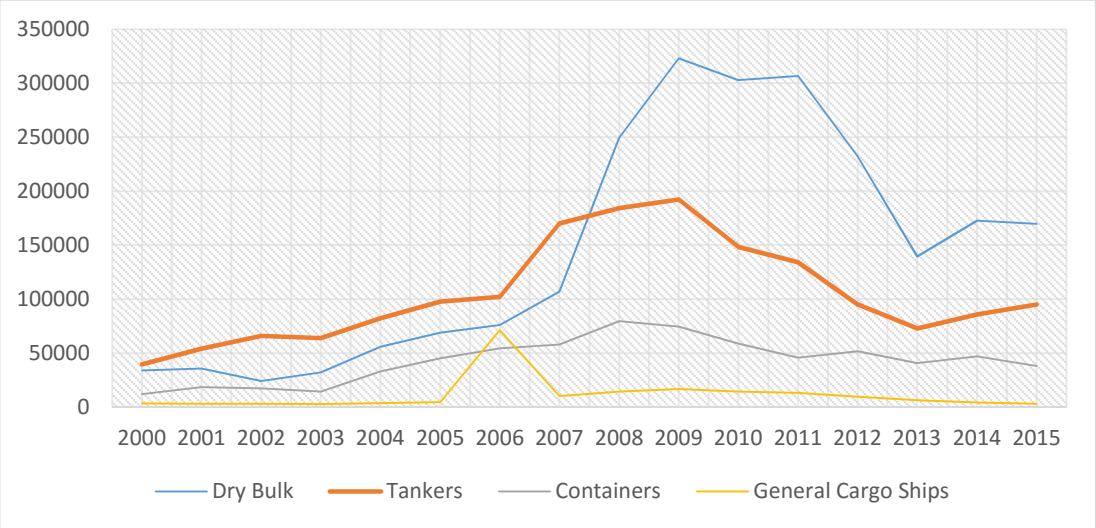
Figure 4: World Tanker Fleet (000 dwt)



Source: UNCTAD, 2015, Processed by the Author

The tanker fleet is formed of many different types of vessels. For example crude oil tankers are used for the deep sea transportation. The unrefined oil is transported from producing countries to refineries. Shuttle tankers are specially designed for offshore loading and transport to onshore storage facilities and refineries. Product tankers are multipurpose ships carrying various types of refined oil products in other words clean products. Their tanks are coated by special chemicals. So inside of the tanks are protected against corrosion. Thus their products remain clean and the tanks become easy to load and unload. The shuttle tanker has become a separate category in recent years (Wijnolst and Wergeland, 2009:112).

Figure 5: Tanker Tonnage on Order (000 dwt)

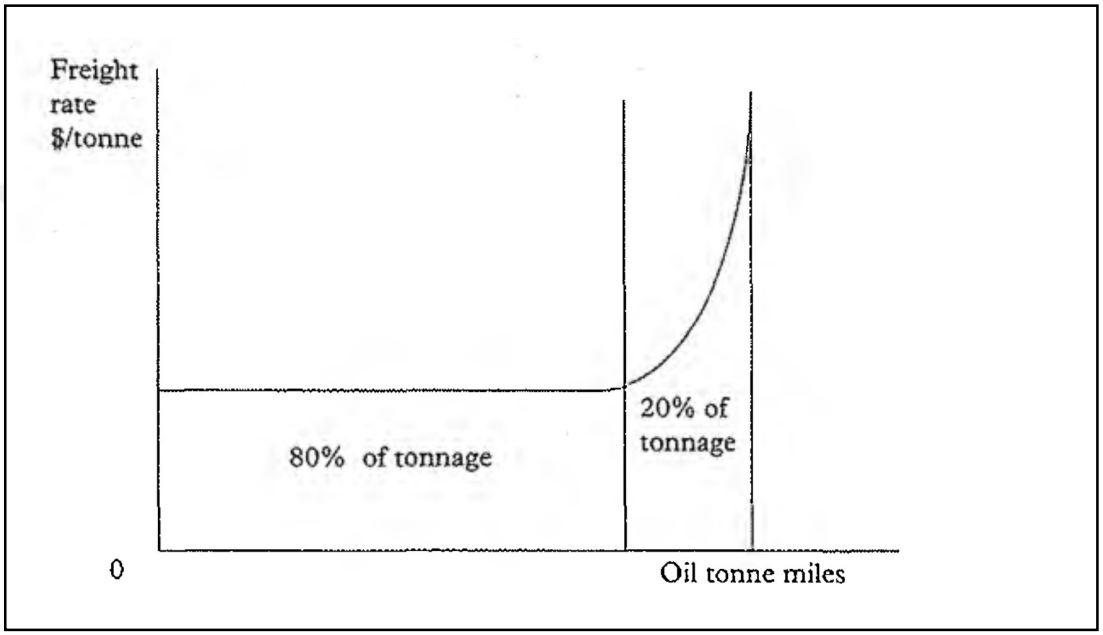


Source: UNCTAD, 2015, Processed by the Author

The short run supply schedule is shaped as revers “L” for tanker shipping market. When there is a low demand for tanker services according to existence of existing fleet, it is very elastic. But it becomes very inelastic (vertical) as demand approaches full capacity of the existing fleet. When trading conditions are poor, and freight earnings are low, the “flat” range of the supply curve is created by the ability to “mothball” tanker tonnage by placing the vessel in layup. As demand approaches the potential maximum productive capacity of the present fleet, all lay ups are brought into use, and the ability to further expand supply becomes very limited. This explains the vertical section of the short run supply curve (Grammenos, 2010:379).

The position of the short run cost curve is also refers to the overall level of marginal cost. The assumed value of factor input prices is one very important determinant of this. In the case of ships, the price of bunker fuel is the most meaningful short run input price. Because most of the short run variable costs are related to voyage activity. The position of the short run costs curve will shift upwards if bunker price rise significantly, and shift downwards if they fall (Grammenos, 2010:379).

Figure 6: Short Run Supply Curve for Tanker Services



Source: Grammenos, 2010:379

2.1.2. Supply and Demand Balance

The tanker industry means carrying oil from exporting to importing areas. The demand for oil transportation will thus depend on a few key factors:

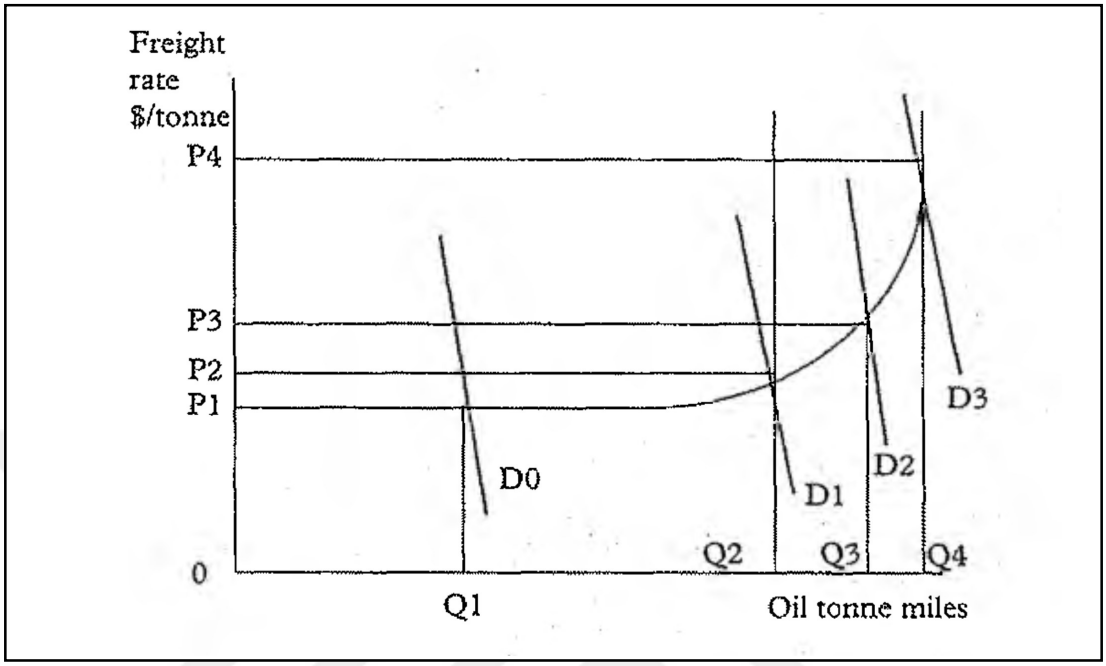
- The resource base - reserves for oil;
- Total demand for energy;
- Distribution of demand on energy sources;
- Developments in producing and exporting areas;
- Distance implications of trade patterns (Wijnolst and Wergeland, 2009:116).

High profits in the tanker market increases orders, as a result tanker deliveries in the near future also increase. But if the demand growth declines or hesitates, spot rates will decline because of the increased level of deliveries in the future. Also older

vessels which might have been scrapped are traded longer at the high level of demand. This situation causes a raise in the scrap price because of the reduction in the supply of tankers for scrap. In the meanwhile demand for shipbuilding increases which causes a pressure on yards. So newbuilding prices apt to rise. Thus freight rates, second hand prices, scrap prices and newbuilding prices will tend to move together in a cyclical trend. They affects each other with a limited effect. This process is driven by the interaction of many owners, charterers, shipbuilders and ship brokers. But none of them have any significant control over their environment in the shipping cycle (Grammenos, 2010:384).

Putting the very inelastic demand schedule together with the varying elasticity supply schedule generates a model of the equilibrium spot freight rate for tanker services. This is shown below, in the figure below. There is an important point about this figure which is irregular response of freight rates to shifts in the position of the demand curve. When demand increases from DO to D l, there is a large shift in demand. But there is little effect on the market freight rate. Because there are unemployed or underemployed vessels. The tanker supply elastic between these points. The balance freight rate moves from PI to P2 meantime tonne miles increase from Q1 to Q2. When demand shifts again, from D l to D2, the freight rates increase more than previous scenario. That demand shift is smaller than previous one but spare capacity is less readily available. As a result the freight rate rises from P2 to P3, and tonne miles increase from Q2 to Q3. Finally, when demand shifts from D2 to D3, small shifts in demand generate large increases in rates. Because tanker supply is perfectly inelastic. In this scenario, the freight rate rises rapidly from P3 to P4 but tonne miles performed rise only awhile from Q3 to Q4 (Grammenos, 2010:380).

Figure 7: Modelling Tanker Demand and Supply in the Short Run



Source: Grammenos, 2010:381

2.1.3. Shipping Cycles

The shipping market is not a constant market. The traditional shipping cycle has the following stages:

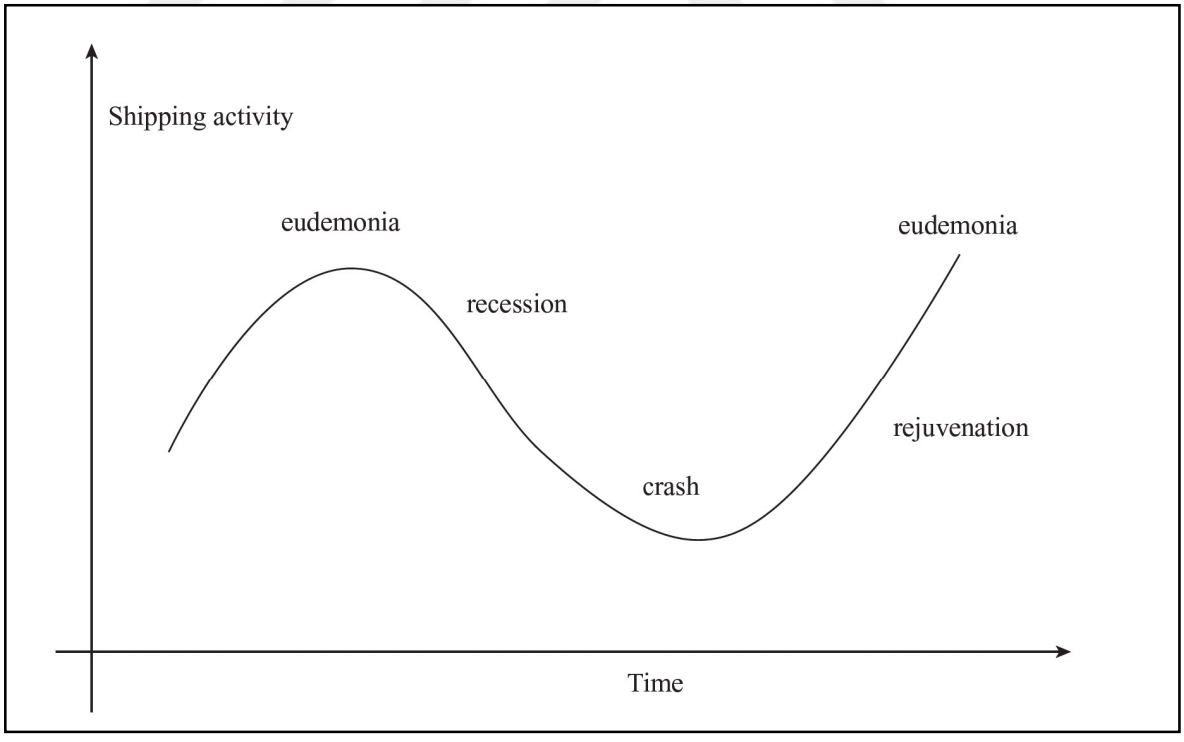
Rejuvenation Freight rates increase after ship supply has considerably decreased. There is a decrease on number of laid-up vessels so a balance occurs between supply and demand. Sentiments about the market become increasingly positive. So both second-hand vessel and scrapping prices increase.

Eudemonia The shipping market has reached now at high levels. Also ships earn two or three times more than their ship operational costs. Demand is very high, so the fleet operates at full speed in order to satisfy demand. Also very few inefficient ships are laid up. The ease of financing from banks certifies good market conditions. Second - hand prices exceed book value as came true in the previous years. Orders for newbuildings rise, as shipping companies have accumulated capital. Shipyards have long waiting lists and new vessels are delivered with a significant delay.

Recession When there is a surplus ship capacity, recession occurs. There are many ships in the ports and they are operating in slow steaming mode. Inefficient ships are laid-up because of decrease on freight rates. In the final stage, the prolonged duration of low freight levels, combined with negative cash flows, leads some shipping companies to sell vessels at low prices. Demolition prices for old ships decreases to market levels because of increase on number of the ships that are sent to the demolition. Also new orders decrease. So banks get very cautious when issuing new loans.

Crash Ship capacity exceeds demand because of delivery of ordered ships incrementally. Sentiments in the market turn negative direction and this situation expedites the market crash. Ships are operated at slow steaming mode again because of high decrease on freight rates. Despite the higher liquidity than earlier, orders of newbuilding vessels decreases because of general pessimism. Also Second-hand prices of the vessels decrease in parallel with newbuilding prices (Talley, 2012:213).

Figure 8: The Shipping Cycle Stages



Source: Talley, 2012:213

2.1.4. Industry Attractiveness

Several authors have made contributions to shedding light on the question of what makes an industry attractive. Seven factors are normally highlighted in this context:

- *Barriers to entry*

  The barriers to entry are very low in tanker shipping. So anyone could become a tanker owner overnight by simply buying a vessel and then purchasing both technical and commercial management of that vessel with one of the many international service providers.

- *Competitors*

  The fewer competitors, the higher the potential of exploiting market power and, normally, the higher is the attractiveness of the industry. The number of competitors is very high in all segments of the industry as the analysis clearly shows.

- *Product similarity*

  In general it is argued that the more differentiated the market is, the higher the attractiveness of the industry. Basically same product is often offered by tanker shipping, transportation of oil from A to B. There may be safety and environmental considerations made by oil companies when offering contracts. But by the end of the day, if transportation is scarce, one supplier is as good as anybody else.

- *Switching costs*

  The reason of high switching costs is high attractiveness. Loyal customers contribute highly to bottom line profits. Some tanker companies have established long term relationships with oil companies, no doubt giving them an advantage when securing particularly TC contracts. In a scarcity situation, however, this will not mean much - the oil companies will accept what they can get.

- *Demand growth*

  High demand growth is clearly related with high attractiveness of the industry. In this respect, the cruise industry has one of the highest scores. The transport work in crude oil shipping has grown on average 4% p.a. for the 45 years from 1962-2007. The industry is not a fast growing one. Because the current growth trend is around 2.5%.

- *Fixed costs*

  Low fixed costs are normally associated with high industry attractiveness. Tanker shipping is relatively capital intensive. Because the cost of acquiring the asset is high relative to the operations costs. In that context, the fixed costs may be regarded as high. Unlike liner shipping operations, however, an owner can lay up his vessel if the market is too unattractive, so very little of the total operation is truly fixed costs.

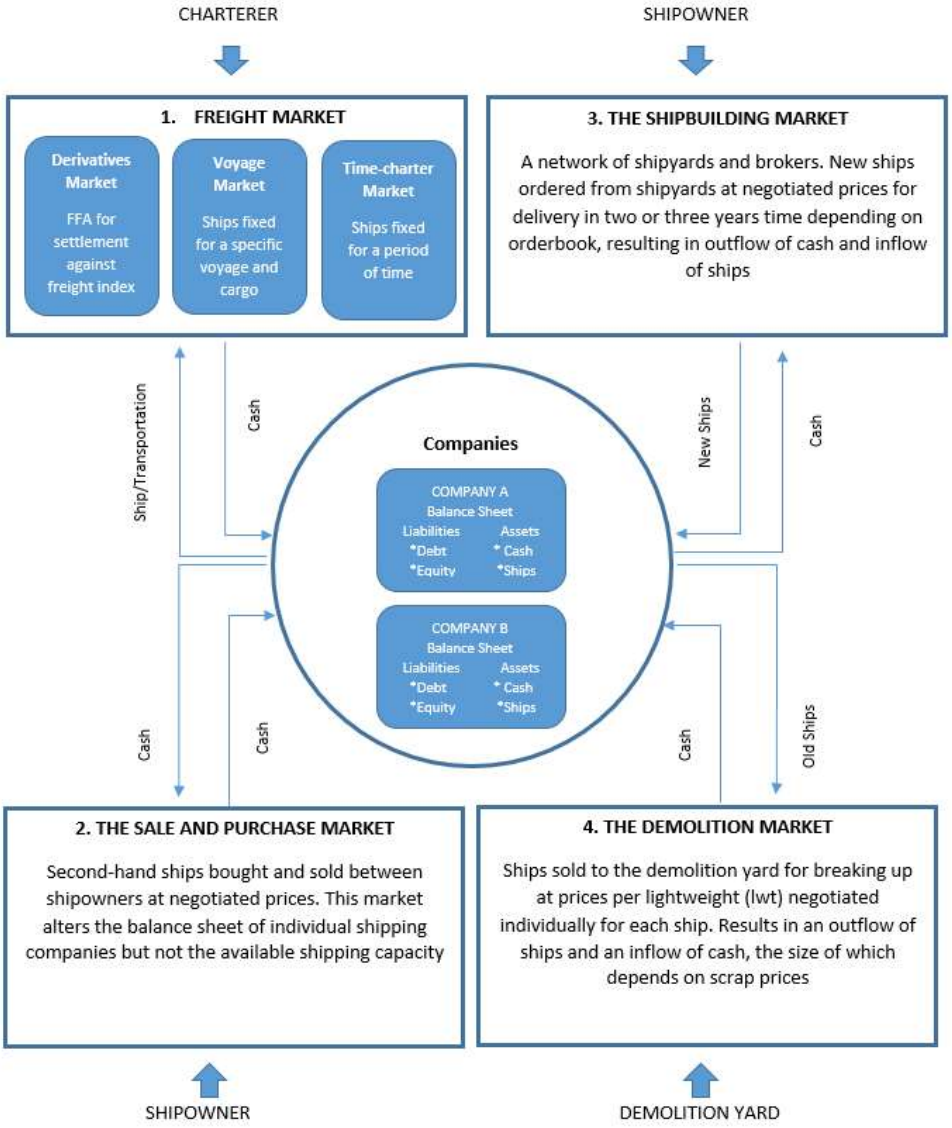
- *Barriers to exit*

  Low barriers to exit normally favours profitability. It is easy to get out of the tanker shipping business. Just a phone call to a broker will normally be sufficient to set in motion the necessary steps to get out of the business (Wijnolst and Wergeland, 2009:133).

2.2.TANKER INDUSTRY

Today sea transport services are provided by four closely related markets. Each of these markets are trading in a different commodity. The freight market trades in sea transport; the sale and purchase market trades second-hand ships; the newbuilding market trades new ships; and the demolition market deals in ships for scrapping (Stopford, 2009:177). Stock exchange market is added by author in order to analyze relationship between oil price and stock exchange prices of tanker shipping companies.

Figure 9: Four Shipping Markets



Source: Stopford, 2009:179

2.2.1. Freight Market

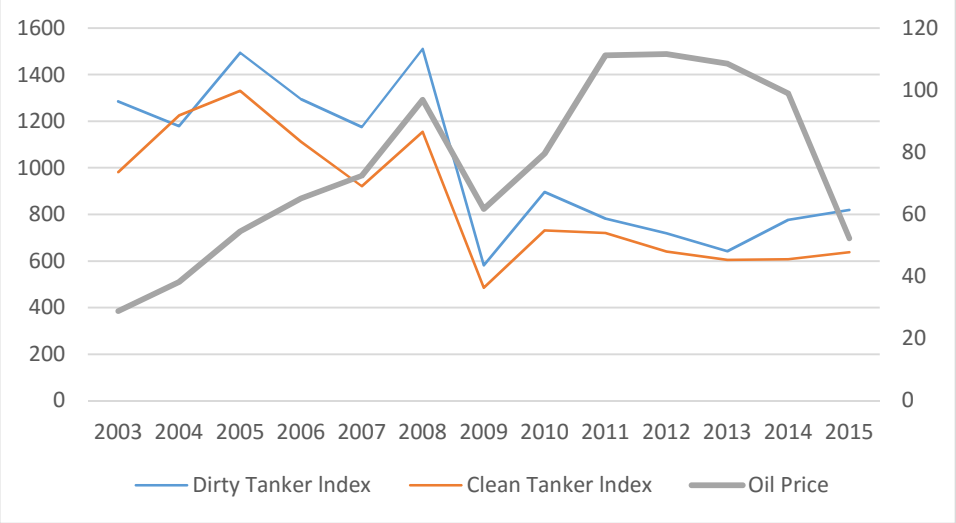
The freight market provides freight revenue as known. So it is the main source of cash for shipping companies like other companies. In fact there are three sectors to

this market which consist of voyage market, time charter market and freight derivatives market. The voyage market trades transport for a single voyage. The time-charter market hires out the ship for a limited time. The freight derivatives market deals in forward contracts settled against an index. The primary motivating force driving the activities of shipping investors are freight rates earned in these markets (Stopford, 2009:178).

In the short term the freight rates for tankers, bulk carriers, container-ships, gas tankers, and chemical tankers behave quite differently, but because it is the same broad group of traders, what happens in one sector eventually ripples through into the others (Stopford, 2009:180).

The tanker charter follows a similar pattern to that for the dry cargo market, though in this case the main division in the reported charter is between 'clean' and 'dirty'. The clean charters refer to products tankers carrying clean oil products such as gasoline, diesel fuel and jet fuel, while the dirty charters refer to crude oil and black products (Stopford, 2009:190).

Figure 10: Baltic Dirty Tanker Index, Baltic Clean Tanker Index and Oil Price

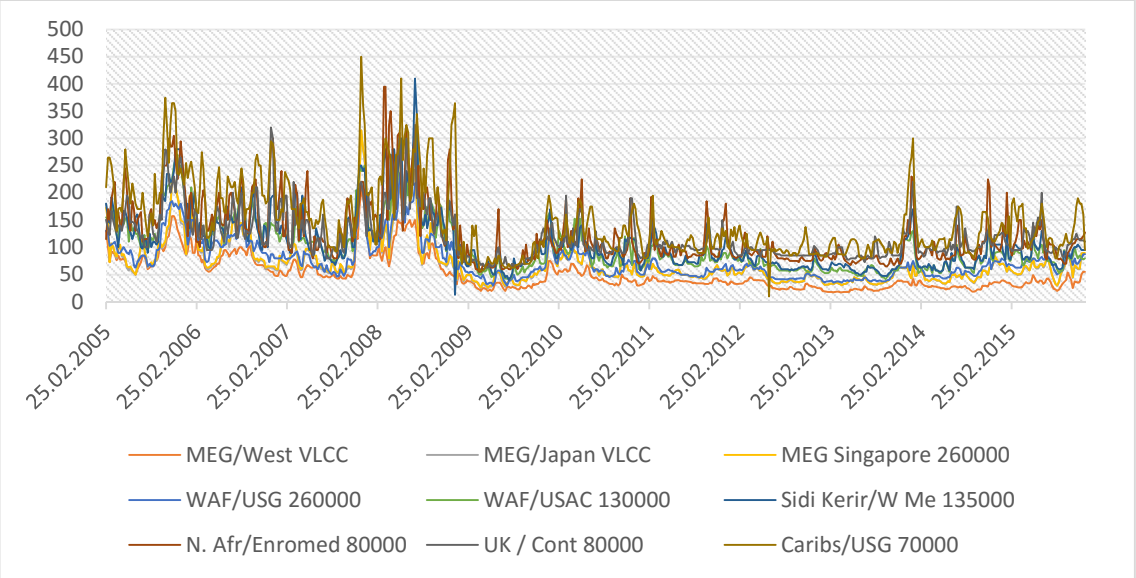


Source: UNCTAD, EIA, 2016, Processed by the Author

2.2.1.1.Dirty Spot Market

Dirty spot means the products that are not refined. The figure below shows the historical dirty worldscale spot rates of various routes.

Figure 11: Worldscale Rates of Various Dirty Tanker Transportation Routes

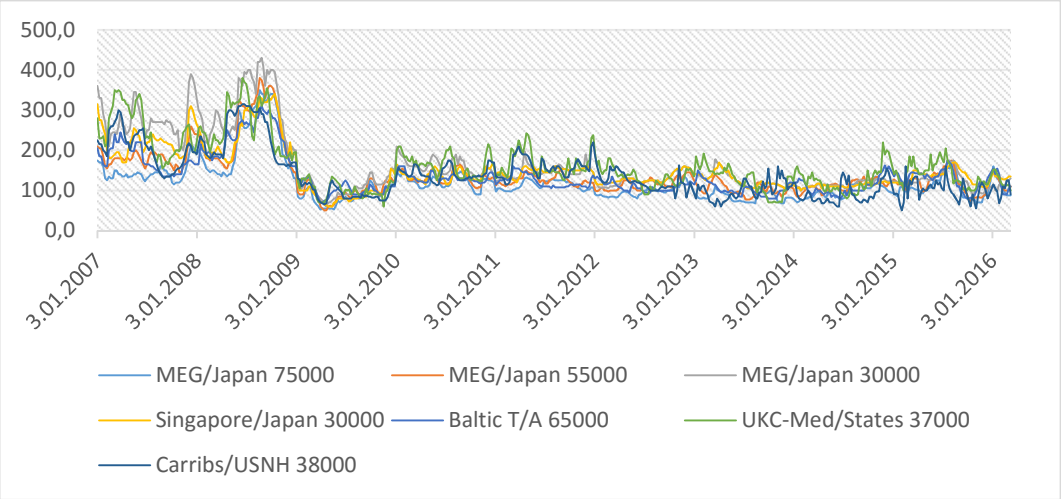


Source: Fearnleys Weekly, 2016, Processed by the Author

2.2.1.2.Clean Spot Market

Clean product means that are refined and ready to use in vehicles. Historical worldscale spot rates are shown below.

Figure 12: Worldscale Rates of Various Clean Tanker Transportation Routes



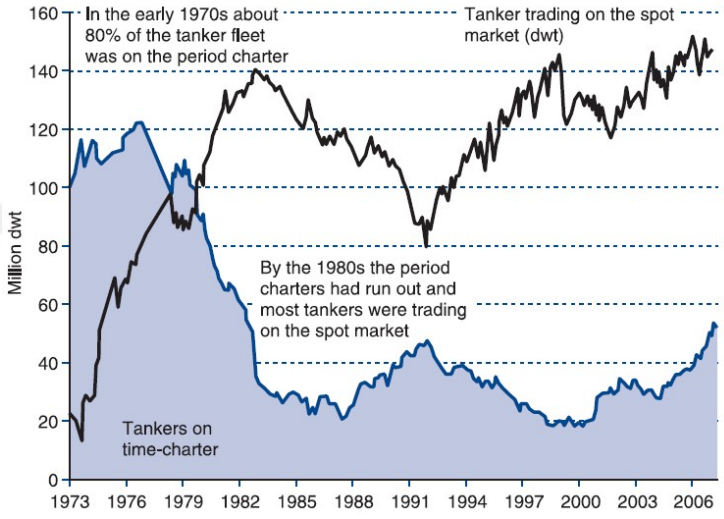
Source: Fearnleys Weekly, 2016, Processed by the Author

2.2.1.3.Time Charter Market

A time charter gives the charterer operational control of the ships carrying his cargo. But time charterer gives ownership and management of the vessel in the hands

of the shipowner. Charterer undertakes only commercial management of the ship. The length of the charter varies according to the contract. It may be the time taken to complete a single voyage or a period of months or years (Stopford, 2009:184). The figure below shows the historical rate of independent tanker fleet trading on time charter and spot.

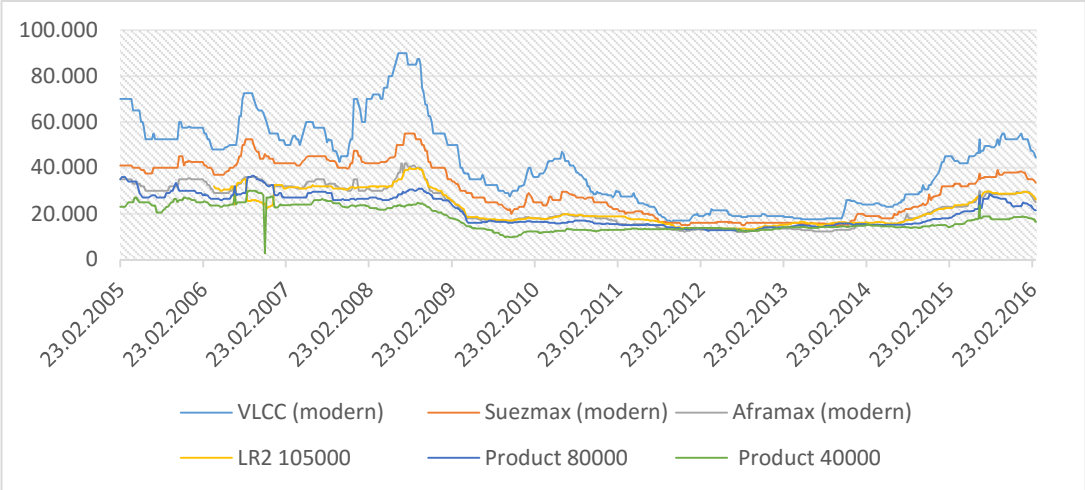
Figure 13: Independent Tanker Fleet Trading On Time Charter and Spot



Source: Stopford, 2009:185

The figure below shows the 1 year time charter earnings of various tanker types. As seen on the figure, rates had reached the highest point ever in 2008. After this increase, time charter rates had decreased and remained on same levels for a long period of time. Then the rates have increased again in recent years. Decrease on oil price may affect this situation as will examined in the further parts of this study.

Figure 14: Various Tanker Types' 1 Year Time Charter Earnings ($)

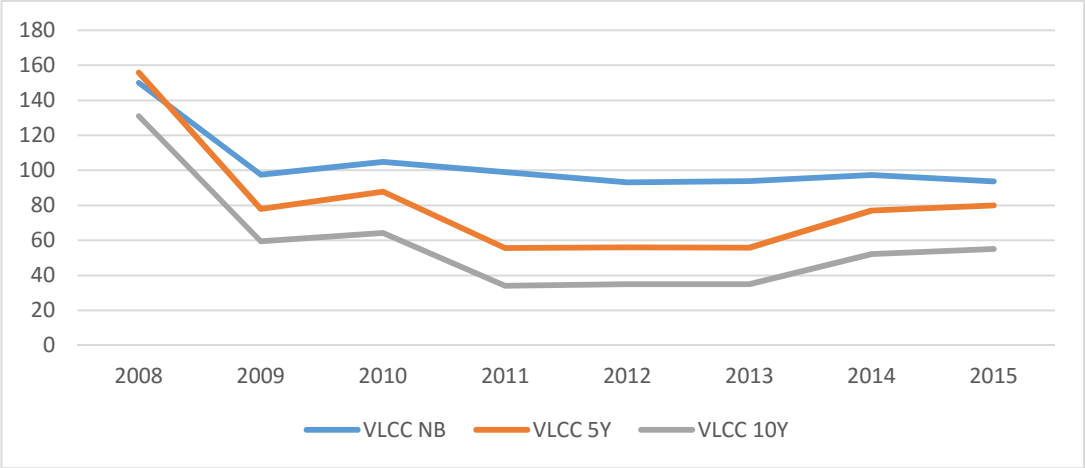


Source: Fearnleys Weekly, 2016, Processed by the Author

2.2.2. Sale and Purchase Market

The price of second-hand ships correlates very well with movements of spot and time charter rates. When market conditions are very good, second-hand prices are high. Even in some extreme cases have risen close to, and even above, the newbuilding price of an equivalent sized tanker. But when market conditions are poor, the second hand price may be closer to the value implied if the vessel were to scrapped. The vessel's value determined by the prevailing price of scrap. Both of these situations have been observed in the past (Grammenos, 2010:383).

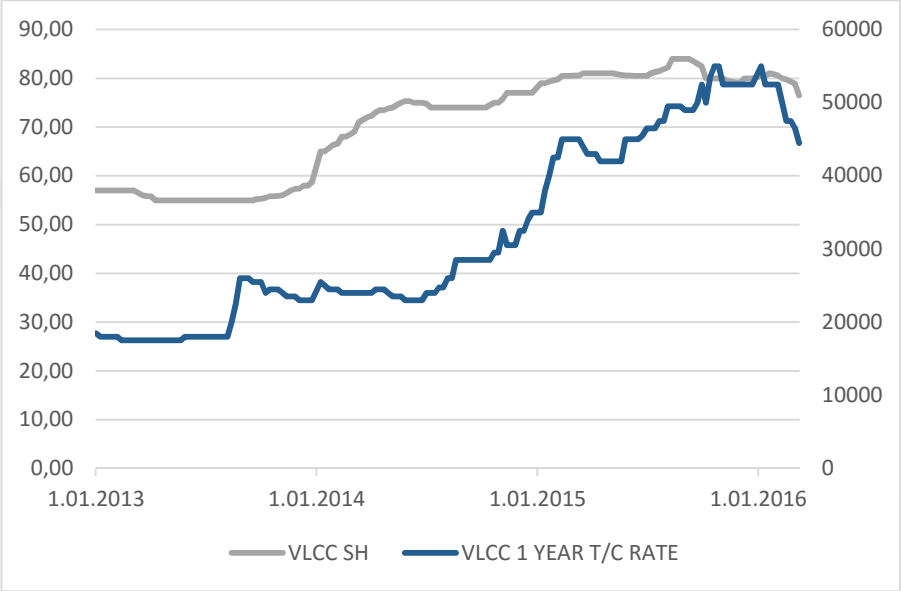
Figure 15: VLCC 5 Years Old, 10 Years Old and Newbuilding Prices (million $)



Source: Athenian Shipbrokers, 2016, Processed by the Author

Second-hand tanker prices are driven by expected future earnings. So if the freight rates are high, this situation leads to greater expected profits. As a result there can be seen an immediate increase in second-hand prices of vehicles (Grammenos, 2010:384).

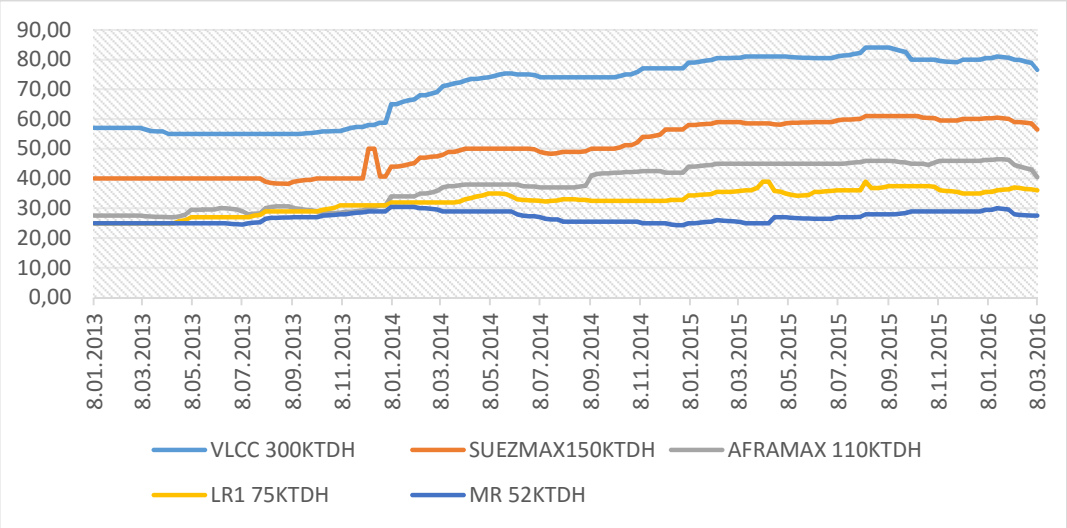
Figure 16: VLCC 5 Years Old Ship's Price and VLCC 1 Year Time Charter Earning



Source: Intermodal, Fearnleys Weeklies, 2016, Processed by the Author

Not only ship owners who operate vessels, but also investors who purchase and see vessels for asset play, enter the second-hand market. Liquidity of second-hand market is increased by investors and they contribute to a better functioning market. Thus to a more efficient allocation of capital equipment in the freight market (Grammenos, 2010:222).

Figure 17: Values of Various 5 Years Old Tanker Types (million $)

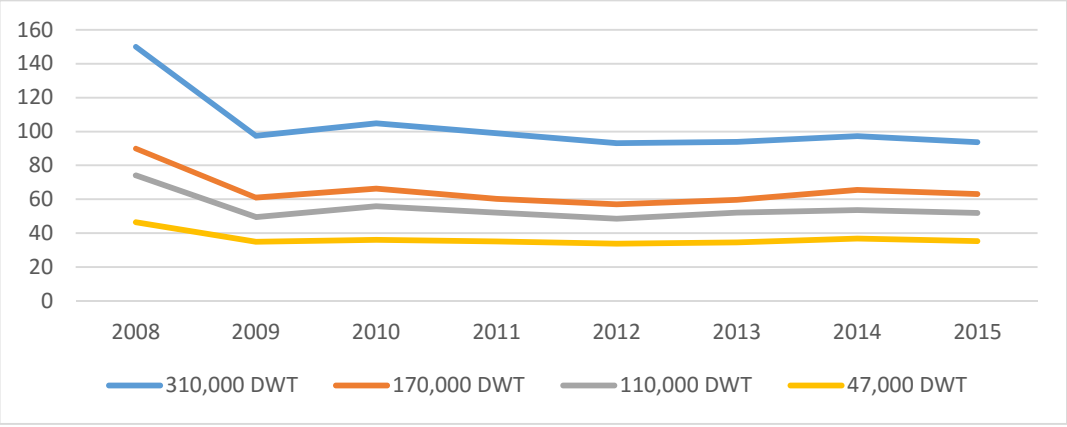


Source: Intermodal Weekly, 2016, Processed by the Author

2.2.3. Newbuilding Market

There is a positive relationship between newbuilding market and freight market. Shipping firms decide to order new ships to expand their fleet sizes when the freights are high. Demand for new vessels reflects the need for shipping capacity in the tanker shipping industry. It may take one to 3 years from placing an order of a new vessel till the delivery of ship to carry cargo in the freight market. The order of new ships from tanker shipping firms indicates that they have positive expectation of the growth of seaborne trade and increase in future freight rates (Lun et al, 2013:16).

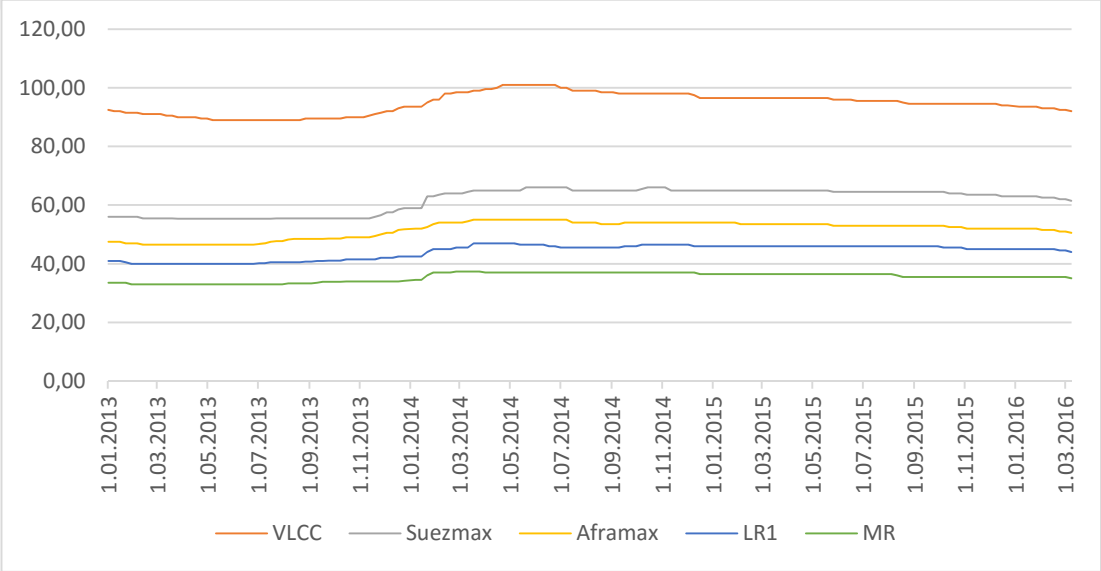
Figure 18: Newbuilding Prices of Various Tanker Types (million$)



Source: Athenian Shipbrokers, 2016, Processed by the Author

When the perspective of business operations is considered, prices of newbuilding ships stabilize the tanker market. Shipping firms decide to invest new ships to increase their capacity when the demand for shipping services increase. At the same time, high demand triggers the freight rates and freight rates increase. High freight rate gives an indication that shipping firms can earn higher than normal profit. High freight rate and profit level affect shipping firms to place orders for new ships when the demand for seaborne rises. Prices in the shipping building market also increase because of increase in demand for new ships. So, capital cost of shipping firms increases (Lun et al, 2013:16).

Figure 19: Newbuilding Prices of Various Tanker Types (million$)

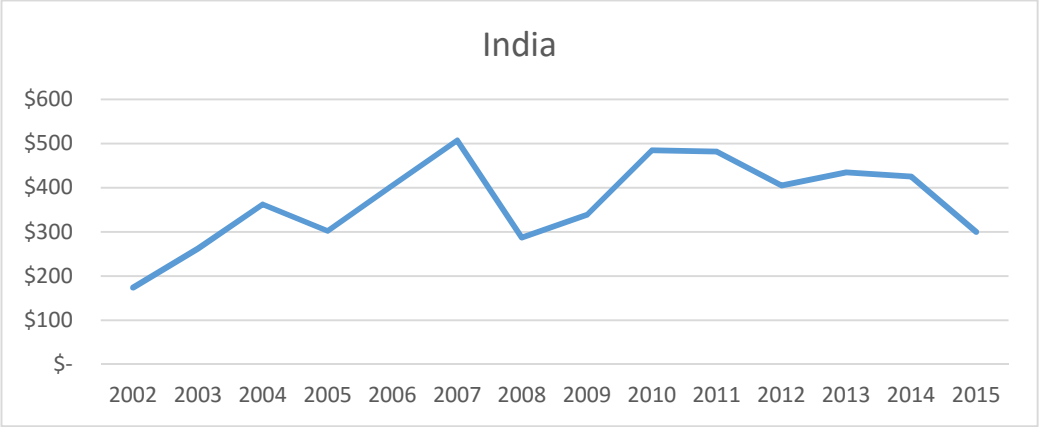


Source: Intermodal Weekly, 2016, Processed by the Author

2.2.4. Demolition Market

Old or obsolete vessels sold to scrap dealers provide a useful source of cash, especially during recessions. This is called demolition market.

Figure 20: Historical Demolition Prices of India

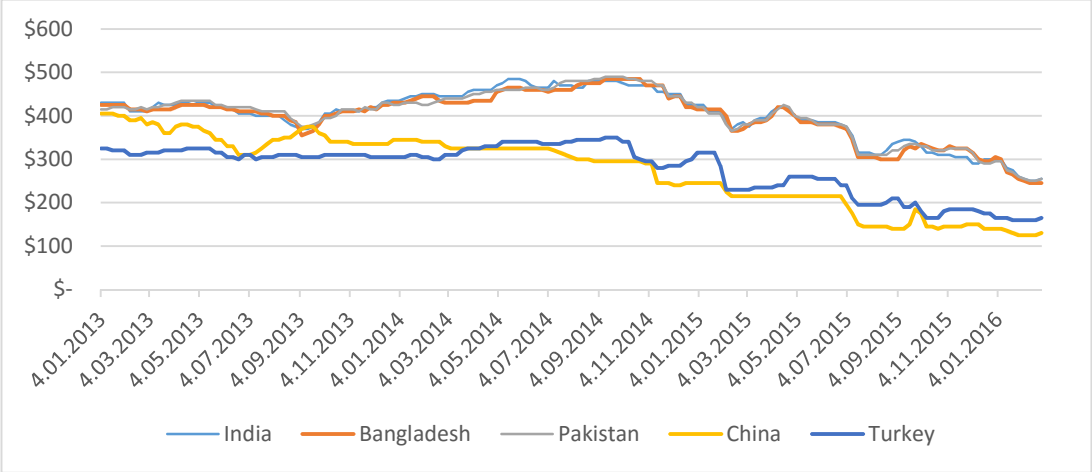


Source: Athenian Shipbrokers, 2016, Processed by the Author

With the exception of old ships that are unable to meet the safety requirements and regulations, the scrapping decision made by ship owners depends on expected financial return from scrapping the ship and the future freight rate (Lun et al, 2013:17).

The activity in scrapping market has strong relationship with the second-hand market. At the time when freight rates are very high, ship owners may keep the used ships to carry cargoes. Or they sell these ships to other ship owners. On the contrary, if the profitability of the vessel are negative in the near future and demand for secondhand ships in the sale and purchase market is weak, ship owners are disposed to send their ships to the demolition market (Lun et al, 2013:17).

Figure 21: Demolition Prices of Various Countries

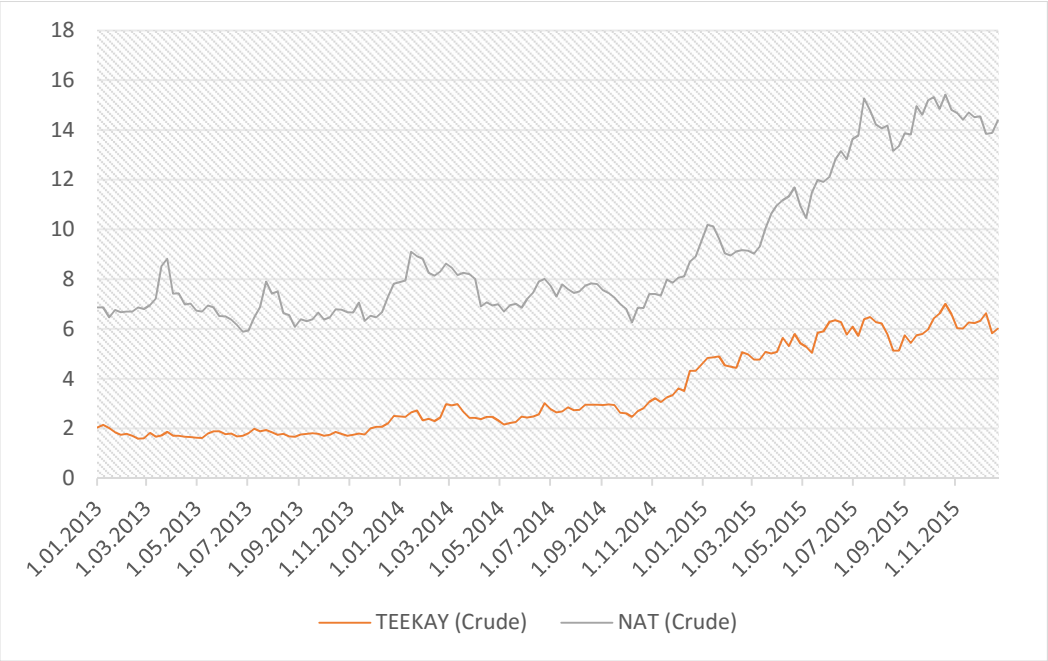


Source: Athenian Shipbrokers, 2016, Processed by the Author

2.2.5. Stock Exchange Market

The figure shows 2 of the tanker shipping companies that are selected randomly. When the figure examined it can be seen that there is an upward trend in both of the stock exchange values.

Figure 22: Stock Exchange Values of Two Crude Oil Transport Companies



Source: Yahoo Finance, 2016, Processed by the Author

2.3.THE WORLDSCALE INDEX

The tanker industry uses Worldscale index as a more convenient way of negotiating. It is based on the freight rate per barrel of oil transported on many different routes. The concept was developed during the Second World War. The British government introduced a schedule of official freight rates as a basis for paying the owners of requisitioned tankers. The schedule showed the cost of transporting a cargo of oil on each of the main routes using a standard 12,000 dwt tanker. Owners were paid the rate shown in the schedule or some fraction of it. The system was adopted by the tanker industry after the war. The index has been progressively revised over the years, the last amendment being in January 1989 when 'New Worldscale' was introduced (Stopford, 2009:192).

The Worldscale index is published in a book that is used as the basis for calculating tanker spot rates. The book shows, for each tanker route, the cost of transporting a tonne of cargo using the standard vessel on a round voyage. This cost is known as 'Worldscale 100'. Each year the Worldscale Panel meets in New York (which covers the Western Hemisphere) and London (which covers the rest of the world) and updates the book. The standard vessel has, from time to time, been updated. The one in use in 2007 is shown in the table below (Stopford, 2009:192).

Table 11: Worldscale Basis Tanker

Total capacity	75,000 tonnes
Average service speed	14.5 knots
Bunker consumption	
steaming	55 tonnes per day
other	100 tonnes per round voyage
in port	5 tonnes per port
Grade of fuel oil	380 centistokes
Port time	4 days for a voyage from one loading port to another discharging port
Fixed hire element	$12,000 per day
Bunker price	US$116.75 per tonne
Port costs	Most recent available
Canal transit time	30 hours per Suez transit

Source: Stopford, 2009:192

CHAPTER THREE

SHORT RUN RELATIONSHIP BETWEEN OIL PRICE AND TANKER INDUSTRY: ELASTICITY ANALYSIS

3.1.METHODOLOGY

This study mainly include 4 type of application. The first one is examining the correlation coefficients between oil price and tanker market variables. The second one is regression modelling of tanker market variables and examining the effect of oil price according to these models. The third one is the application of the Granger Causality test to these variables to determine which variables are reasons for the other ones. The last one is the simulating second hand tanker prices according to regression model, because second hand tanker price model has the highest meaningfulness score. Also scatterplot matrix has been applied to determine the direction of relationship between variables.

The scatterplot (or X-Y plot, or scattergram) is a plot that displays the joint distribution of two variables. While the stem-and-leaf and boxplot are univariate (one variable) graphs, the scatterplot is bivariate (two variables). The basic scatterplot consists of two axes, one for the dependent variable, usually indicated by Y. This is by tradition the vertical axis. The horizontal axis is for the independent variable, which is usually called X (Dietz and Kalof, 2009:156).

Pearson's correlation coefficient R, a measure of the strength and direction of the linear relationship between two variables, is defined as the (sample) covariance of the variables divided by the product of their (sample) standard deviations. The absolute value of Pearson correlation coefficients is no larger than 1. Correlations equal to 1 or -1 correspond to data points lying exactly on a straight line. The Pearson correlation coefficient is symmetric, i.e., the correlation between X and Y is the same as that between Y and X (Chang, 2014:78).

The term regression is attributed to Francis Galton. Regression analysis allows scientists to quantify how the average of one variable systematically varies according

to the levels of another variable. The former variable is often called a dependent variable or outcome variable and the latter an independent variable, predictor variable, or explanatory variable (Gordon, 2015:5).

There is limited number of study about this topic. Yang and Shi (2013) examines the impact of crude oil price on the tanker market. They use three variables; Baltic Dirty Tanker Index, Oil production and Oil price. Then they use SVAR model and impulse response analysis and analyze impact of different shocks on the tanker market. They find out that crude oil production has insignificant effect on crude oil price and supply shocks have significant effect on tanker market. Finally they find out that there is no evidence about relationships between tanker freight rates and crude oil prices.

Poulakidas and Joutz (2009) also make a study about exploring the link between oil price and tanker rates. They use 5 variables; Baltic Dirty Tanker Index, Crude Oil Future Contracts, West Texas Intermediate Spot Prices, US Weekly Ending Crude Oil Stocks and Spread between WTI Spot Price and Future Contracts. They make Granger causality test and cointegration analysis. They find that when day's supply of crude oil increases, the spot tanker rates declines.

Sun, Tang, Yang, Wu and Li (2014) make an analysis about identifying dynamic relationship between tanker freight rates and oil prices. They use 2 variables Baltic Dirty Tanker Index and WTI Spot Price and they implement Ensamble Empirical Mode Decomposition model. They find out that freight rates and oil prices are significantly correlated in the medium and long term.

Jin (2006) makes a study about supply and demand of new oil tankers. He finds out that oil price and second-hand tanker price are predominant factors influencing future newbuilding demand.

As seen from literature there is a little study about this topic and there is no directly related study about the same topic. So this study is expected to be one of the first studies about short term relationship between oil price and tanker market.

3.1.1. Data Collection

The data are collected from various prestigious weekly reports in the shipping industry. The sources of the data and collected method are defined below. Also sources are stated at the related parts of the next section. All the data are compiled by the author through his own means, because high fees are demanded for relevant data.

Worldscale values of the routes that include both clean and dirty spot market are obtained from Fearnley Weekly Reports (http://www.fearnleys.no). Time charter earnings of all tankers are compiled by the author from Fearnleys too.

Indicative newbuilding prices and secondhand prices are collected from Intermodal Weekly Reports (http://www.intermodal.gr) that present reliable information about both liquid and dry bulk sectors.

Demolition prices are compiled from Athenian Shipbrokers S.A. (http://www.atheniansa.gr) which is published weekly and present up-to-date information from demolition sector.

Spot oil prices are collected from U.S. Energy Information Administration (https://www.eia.gov) which is an independent statistics and analysis institution.

SPSS 22 software is used for correlation analysis. Eviews 9 software is used for regression analysis and Granger tests.

3.1.2. Limitations of the Study

The most important limitation of the study is data availability. All institutions demand fees for data. So the author compiled the data this study include by his own means. All the data are collected one by one. So the study contains nearly 3 years data for main objectives. If the more data had been reached, the study would have been well-designed as a matter of fact.

3.2.HYPOTHESIS

Hypothesis 1

When oil price decreases, time charter earnings increases in the short run.

Because of the main law of the economics, if price of a commodity decreases, demand for it increases. When oil price decrease, demand for it should increase. Also if demand for a product or service increases, price of the product or service increases in the short run. Because the other supplier enters to the market in the long run. So time charter earnings should increase in the short run.

Hypothesis 2

When oil price decreases, spot earnings increases in the short run.

The same law is prevails for the second hypothesis; if demand for a product or service increases, price of the product or service increases in the short run. So spot earnings should increase in the short run.

Hypothesis 3

When oil price decreases, laid-up tonnage decreases in the short run.

The laid-up tonnage means that the vehicles that cannot be operated in current competitive environment. Because demand for them is low and their operation costs are high beside new vehicles. So when the oil price decreases, demand for oil increases. Because of being derived demand, also demand for sea transport increases in order to meet oil demand. As a result laid-up tonnage should decrease.

Hypothesis 4

When oil price decreases, tonnage on order increases in the short run.

Tonnage on order means that the amount of tonnage that ordered to shipyards. When the earnings in a sector increases, new suppliers want to enter this sector. Supply in the sea transport increases by shipyards. So order for new ships should increase in the short run.

Hypothesis 5

When oil price decreases, price of newbuildings increases in the short run.

Law of supply and demand is valid again in this hypothesis; if demand for a product or service increases, price of the product or service increases in the short run. High earnings in the sector attracts new suppliers into the sector. So demand for new ship increases in order to get benefit from high earnings. So demand for new ships increases. As a result price of newbuildings should increase in the short run.

Hypothesis 6

When oil price decreases, price of secondhand ships increases in the short run.

According to law of supply and demand, prices secondhand ships should increase in the short run because of the high earnings in the sector. Because if demand for a product or service increases, price of the product or service increases in the short run. So price of secondhand ships should increase in the short run.

Hypothesis 7

When oil price decreases, price of secondhand ships increase more than newbuilding ships in the short run.

Because of being easier to convert to the cash, prices secondhand ships should increase more than prices of newbuildings. Also building a ship takes time between 1 and 3 years. So the investors know that the earnings are temporary earnings. They increase the demand for secondhand ships in order not to wait for new ships. As a result, price of secondhand ships should increase more than prices of newbuilding ships in the short run.

Hypothesis 8

When oil price decreases, demolition price of tanker increases in the short run.

Demolition market means that ships are broken into steel items. So when the oil price decreases, even old ships are traded because of increase on demand. So demolition markets shouldn't find ships easily. As a result demolition prices of tankers should increase in the short run.

Hypothesis 9

When oil price decrease, stock exchange values of tanker firms increase in the short run.

Shipping firms start to make profit when they fully operate their ships. So their income statements and balance sheets turn into good and hopeful conditions. So the other investors start to invest these stocks. As a result stock values of the tanker ships should increase in the short run.

3.3.RESULTS

3.3.1. Correlation Relationship between Oil and Tanker Industry

3.3.1.1.Freight Market

Freight market consists of charter market and spot market. This section will examine 3 relationships. Firstly, time charter earnings' relationship with oil will be studied. Then spot markets' earnings will be handled in two parts; dirty spot market and clean spot market. Finally, tanker fleet's relationship with oil price will be studied.

3.3.1.1.1. Time Charter Earnings' Relationship with Oil

The data that will be used in this section and their sources are defined below. Correlation matrix between 1 year time charter earnings of VLCC, Suezmax, Aframax, LR2, 80.000dwt Product tanker, 40.000dwt product tanker, and oil price will be examined. Definitions of abbreviations of the variables that is used are listed below.

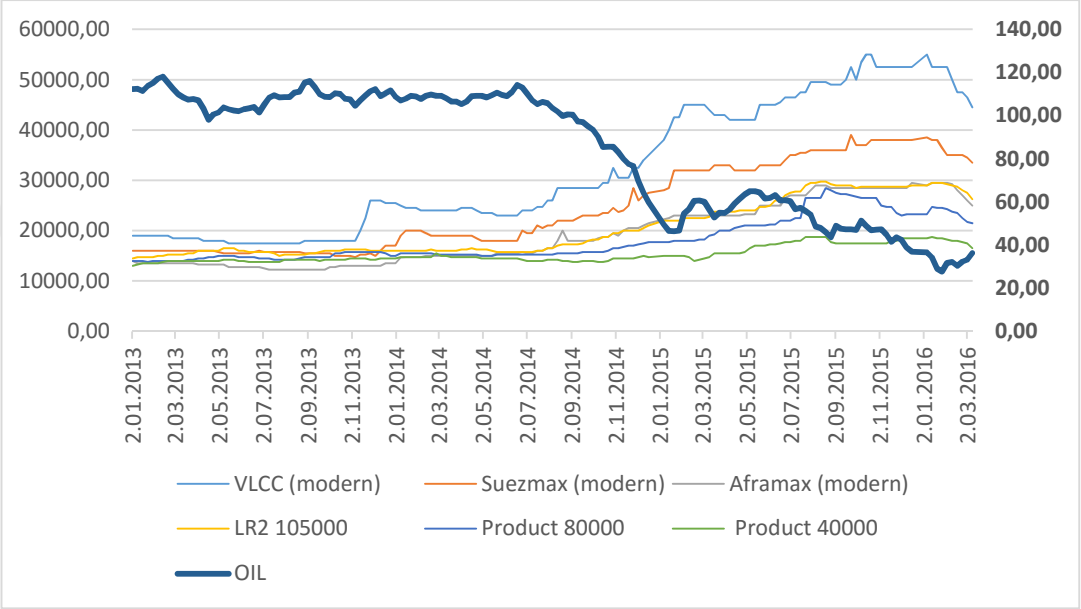
Table 12: Data Descriptions for Correlation Matrix of Time Charter

Variable Name	Description	Units	Frequency	Source
VLCC	VLCC 1 Year Time Charter Rate	$/day	Weekly	Fearnley Weekly Reports
SUEZMAX	SUEZMAX 1 Year Time Charter Rate	$/day	Weekly	Fearnley Weekly Reports
AFRAMAX	AFRAMAX 1 Year Time Charter Rate	$/day	Weekly	Fearnley Weekly Reports
LR2	LR2 Product Tanker 1 Year Time Charter Rate	$/day	Weekly	Fearnley Weekly Reports
PRO80K	80000 DWT Product Tanker 1 Year Time Charter Rate	$/day	Weekly	Fearnley Weekly Reports
PRO40K	40.000 DWT Product Tanker 1 Year Time Charter Rate	$/day	Weekly	Fearnley Weekly Reports
OILPRICE	Europe Brent Spot Price FOB	$/barrel	Weekly	U.S. Energy Information Administration

Source: Fearnley, IEA, Processed by the Author

Figure 23 includes the variables above. The dates of the variables are between the range of 02.01.2013 and 08.03.2016. Oil price exceeded the amount of $120 on 02.03.2013 when time charter earnings were about $15.000 per day. When oil price has decreased to $30, time charter earnings had reached the highest point that is $55.000 as can be seen on the figure below.

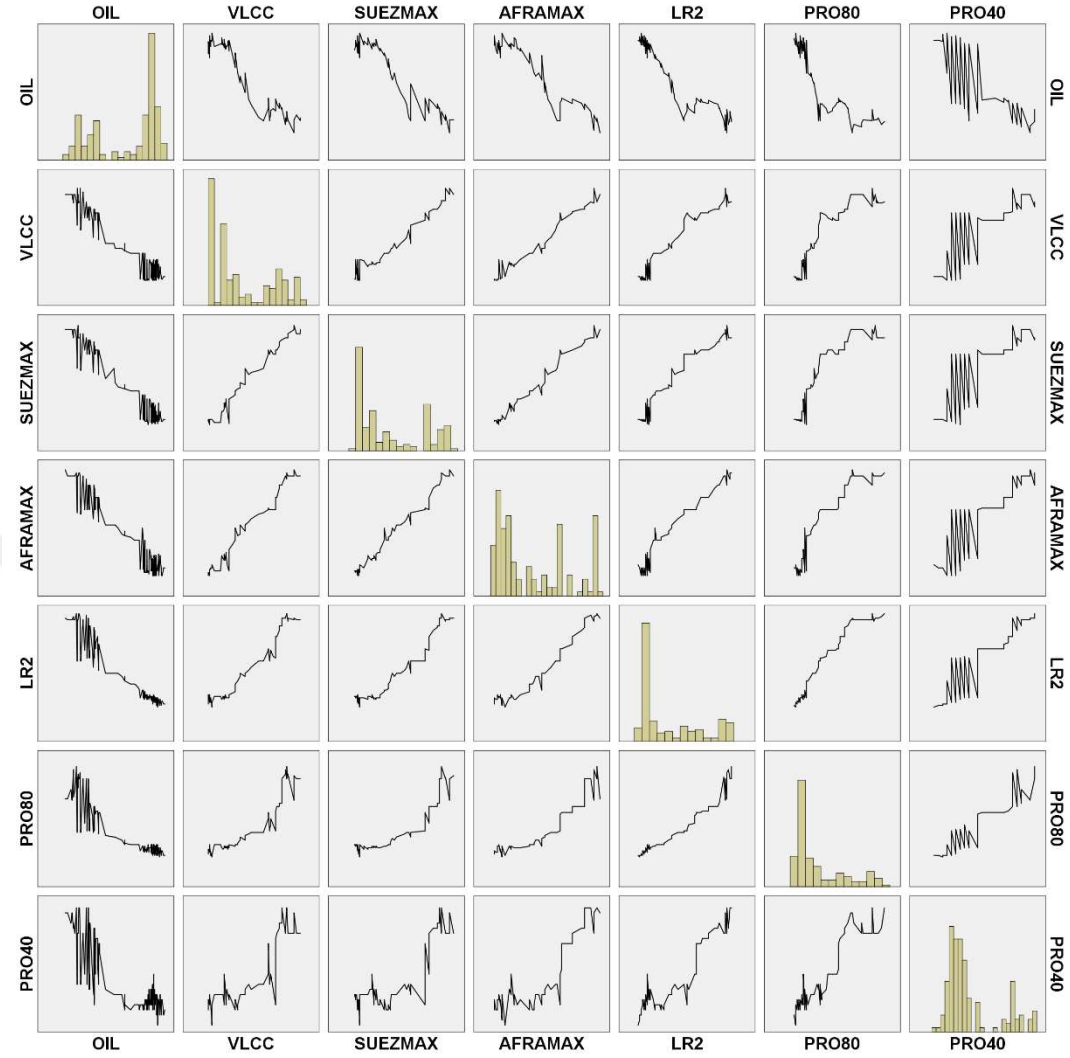
Figure 23: Oil Price and 1 Year Time Charter Earnings



Source: Fearnley, IEA, Processed by the Author

When the figure above is examined, that can be seen that there is a reverse correlation between time charter earnings and oil price. The correlation will be defined in 3 steps. Firstly, scatterplot matrix will be examined. Scatterplot matrix shows if there is a linear relationship between two variables or not. When the oil row is examined, it can be seen that time charter earnings decrease while oil prices increase on all type of vessels.

Figure 24: Scatterplot Matrix of 1 Year Time Charter Earnings and Oil Price



Source: Fearnley, IEA, Processed by the Author

The table below show the volatility degrees of time charter earnings and oil price. The most volatile variable is VLCC time charter earnings. It has $31.815 mean, $12.900 standard deviation and 41% volatility. Then Suezmax follows it with a rate of 35%. The least volatile ship type is product 40.000dwt as can be seen on the table below. For better analysis, correlation matrix should be examined.

Table 13: Descriptive Statistics for Time Charter Earnings and Oil Price

	Mean	Std. Deviation	% of Mean	N
VLCC	31815,95	12900,582	41%	163
SUEZMAX	24343,25	8505,607	35%	163
AFRAMAX	19039,57	6092,989	32%	163
LR2	20134,97	5354,864	27%	163
PRO80K	17964,72	4184,303	23%	163
PRO40K	15273,01	1628,216	11%	163
OILPRICE	84,2171	28,65171	34%	163

Source: Fearnley, IEA, Processed by the Author

When the oil price row is examined, it can be seen that all type of vessels' time charter earnings have strong significant negative correlation with oil price. This analysis may show that, when the oil price decreases, demand for oil increases. Because of being derived demand, demand for tanker transportation also increases. That situation causes increase on time charter earnings in a short run. Because supply side of the tanker transportation will balance the demand and time charter earnings will start to decrease again. The figure at the next section which shows tonnage on order supports our hypothesis.

Table 14: Correlation Matrix for Time Charter Earnings and Oil Price

		VLCC	SUEZMAX	AFRAMAX	LR2	PRO80K	PRO40K	OILPRICE
VLCC	Pearson Correlation	1	,991**	,986**	,970**	,927**	,879**	-,954**
	Sig. (2-tailed)		,000	,000	,000	,000	,000	,000
	N	163	163	163	163	163	163	163
SUEZMAX	Pearson Correlation	,991**	1	,990**	,971**	,923**	,871**	-,962**
	Sig. (2-tailed)	,000		,000	,000	,000	,000	,000
	N	163	163	163	163	163	163	163
AFRAMAX	Pearson Correlation	,986**	,990**	1	,981**	,941**	,895**	-,959**
	Sig. (2-tailed)	,000	,000		,000	,000	,000	,000
	N	163	163	163	163	163	163	163
LR2	Pearson Correlation	,970**	,971**	,981**	1	,972**	,936**	-,959**
	Sig. (2-tailed)	,000	,000	,000		,000	,000	,000
	N	163	163	163	163	163	163	163
PRO80K	Pearson Correlation	,927**	,923**	,941**	,972**	1	,938**	-,889**
	Sig. (2-tailed)	,000	,000	,000	,000		,000	,000
	N	163	163	163	163	163	163	163
PRO40K	Pearson Correlation	,879**	,871**	,895**	,936**	,938**	1	-,839**
	Sig. (2-tailed)	,000	,000	,000	,000	,000		,000
	N	163	163	163	163	163	163	163
OILPRICE	Pearson Correlation	-,954**	-,962**	-,959**	-,959**	-,889**	-,839**	1
	Sig. (2-tailed)	,000	,000	,000	,000	,000	,000	
	N	163	163	163	163	163	163	163
**. Correlation is significant at the 0.01 level (2-tailed).								

Source: Fearnley, IEA, Processed by the Author

As a result hypothesis 1 is failed to reject. *When oil price decreases, time charter earnings increases in the short run.*

3.3.1.1.2. Dirty Spot Earnings' Relationship with Oil

The data that will be used in this section and their sources are defined below. Correlation matrix between dirty spot routes worldscale earnings and oil price will be studied. Definitions of abbreviations of the variables that will be used are listed below.

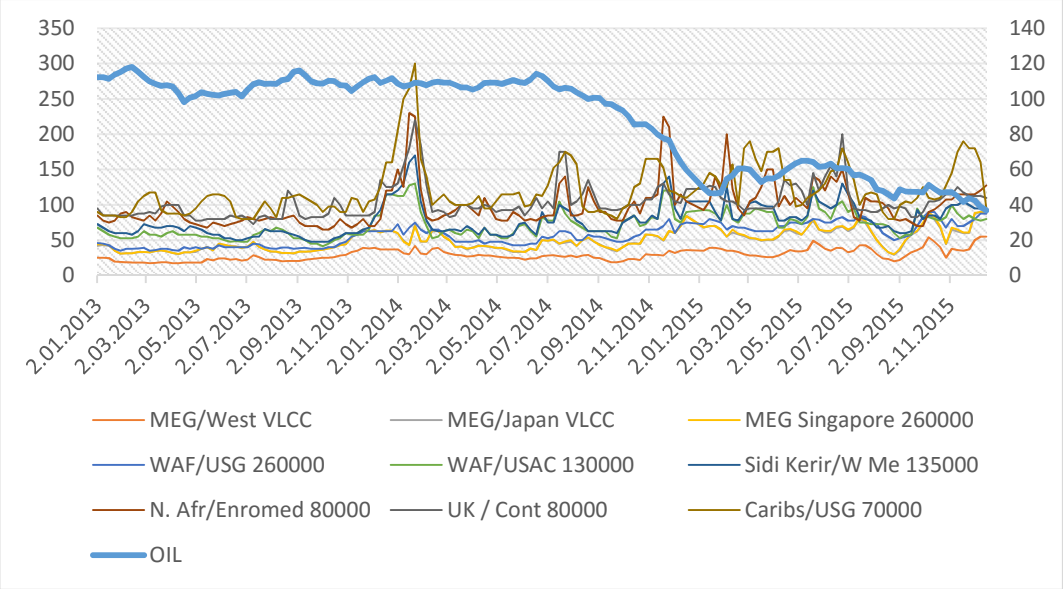
Table 15: Data Descriptions for Correlation Matrix of Dirty Spot Earnings

Variable Name	Description	Units	Frequency	Source
OILPRICE	Europe Brent Spot Price FOB	$/barrel	Weekly	U.S. Energy Information Administration
MEGWESTVLCC	Mexico Gulf / West VLCC Route	Dirty Spot World Scale	Weekly	Fearnley Weekly Reports
MEGJAPVLCC	Mexico Gulf / Japan VLCC Route	Dirty Spot World Scale	Weekly	Fearnley Weekly Reports
MEGSING	Mexico Gulf / Singapore 260.000 Dwt Route	Dirty Spot World Scale	Weekly	Fearnley Weekly Reports
WAFUSG	West Africa / US Gulf 260.000 Dwt Route	Dirty Spot World Scale	Weekly	Fearnley Weekly Reports
WAFUSAC	West Africa / US Atlantic Coast 130.000 Dwt Route	Dirty Spot World Scale	Weekly	Fearnley Weekly Reports
SIDIKERIR	Sidi Kerir / West Mexico Gulf	Dirty Spot World Scale	Weekly	Fearnley Weekly Reports
NAFR	North Africa / Euromed 80.000 Dwt Route	Dirty Spot World Scale	Weekly	Fearnley Weekly Reports
UKCONT	UK/Continent 80.000 Dwt Route	Dirty Spot World Scale	Weekly	Fearnley Weekly Reports
CARRIBS	Caribs / US Gulf 70.000 Dwt Route	Dirty Spot World Scale	Weekly	Fearnley Weekly Reports

Source: Fearnley, IEA, Processed by the Author

Volatility of the dirty spot earnings increases in the parallel with decrease of oil prices as can be seen at the table below. This situation is related with short-term demand volatility.

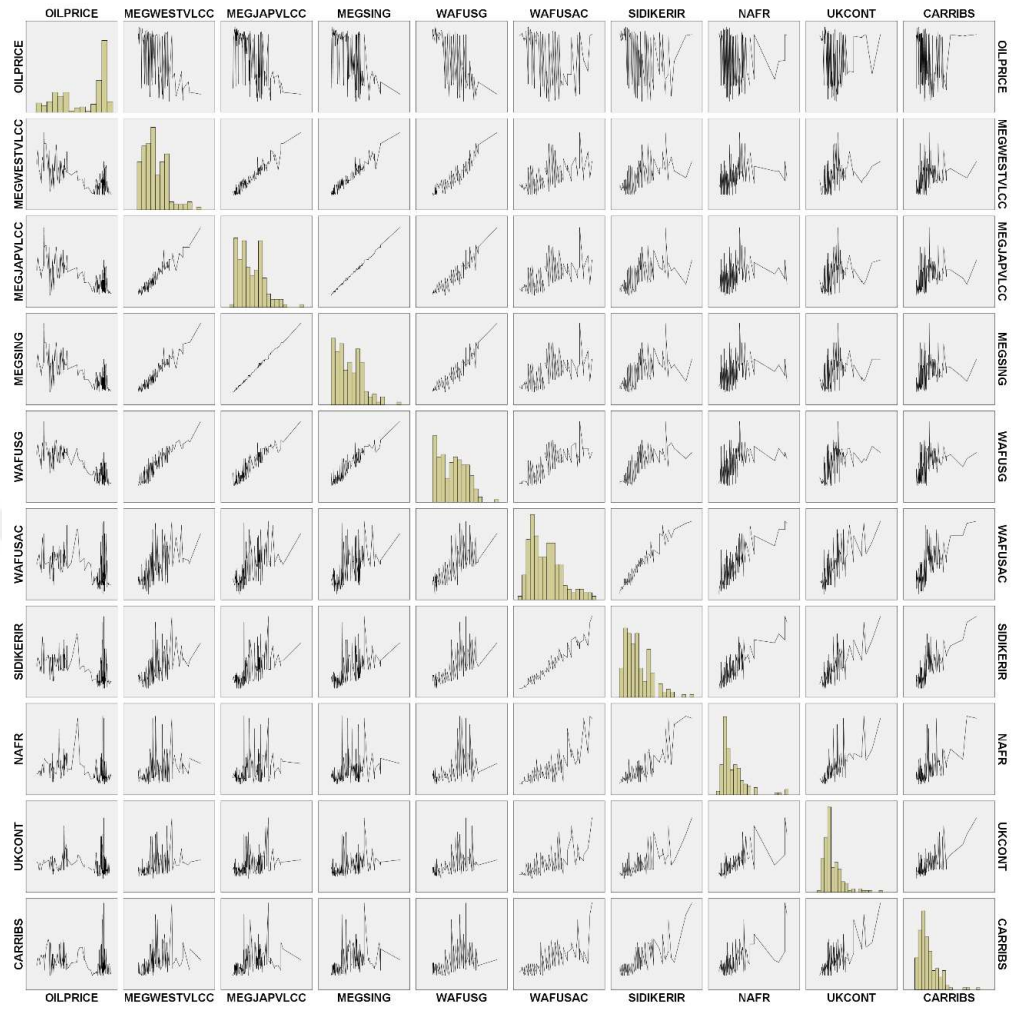
Figure 25: Oil Price and Dirty Spot Earnings



Source: Fearnley, IEA, Processed by the Author

The figure blow shows a weak linear relationship between variables. For better analysis, correlation matrix should be examined.

Figure 26: Scatterplot Matrix of Dirty Spot Earnings and Oil Price



Source: Fearnley, IEA, Processed by the Author

The table below show the volatility degrees of dirty spot earnings and oil price. According to the table all dirty spot earnings have a volatility mean of 30%.

Table 16: Descriptive Statistics for Dirty Spot Earnings and Oil Price

	Mean	Std. Deviation	% of Mean	N
OILPRICE	84,2171	28,65171	34%	163
MEGWESTVLCC	29,7767	8,65542	29%	163
MEGJAPVLCC	50,7779	15,15052	30%	163
MEGSING	51,3546	15,54703	30%	163
WAFUSG	58,0215	15,92240	27%	163
WAFUSAC	72,7546	18,96076	26%	163
SIDIKERIR	78,6564	22,64041	29%	163
NAFR	97,8896	29,38254	30%	163
UKCONT	103,7853	23,69182	23%	163
CARRIBS	121,3282	35,40804	29%	163

Source: Fearnley, IEA, Processed by the Author

Correlation coefficients of dirty spot earnings are more volatile and higher than clean spot earnings. Also they have less correlation coefficient than time charter earnings. This situation may arise from sentiments. Because in time charter contracts, charterers want to save their future interests. Then they tie their future transport needs with time charter contracts. In spot market rates can change even hour by hour.

Table 17: Correlation Matrix for Dirty Spot Earnings and Oil Price

		OILPRICE	MEGWESTVLCC	MEGJAPVLCC	MEGSING	WAFUSG	WAFUSAC	SIDIKERIR	NAFR	UKCONT	CARRIBS
OILPRICE	Pearson Correlation	1	-,578**	-,642**	-,653**	-,750**	-,441**	-,432**	-,278**	-,182*	-,248**
	Sig. (2-tailed)		0	0	0	0	0	0	0	0,02	0,001
	N	163	163	163	163	163	163	163	163	163	163
MEGWESTVLCC	Pearson Correlation	-,578**	1	,944**	,942**	,891**	,582**	,562**	,355**	,385**	,344**
	Sig. (2-tailed)	0		0	0	0	0	0	0	0	0
	N	163	163	163	163	163	163	163	163	163	163
MEGJAPVLCC	Pearson Correlation	-,642**	,944**	1	,998**	,918**	,601**	,580**	,355**	,381**	,369**
	Sig. (2-tailed)	0	0		0	0	0	0	0	0	0
	N	163	163	163	163	163	163	163	163	163	163
MEGSING	Pearson Correlation	-,653**	,942**	,998**	1	,923**	,597**	,575**	,352**	,378**	,364**
	Sig. (2-tailed)	0	0	0		0	0	0	0	0	0
	N	163	163	163	163	163	163	163	163	163	163
WAFUSG	Pearson Correlation	-,750**	,891**	,918**	,923**	1	,723**	,700**	,505**	,496**	,464**
	Sig. (2-tailed)	0	0	0	0		0	0	0	0	0
	N	163	163	163	163	163	163	163	163	163	163
WAFUSAC	Pearson Correlation	-,441**	,582**	,601**	,597**	,723**	1	,957**	,763**	,672**	,691**
	Sig. (2-tailed)	0	0	0	0	0		0	0	0	0
	N	163	163	163	163	163	163	163	163	163	163
SIDIKERIR	Pearson Correlation	-,432**	,562**	,580**	,575**	,700**	,957**	1	,805**	,708**	,744**
	Sig. (2-tailed)	0	0	0	0	0	0		0	0	0
	N	163	163	163	163	163	163	163	163	163	163
NAFR	Pearson Correlation	-,278**	,355**	,355**	,352**	,505**	,763**	,805**	1	,698**	,632**
	Sig. (2-tailed)	0	0	0	0	0	0	0		0	0
	N	163	163	163	163	163	163	163	163	163	163
UKCONT	Pearson Correlation	-,182*	,385**	,381**	,378**	,496**	,672**	,708**	,698**	1	,658**
	Sig. (2-tailed)	0,02	0	0	0	0	0	0	0		0
	N	163	163	163	163	163	163	163	163	163	163
CARRIBS	Pearson Correlation	-,248**	,344**	,369**	,364**	,464**	,691**	,744**	,632**	,658**	1
	Sig. (2-tailed)	0,001	0	0	0	0	0	0	0	0	
	N	163	163	163	163	163	163	163	163	163	163

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Fearnley, IEA, Processed by the Author

3.3.1.1.3. Clean Spot Earnings' Relationship with Oil

The data that will be used in this section and their sources are defined below. Correlation matrix between clean spot routes worldscale earnings and oil price will be studied.

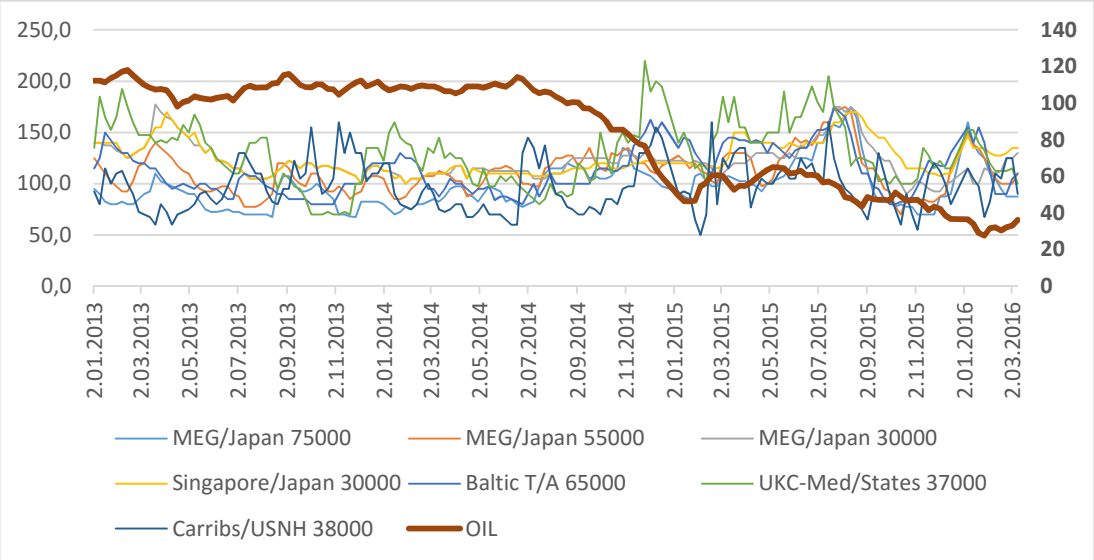
Table 18: Data Descriptions for Correlation Matrix of Clean Spot Earnings

Variable Name	Description	Units	Frequency	Source
OILPRICE	Europe Brent Spot Price FOB	$/barrel	Weekly	U.S. Energy Information Administration
MEGJAP75K	Mexico Gulf / Japan 75000dwt Route	Clean Spot World Scale	Weekly	Fearnley Weekly Reports
MEGJAP55K	Mexico Gulf / Japan 55000dwt Route	Clean Spot World Scale	Weekly	Fearnley Weekly Reports
MEGJAP30K	Mexico Gulf / Japan 30000dwt Route	Clean Spot World Scale	Weekly	Fearnley Weekly Reports
SINCAP30K	Singapore / Japan 30000dwt Route	Clean Spot World Scale	Weekly	Fearnley Weekly Reports
BALTA65K	Baltic T/A 65000dwt Route	Clean Spot World Scale	Weekly	Fearnley Weekly Reports
MEDSTA37K	United Kingdom/ Med States 37000dwt Route	Clean Spot World Scale	Weekly	Fearnley Weekly Reports
CARRIBS38K	Caribbean / US North of Hatteras 38000dwt Route	Clean Spot World Scale	Weekly	Fearnley Weekly Reports

Source: Fearnley, IEA, Processed by the Author

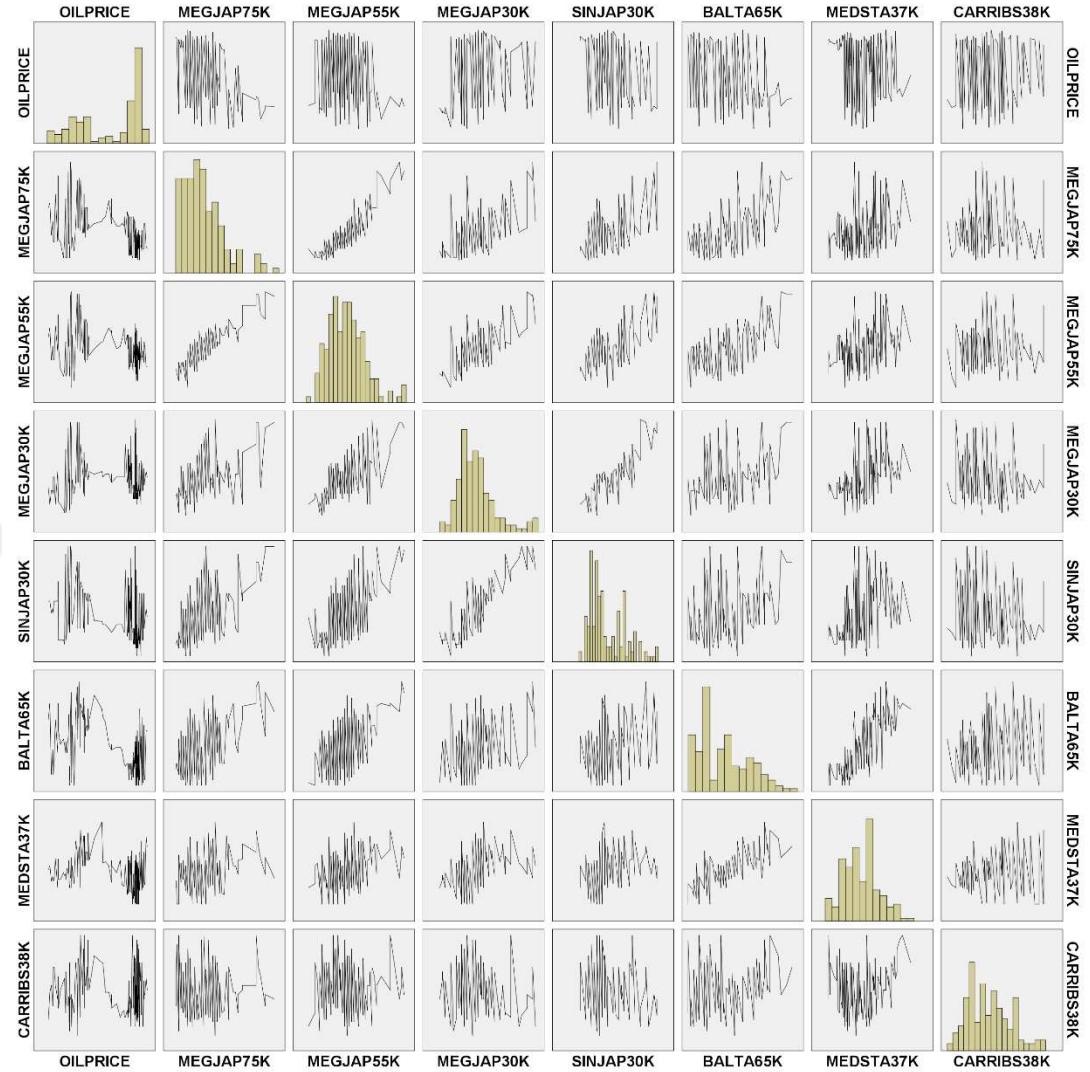
The figure below shows that there aren't clear correlations among clean spot earnings and oil price. So the correlation matrix should be investigated for more clear results.

Figure 27: Oil Price and Clean Spot Earnings



Source: Fearnley, IEA, Processed by the Author

Figure 28: Scatterplot Matrix of Clean Spot Earnings and Oil Price



Source: Fearnley, IEA, Processed by the Author

When we examined table below and dirty spot earnings' descriptive statistics, it can be said that clean spot earnings are less volatile than dirty spot earnings.

Table 19: Descriptive Statistics for Clean Spot Earnings and Oil Price

	Mean	Std. Deviation	% of Mean	N
OILPRICE	84,2171	28,65171	34%	163
MEGJAP75K	96,79	21,868	23%	163
MEGJAP55K	111,17	20,282	18%	163
MEGJAP30K	121,98	17,378	14%	163
SINJAP30K	124,85	16,589	13%	163
BALTA65K	112,83	22,864	20%	163
MEDSTA37K	129,42	31,101	24%	163
CARRIBS38K	97,47	24,363	25%	163

Source: Fearnley, IEA, Processed by the Author

When the oil price decreases, demand for oil increases. Hence demand for tanker transportation increases because of being derived demand. So earnings of tanker owners increase. This situation causes a negative correlation among variables. Nearly all variables have significant inverse correlation with oil price. But degrees of the correlation are low in some of them. Correlation of dirty spot earnings are much more than clean spot earnings' correlations.

Table 20: Correlation Matrix for Clean Spot Earnings and Oil Price

		OILPRICE	MEGJAP75K	MEGJAP55K	MEGJAO30K	SINJAP30K	BALTA65K	MEDSTA37K	CARRIBS38K
OILPRICE	Pearson Correlation	1	-,411**	-,279**	-,057	-,392**	-,441**	-,216**	-,101
	Sig. (2-tailed)		,000	,000	,466	,000	,000	,006	,202
	N	163	163	163	163	163	163	163	163
MEGJAP75K	Pearson Correlation	-,411**	1	,877**	,550**	,532**	,516**	,289**	,011
	Sig. (2-tailed)	,000		,000	,000	,000	,000	,000	,886
	N	163	163	163	163	163	163	163	163
MEGJAP55K	Pearson Correlation	-,279**	,877**	1	,654**	,573**	,552**	,369**	-,011
	Sig. (2-tailed)	,000	,000		,000	,000	,000	,000	,886
	N	163	163	163	163	163	163	163	163
MEGJAO30K	Pearson Correlation	-,057	,550**	,654**	1	,835**	,356**	,405**	-,092
	Sig. (2-tailed)	,466	,000	,000		,000	,000	,000	,244
	N	163	163	163	163	163	163	163	163
SINJAP30K	Pearson Correlation	-,392**	,532**	,573**	,835**	1	,399**	,424**	-,038
	Sig. (2-tailed)	,000	,000	,000	,000		,000	,000	,633
	N	163	163	163	163	163	163	163	163
BALTA65K	Pearson Correlation	-,441**	,516**	,552**	,356**	,399**	1	,748**	,253**
	Sig. (2-tailed)	,000	,000	,000	,000	,000		,000	,001
	N	163	163	163	163	163	163	163	163
MEDSTA37K	Pearson Correlation	-,216**	,289**	,369**	,405**	,424**	,748**	1	,145
	Sig. (2-tailed)	,006	,000	,000	,000	,000	,000		,065
	N	163	163	163	163	163	163	163	163
CARRIBS38K	Pearson Correlation	-,101	,011	-,011	-,092	-,038	,253**	,145	1
	Sig. (2-tailed)	,202	,886	,886	,244	,633	,001	,065	
	N	163	163	163	163	163	163	163	163

**. Correlation is significant at the 0.01 level (2-tailed).

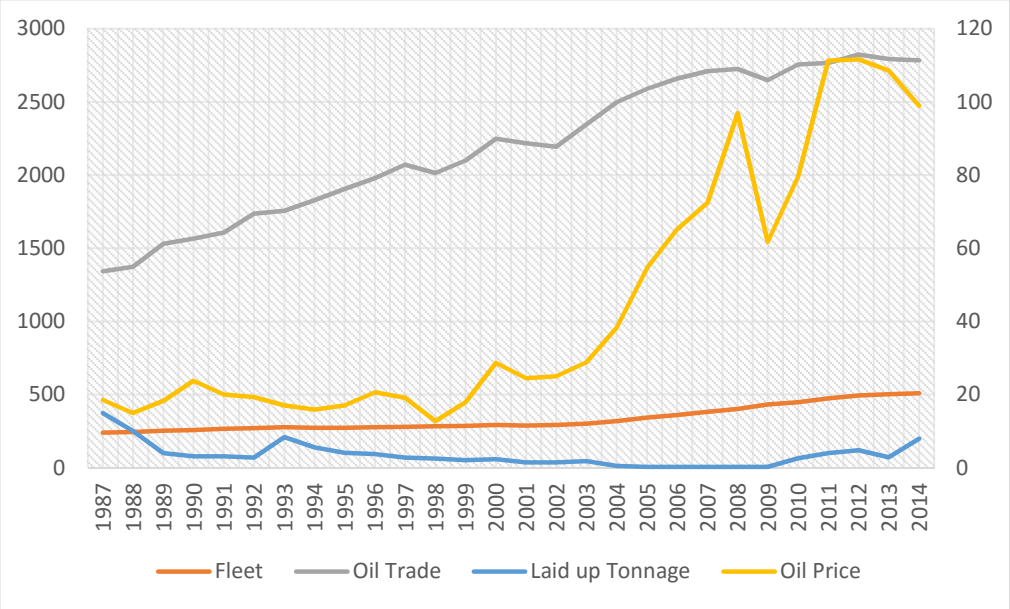
Source: Fearnley, IEA, Processed by the Author

As a result hypothesis 2 is failed to reject. *When oil price decreases, spot earnings increases in the short run.*

3.3.1.1.4. Fleet's Relationship with Oil Price

Fleet represents the supply side of the tanker transportation. It is affected by demand of oil of course. If demand for oil increases, demand for oil transportation also increases. As a result the market becomes more profitable and new investors enter to the market in order to make profit.

Figure 29: Oil Price, Laid-up Tonnage, Fleet and Oil Trade



Source: UNCTAD, EIA, BP, Processed by the Author

Laid-up tonnage has the highest volatility nearly a hundred percent. Technological developments, supply side investments, oil demand and oil price may cause this high volatility.

Table 21: Descriptive Statistics for Laid-up Tonnage, Fleet, Oil Trade and Oil Price

	Mean	Std. Deviation	% of Mean	N
LAIDUPTON	3,4964	3,35432	96%	28
FLEET	332,8393	86,14612	26%	28
OILTRADE	2198,7500	482,76776	22%	28
OILPRICE	44,3282	34,48112	78%	28

Source: UNCTAD, EIA, BP, Processed by the Author

As seen at the table below, there is a strong correlation coefficient between oil price and fleet. When the laid-up tonnage is examined, it can be seen that there is a medium degree correlation coefficient between oil trade and laid-up tonnage. When the oil trade increases, laid-up tonnage decreases.

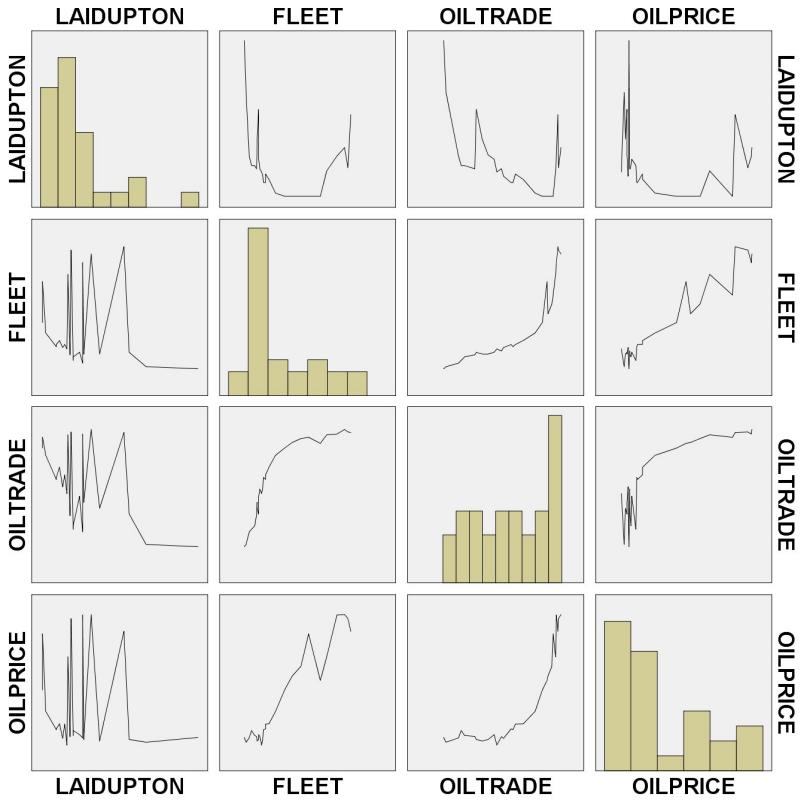
Table 22: Correlation Matrix for Laid-up Tonnage, Fleet, Oil Trade and Oil Price

Correlations					
		LAIDUPTON	FLEET	OILTRADE	OILPRICE
LAIDUPTON	Pearson Correlation	1	-,200	-,538**	-,187
	Sig. (2-tailed)		,307	,003	,340
	N	28	28	28	28
FLEET	Pearson Correlation	-,200	1	,872**	,963**
	Sig. (2-tailed)	,307		,000	,000
	N	28	28	28	28
OILTRADE	Pearson Correlation	-,538**	,872**	1	,842**
	Sig. (2-tailed)	,003	,000		,000
	N	28	28	28	28
OILPRICE	Pearson Correlation	-,187	,963**	,842**	1
	Sig. (2-tailed)	,340	,000	,000	
	N	28	28	28	28
**. Correlation is significant at the 0.01 level (2-tailed).					

Source: UNCTAD, EIA, BP, Processed by the Author

As a result hypothesis 3 is rejected. *When oil price decreases, laid-up tonnage does not decrease in the short run.*

Figure 30: Scatterplot Matrix of Fleet and Oil Price



Source: UNCTAD, EIA, BP, Processed by the Author

The table below shows tonnage on order amounts of tankers and oil prices. There was a record of order on 2009 as 192.252.000 dwt.

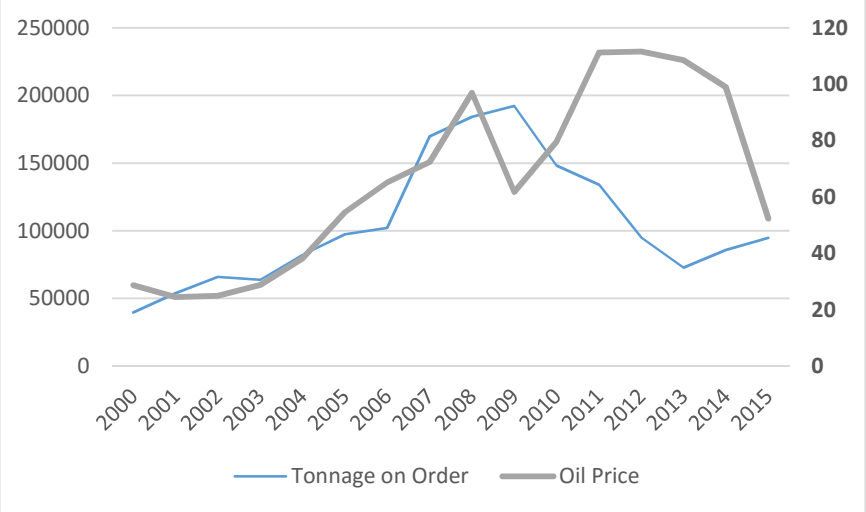
Table 23: Tonnage on Order and Oil Price (000dwt)

Years	**Tonnage on Order**	**Oil Price**	Years	**Tonnage on Order**	**Oil Price**
2000	39546	28,66	**2008**	184196	96,94
2001	53919	24,46	**2009**	192252	61,74
2002	65898	24,99	**2010**	148307	79,61
2003	63678	28,85	**2011**	134044	111,26
2004	82258	38,26	**2012**	94936	111,63
2005	97474	54,57	**2013**	72843	108,56
2006	102010	65,16	**2014**	85844	98,97
2007	169883	72,44	**2015**	94851	52,32

Source: EIA, UNCTAD, Processed by the Author

The figure below shows the graphical presentation of the table above. There was a peak at 2009 then amount of tonnage on order had started to decrease until 2013. After 2013, in contradiction to the decrease on oil price, amount of tonnage on order have started to increase again.

Figure 31: Oil Price and Tonnage on Order



Source: EIA, UNCTAD, Processed by the Author

As a result, according to the figure above hypothesis 4 is failed to reject. *When oil price decreases, tonnage on order increases in the short run.*

3.3.1.2.Newbuilding Market's Relationship with Oil Price

The data that will be used in this section and their sources are defined below. Correlation matrix between newbuilding prices of tanker ships and oil price will be studied.

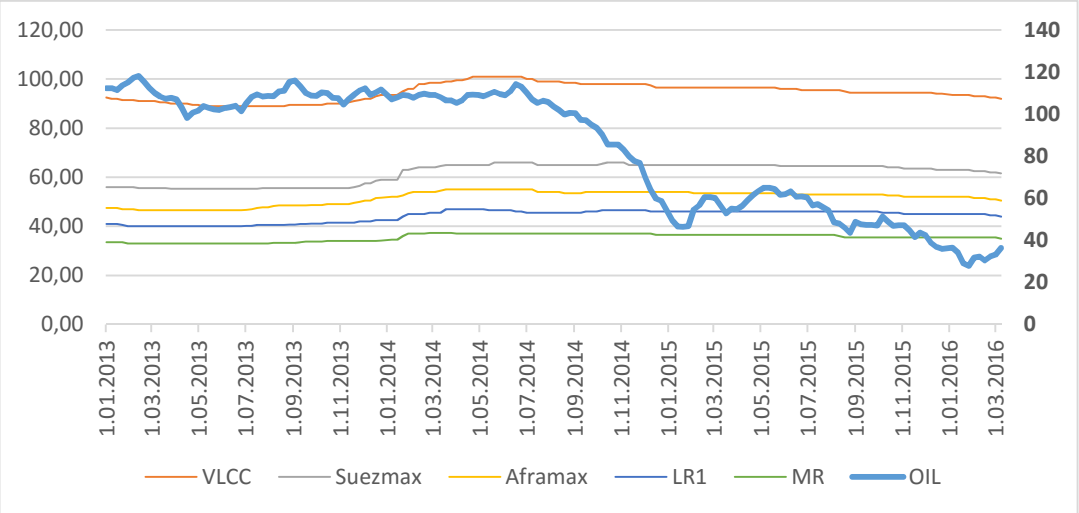
Table 24: Data Descriptions for Correlation Matrix of Newbuilding Tanker Prices

Variable Name	Description	Units	Frequency	Source
OIL	Europe Brent Spot Price FOB	$/barrel	Weekly	U.S. Energy Information Administration
VLCC	VLCC Newbuilding Price	million $	Weekly	Intermodal Report
SUEZMAX	SUEZMAX Newbuilding Price	million $	Weekly	Intermodal Report
AFRAMAX	AFRAMAX Newbuilding Price	million $	Weekly	Intermodal Report
LR1	LR1 Newbuilding Price	million $	Weekly	Intermodal Report
MR	MR Newbuilding Price	million $	Weekly	Intermodal Report

Source: EIA, Intermodal, Processed by the Author

The figure below shows the newbuilding prices by types of the vessels and oil prices. An inverse correlation can be seen but not as much as correlation of secondhand prices.

Figure 32: Oil Price and Newbuilding Prices of Tankers



Source: EIA, Intermodal, Processed by the Author

The volatilities of the newbuilding prices are low. Because building a ship takes time between 1 and 3 years according to market conditions. In addition, this volatility

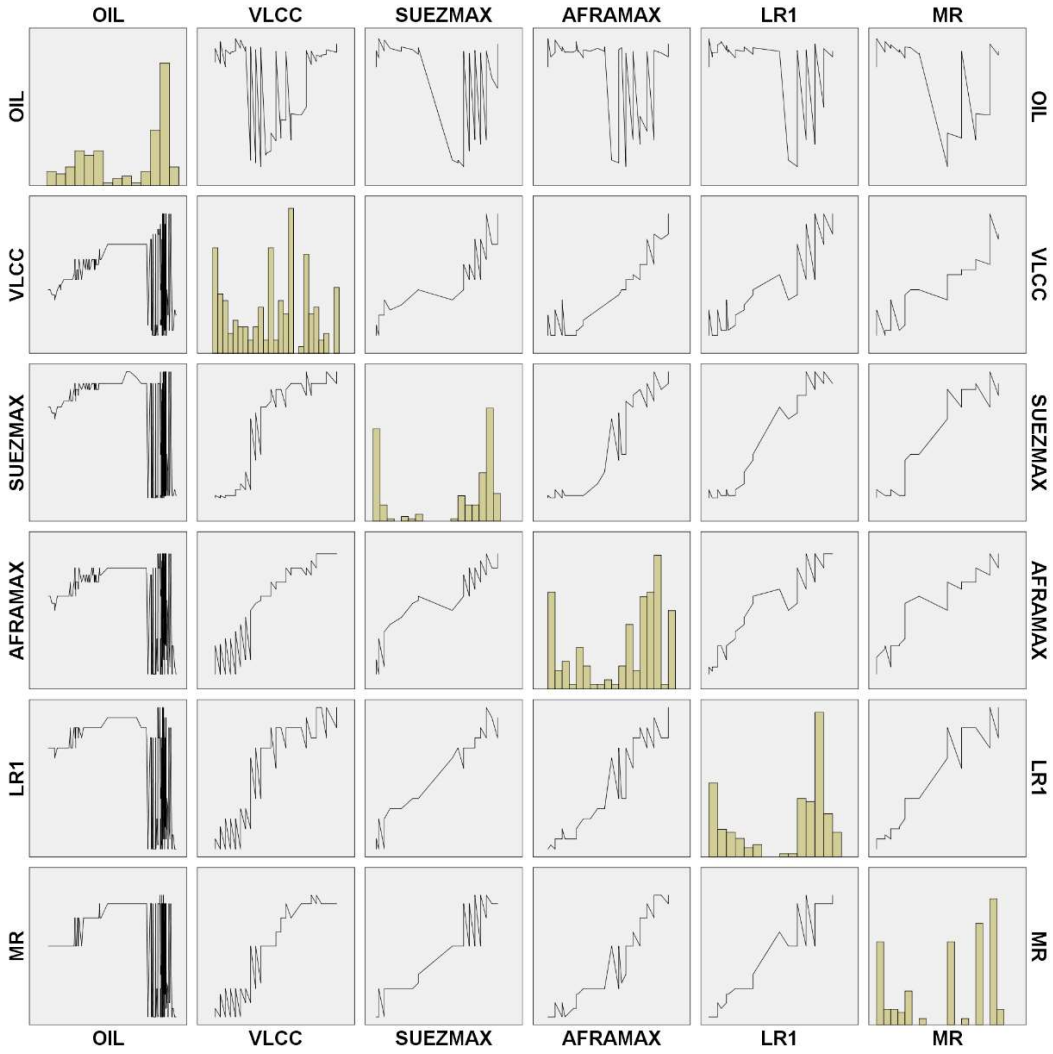
is relevant with capacity of shipyards. Low volatility shows that the shipyards are not working in a full swing.

Table 25: Descriptive Statistics for Newbuilding Values and Oil Price

	Mean	Std. Deviation	% of Mean	N
OIL	83,6174	28,81242	34%	164
VLCC	94,6311	3,65451	4%	164
SUEZMAX	61,6896	4,21896	7%	164
AFRAMAX	51,6335	2,88800	6%	164
LR1	44,1378	2,50340	6%	164
MR	35,4415	1,55145	4%	164

Source: EIA, Intermodal, Processed by the Author

Figure 33: Scatterplot Matrix of Newbuilding Prices and Oil Price



Source: EIA, Intermodal, Processed by the Author

According to the correlation matrix, there is an inverse reasonable correlation among some variables and oil price. Correlations are significant except Vlcc newbuilding price. Because of taking long time to be built, newbuilding prices are affected less than secondhand prices. If wider data obtained, the research would give more clear results.

Table 26: Correlation Matrix for Newbuilding Values and Oil Price

		OIL	VLCC	SUEZMAX	AFRAMAX	LR1	MR
OIL	Pearson Correlation	1	-,140	-,509**	-,355**	-,520**	-,338**
	Sig. (2-tailed)		,075	,000	,000	,000	,000
	N	164	164	164	164	164	164
VLCC	Pearson Correlation	-,140	1	,909**	,931**	,892**	,943**
	Sig. (2-tailed)	,075		,000	,000	,000	,000
	N	164	164	164	164	164	164
SUEZMAX	Pearson Correlation	-,509**	,909**	1	,959**	,985**	,962**
	Sig. (2-tailed)	,000	,000		,000	,000	,000
	N	164	164	164	164	164	164
AFRAMAX	Pearson Correlation	-,355**	,931**	,959**	1	,969**	,971**
	Sig. (2-tailed)	,000	,000	,000		,000	,000
	N	164	164	164	164	164	164
LR1	Pearson Correlation	-,520**	,892**	,985**	,969**	1	,960**
	Sig. (2-tailed)	,000	,000	,000	,000		,000
	N	164	164	164	164	164	164
MR	Pearson Correlation	-,338**	,943**	,962**	,971**	,960**	1
	Sig. (2-tailed)	,000	,000	,000	,000	,000	
	N	164	164	164	164	164	164
**. Correlation is significant at the 0.01 level (2-tailed).							

Source: EIA, Intermodal, Processed by the Author

As a result, according to the correlation coefficients, hypothesis 5 failed to reject. *When oil price decreases, price of newbuildings increases in the short run.*

3.3.1.3.Secondhand Market's Relationship with Oil Price

The data that will be used in this section and their sources are defined below. Correlation matrix between secondhand prices of tanker ships and oil price will be studied.

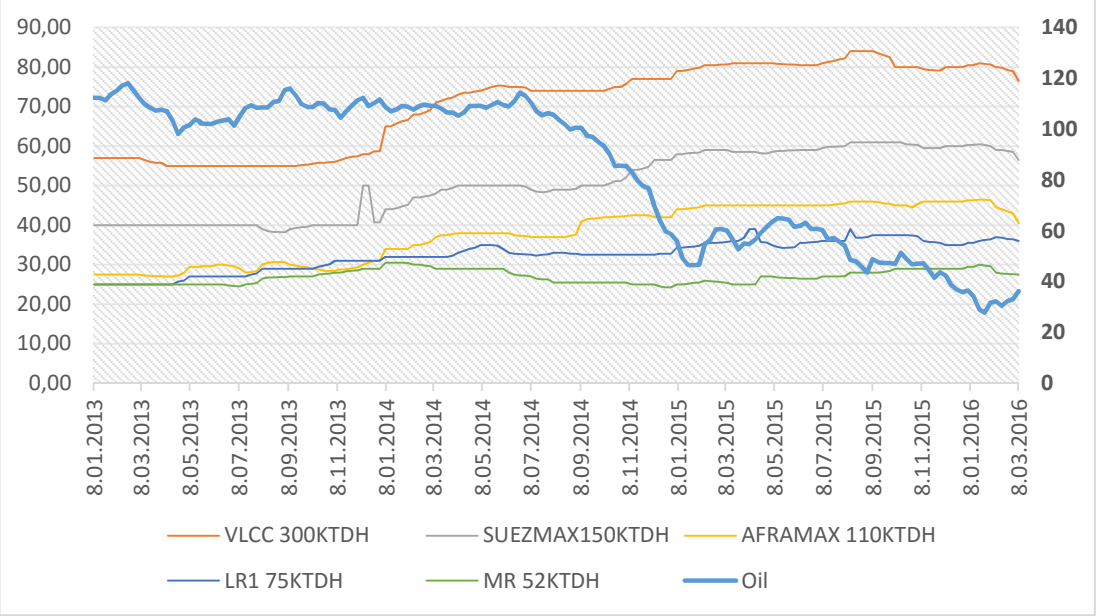
Table 27: Data Descriptions for Correlation Matrix of Secondhand Tanker Prices

Variable Name	Description	Units	Frequency	Source
OIL	Europe Brent Spot Price FOB	$/barrel	Weekly	U.S. Energy Information Administration
VLCC	VLCC Secondhand Price	million $	Weekly	Intermodal Report
SUEZMAX	SUEZMAX Secondhand Price	million $	Weekly	Intermodal Report
AFRAMAX	AFRAMAX Secondhand Price	million $	Weekly	Intermodal Report
LR1	LR1 Secondhand Price	million $	Weekly	Intermodal Report
MR	MR Secondhand Price	million $	Weekly	Intermodal Report

Source: EIA, Intermodal, Processed by the Author

When the graphic below is examined, it can be clearly seen that secondhand prices of tankers and oil prices have inverse correlation. When the secondhand values of oil tankers increases, oil prices decreases.

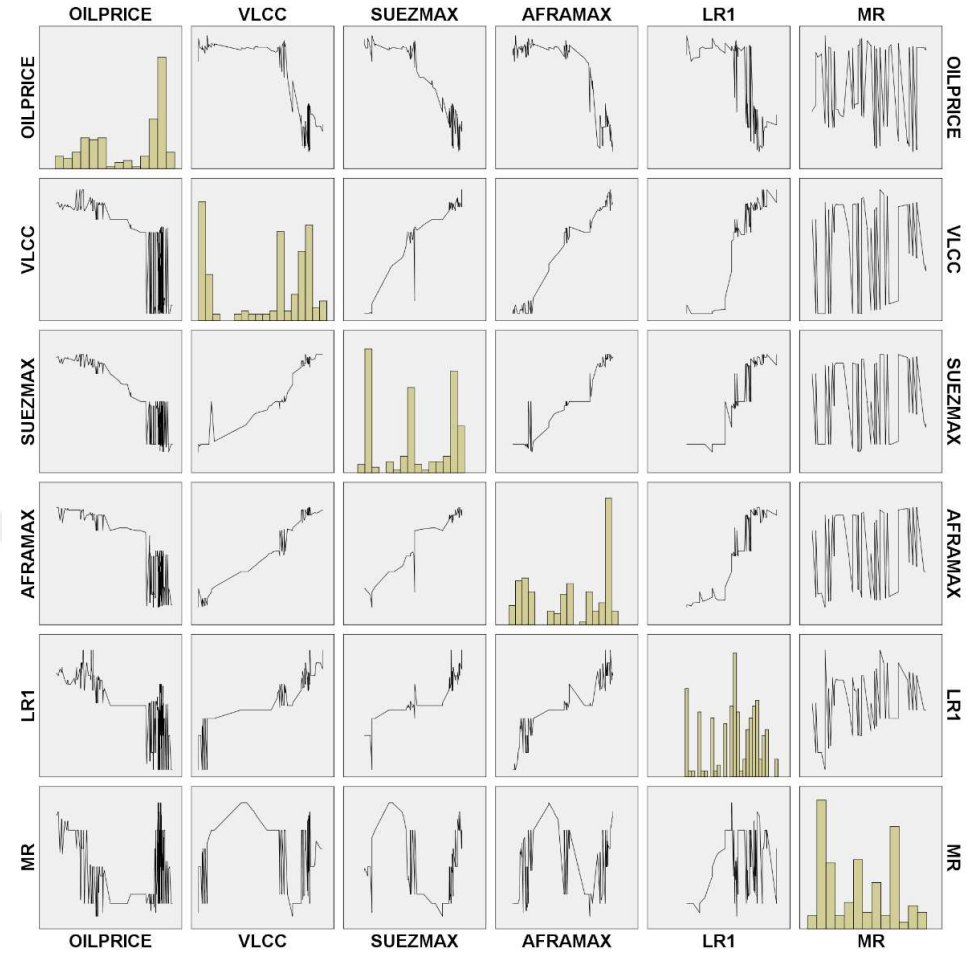
Figure 34: Oil Price and Secondhand Prices of Tankers



Source: EIA, Intermodal, Processed by the Author

Scatterplot matrix shows the linear relationship between oil price and secondhand value of oil tanker in the first row of the figure.

Figure 35: Scatterplot Matrix of Secondhand Prices and Oil Price



Source: EIA, Intermodal, Processed by the Author

When the descriptive statistics for secondhand values of the tankers are examined, it can be seen that secondhand values of tankers are more volatile than newbuilding values. Because of taking time between 1-3 years for building, newbuilding ships are less volatile. The secondhand ships are more convertible to the cash quickly.

Table 28: Descriptive Statistics for Secondhand Values and Oil Price

	Mean	Std. Deviation	% of Mean	N
OILPRICE	83,6025	28,78416	34%	166
VLCC	70,6096	10,62707	15%	166
SUEZMAX	50,4283	8,24615	16%	166
AFRAMAX	37,9500	6,99510	18%	166
LR1	32,3910	3,79690	12%	166
MR	26,9627	1,76760	7%	166

Source: EIA, Intermodal, Processed by the Author

The correlation matrix below points relationship degrees between secondhand values and oil prices up. According to the table below, all ship types, except MR, have negative significant correlation with oil prices. Furthermore, MR have the least standard deviation percentage at the table above. That means secondhand price of MR is the most stable one. This situation may arise from demand for that kind of product tanker and amount of it in the market. Apart from that, it can be said that secondhand values of tankers have strong negative correlation with oil price. When the oil price decreases, demand for oil increases. Because of being a derived demand, demand for transport services also increases. So secondhand values of the tanker rise.

Table 29: Correlation Matrix for Secondhand Values and Oil Price

		OILPRICE	VLCC	SUEZMAX	AFRAMAX	LR1	MR
OILPRICE	Pearson Correlation	1	-,781**	-,891**	-,854**	-,760**	-,130
	Sig. (2-tailed)		,000	,000	,000	,000	,095
	N	166	166	166	166	166	166
VLCC	Pearson Correlation	-,781**	1	,963**	,975**	,916**	,231**
	Sig. (2-tailed)	,000		,000	,000	,000	,003
	N	166	166	166	166	166	166
SUEZMAX	Pearson Correlation	-,891**	,963**	1	,974**	,906**	,228**
	Sig. (2-tailed)	,000	,000		,000	,000	,003
	N	166	166	166	166	166	166
AFRAMAX	Pearson Correlation	-,854**	,975**	,974**	1	,916**	,217**
	Sig. (2-tailed)	,000	,000	,000		,000	,005
	N	166	166	166	166	166	166
LR1	Pearson Correlation	-,760**	,916**	,906**	,916**	1	,439**
	Sig. (2-tailed)	,000	,000	,000	,000		,000
	N	166	166	166	166	166	166
MR	Pearson Correlation	-,130	,231**	,228**	,217**	,439**	1
	Sig. (2-tailed)	,095	,003	,003	,005	,000	
	N	166	166	166	166	166	166

**. Correlation is significant at the 0.01 level (2-tailed).

Source: EIA, Intermodal, Processed by the Author

As a result, according to the correlation coefficients, hypothesis 6 is failed to reject. *When oil price decreases, price of secondhand ships increases in the short run.* Also hypothesis 7 is failed to reject too. *When oil price decreases, price of secondhand ships increase more than newbuilding ships in the short run.*

3.3.1.4.Demolition Market's Relationship with Oil Price

The data that will be used in this section and their sources are defined below. Correlation matrix between demolition prices of tanker ships and oil price will be studied.

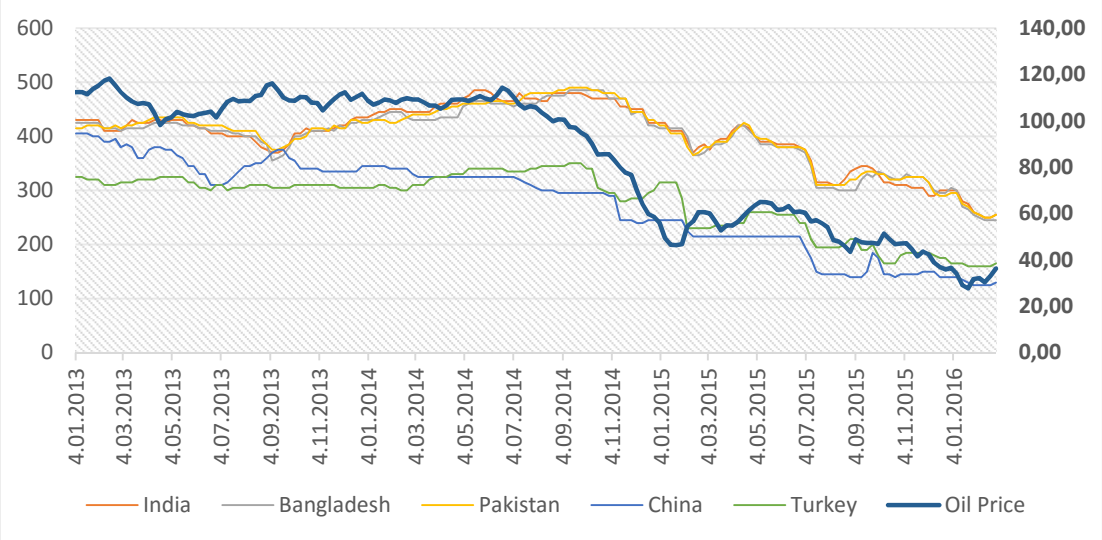
Table 30: Data Descriptions for Correlation Matrix of Demolition Prices

Variable Name	Description	Units	Frequency	Source
OIL	Europe Brent Spot Price FOB	$/barrel	Weekly	U.S. Energy Information Administration
INDIA	India Demolition Price	$ / lt ldt	Weekly	Athenian Shipbrokers S.A.
BANGLADESH	Bangladesh Demolition Price	$ / lt ldt	Weekly	Athenian Shipbrokers S.A.
PAKISTAN	Pakistan Demolition Price	$ / lt ldt	Weekly	Athenian Shipbrokers S.A.
CHINA	China Demolition Price	$ / lt ldt	Weekly	Athenian Shipbrokers S.A.
TURKEY	Turkey Demolition Price	$ / lt ldt	Weekly	Athenian Shipbrokers S.A.

Source: EIA, Athenian, Processed by the Author

The oil price and demolition prices are moving same direction as seen on the figure below. It can be said that there is a significant positive correlation between them. For more clear results, correlation matrix of them will be examined.

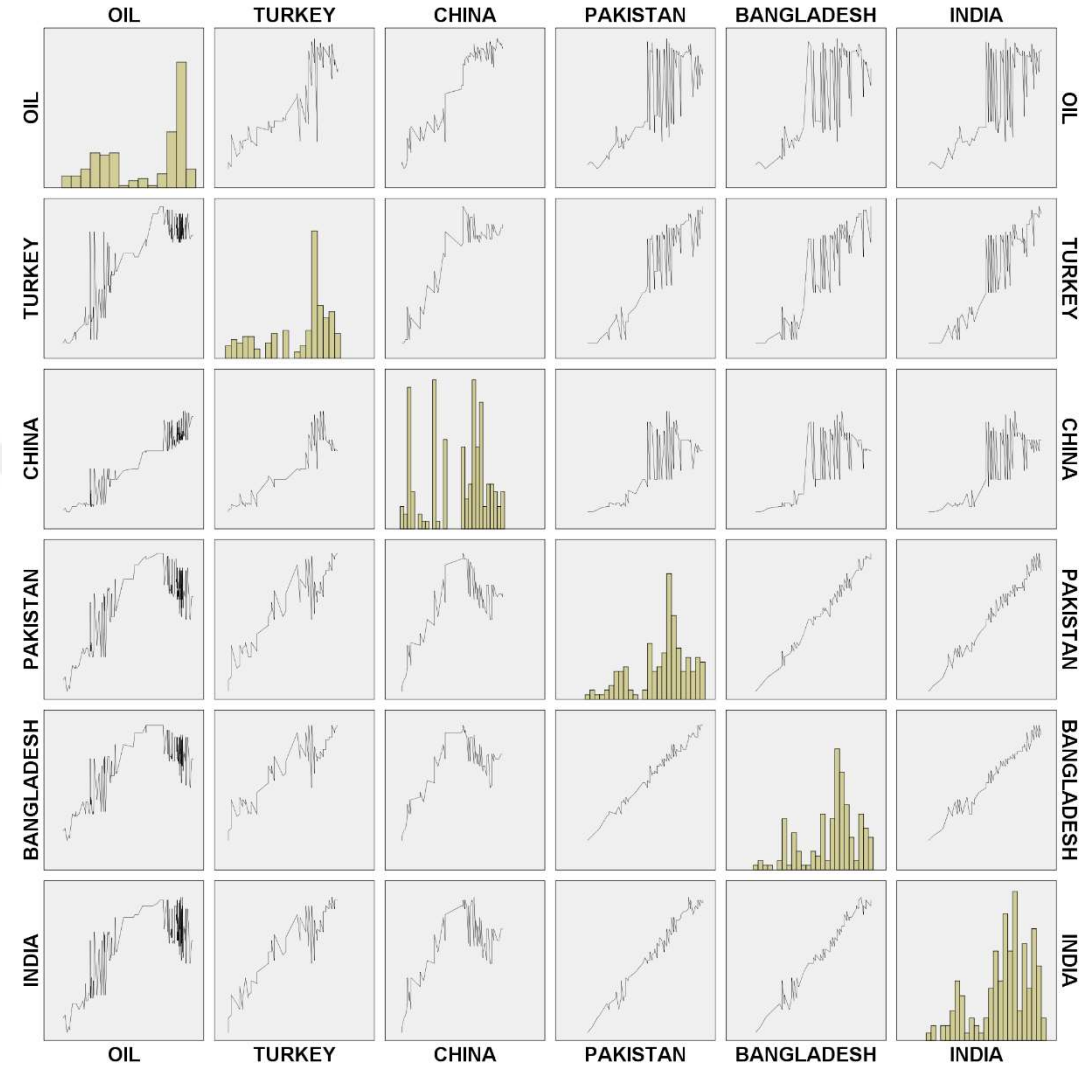
Figure 36: Oil Price and Demolition Prices of Various Countries



Source: EIA, Athenian, Processed by the Author

Scatterplot matrix shows that there is a linear relationship between oil price and demolition prices. They move same direction and have a positive correlation. To understand better, the correlation matrix below should be examined.

Figure 37: Scatterplot Matrix of Demolition Prices and Oil Price



Source: EIA, Athenian, Processed by the Author

When the descriptive statistics are examined, it can be seen that China demolition prices have the highest volatility after oil price.

Table 31: Descriptive Statistics for Demolition Prices and Oil Price

	Mean	Std. Deviation	% of Mean	N
OIL	83,9135	28,59069	34%	165
INDIA	403,0303	59,23727	15%	165
BANGLADESH	399,0000	58,44843	15%	165
PAKISTAN	402,6364	58,80560	15%	165
CHINA	275,1818	84,17623	31%	165
TURKEY	278,8788	57,74300	21%	165

Source: EIA, Athenian, Processed by the Author

Table below shows the correlation matrix between demolition prices and oil price. There are positive significant correlations among variables as can be seen at the table. In theory, when the oil price decreases, demand for tanker ships should be increase. For this reason, the number of ships that are sent to the demolition should decrease. In addition to all these, demolition prices should decrease because of falling of number of ships that are sent to the demolition yards. This contrary situation may arise from demand for steel. Demolition prices will increase as long as demand for steel stays buoyant.

Table 32: Correlation Matrix for Demolition and Oil Prices

		OIL	INDIA	BANGLADESH	PAKISTAN	CHINA	TURKEY
OIL	Pearson Correlation	1	,749**	,736**	,747**	,953**	,881**
	Sig. (2-tailed)		0	0	0	0	0
	N	165	165	165	165	165	165
INDIA	Pearson Correlation	,749**	1	,984**	,985**	,744**	,914**
	Sig. (2-tailed)	0		0	0	0	0
	N	165	165	165	165	165	165
BANGLADESH	Pearson Correlation	,736**	,984**	1	,991**	,739**	,903**
	Sig. (2-tailed)	0	0		0	0	0
	N	165	165	165	165	165	165
PAKISTAN	Pearson Correlation	,747**	,985**	,991**	1	,741**	,915**
	Sig. (2-tailed)	0	0	0		0	0
	N	165	165	165	165	165	165
CHINA	Pearson Correlation	,953**	,744**	,739**	,741**	1	,897**
	Sig. (2-tailed)	0	0	0	0		0
	N	165	165	165	165	165	165
TURKEY	Pearson Correlation	,881**	,914**	,903**	,915**	,897**	1
	Sig. (2-tailed)	0	0	0	0	0	
	N	165	165	165	165	165	165
**. Correlation is significant at the 0.01 level (2-tailed).							

Source: EIA, Athenian, Processed by the Author

As a result, according to the correlation coefficients, hypothesis 8 is rejected. *When oil price decreases, demolition price of tanker does not increase in the short run.* Bad situation of other shipping markets may cause this result. Because it is not important that steel is produced from tanker or bulk carrier on demolition market.

3.3.1.5.Stock Market's Relationship with Oil Price

The data that will be used in this section and their sources are defined below. Correlation matrix between stock exchange prices of two tanker shipping companies and oil price will be studied.

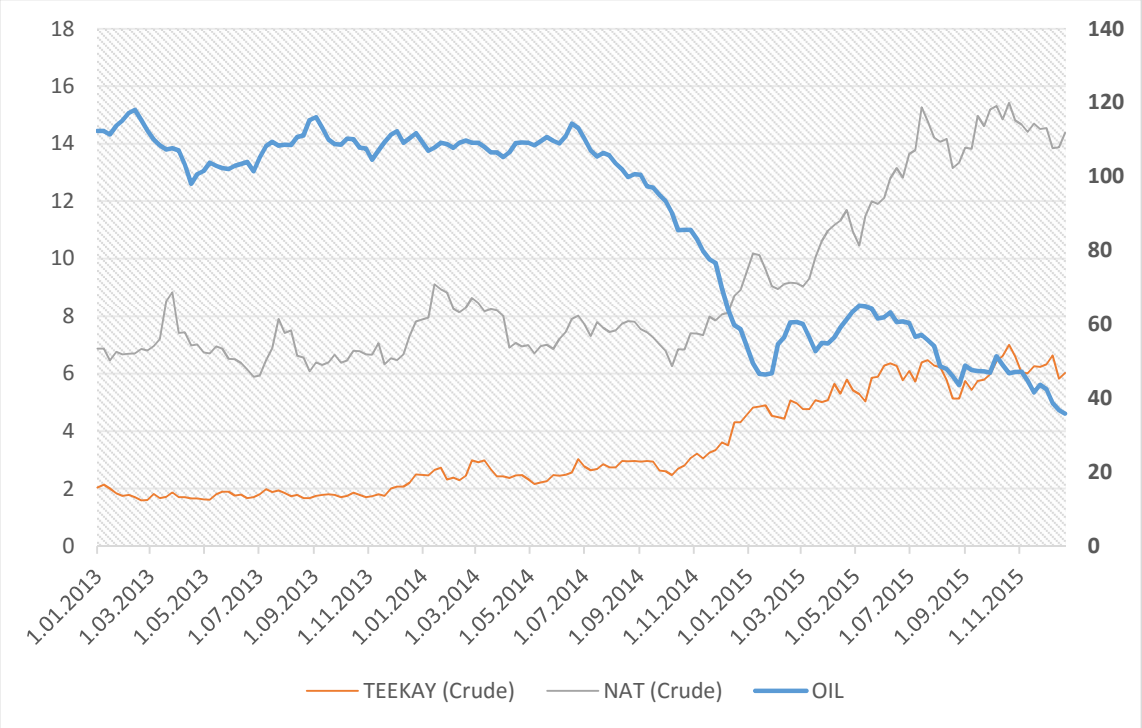
Table 33: Data Descriptions for Correlation Matrix of Stock Exchange Prices

Variable Name	Description	Units	Frequency	Source
OIL	Europe Brent Spot Price FOB	$/barrel	Weekly	U.S. Energy Information Administration
TEEKAY	Teekay Tanker Stock Value	$	Weekly	Yahoo Finance
NAT	Nordic American Tankers Stock Value	$	Weekly	Yahoo Finance

Source: EIA, Yahoo, Processed by the Author

The inverse movement of oil price and stock exchange prices can be seen clearly at the figure below. Oil prices have downward trend whereas stock exchange prices have an upward trend.

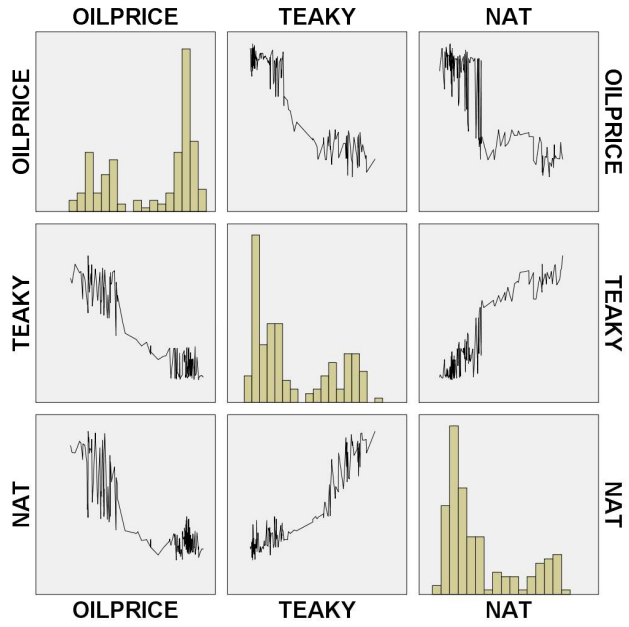
Figure 38: Oil Price and Stock Exchanges



Source: EIA, Yahoo, Processed by the Author

If the scatterplot matrix is examined, linear relationship among oil price and stock exchange values can be seen.

Figure 39: Scatterplot Matrix of Stock Prices and Oil Price



Source: EIA, Yahoo, Processed by the Author

Standard deviations and percentage of means shows how the markets are volatile. Teekay tanker volatility is 50% of the mean.

Table 34: Descriptive Statistics for Stock Exchange Rates and Oil Price

	Mean	Std. Deviation	% of Mean	N
OILPRICE	86,9456	26,47808	30%	154
TEEKAY	3,4152	1,71070	50%	154
NAT	9,0127	2,86006	32%	154

Source: EIA, Yahoo, Processed by the Author

When the correlation between and stock prices are examined, it can be seen that there are strong significant negative correlations between variables. According to the first row of the table below, correlation between oil price and Teekay Tankers is -,937 and the correlation between oil price and Nordic American Tankers is -,863.

Table 35: Correlation Matrix for Stock Exchange Rates and Oil Prices

		OILPRICE	TEEKAY	NAT
OILPRICE	Pearson Correlation	1	-,937**	-,863**
	Sig. (2-tailed)		,000	,000
	N	154	154	154
TEEKAY	Pearson Correlation	-,937**	1	,939**
	Sig. (2-tailed)	,000		,000
	N	154	154	154
NAT	Pearson Correlation	-,863**	,939**	1
	Sig. (2-tailed)	,000	,000	
	N	154	154	154
**. Correlation is significant at the 0.01 level (2-tailed).				

Source: EIA, Yahoo, Processed by the Author

As a result, according to the correlation coefficients hypothesis 9 failed to reject. *When oil price decrease, stock exchange values of tanker firms increase in the short run.*

3.3.2. VLCC Tanker Price Elasticity Models

The descriptions of variables that will be used in this section are defined at the table below.

Table 36: Data Descriptions for Models

Variable Name	**Description**	**Units**	**Frequency**	**Source**
VLCC_SH	VLCC Indicative Secondhand Price	million $	Weekly	Intermodal Weekly Reports
VLCC_NB	VLCC Indicative Newbuilding Price	million $	Weekly	Intermodal Weekly Reports
VLCC_TC	VLCC 1 Year Time Charter Rate	$/day	Weekly	Fearnley Weekly Reports
OIL	Europe Brent Spot Price FOB	$/barrel	Weekly	U.S. Energy Information Adm.
CHINA_DEMO	China Tanker Demolition Price	$ / lt ldt	Weekly	Athenian Shipbrokers S.A.

Source: Intermodal, Fearnley, EIA, Athenian, Processed by the Author

Firstly unit root test results are showed in tables. Then graphical changes of the variables are showed in the figures below. First columns of the figures show the normal graphics. Second columns show the graphic of logarithmic values and the last columns include the graphic of values which are converted to stable values. When the stable logarithmic values are placed to the regression model the result will give us the

elasticity of variables. The reason for making the values stable is saving the result from inflated values.

Table 37: Unit Root Test Results of Secondhand Value

Null Hypothesis: VLCC_SH has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.197564	0.6751
Test critical values:	1% level	-3.470679	
	5% level	-2.879155	
	10% level	-2.576241	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(VLCC_SH) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.948610	0.0000
Test critical values:	1% level	-3.470934	
	5% level	-2.879267	
	10% level	-2.576301	

*MacKinnon (1996) one-sided p-values.

Figure 40: Normal, Logarithmic and Stationary Graphics of Secondhand Value

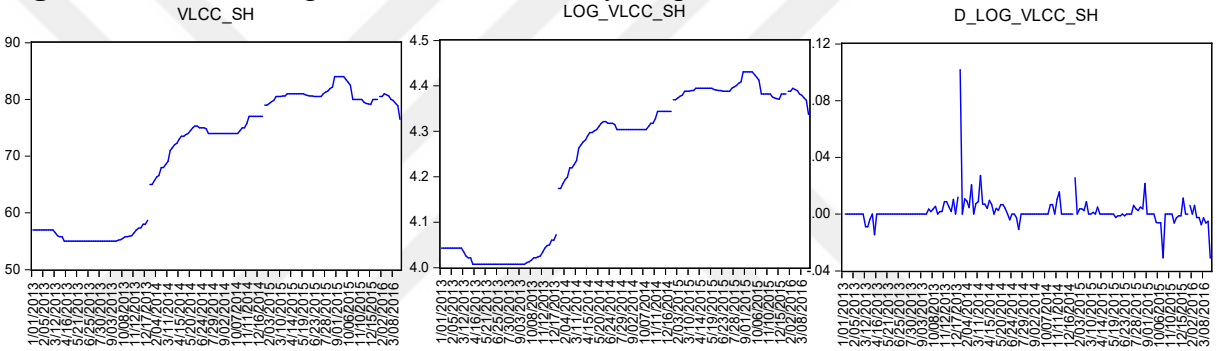


Table 38: Unit Root Test Results of Newbuilding Value

Null Hypothesis: VLCC_NB has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.353789	0.6036
Test critical values:	1% level	-3.471454	
	5% level	-2.879494	
	10% level	-2.576422	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(VLCC_NB) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.049985	0.0015
Test critical values:	1% level	-3.471454	
	5% level	-2.879494	
	10% level	-2.576422	

*MacKinnon (1996) one-sided p-values.

Figure 41: Normal, Logarithmic and Stationary Graphics of Newbuilding Value

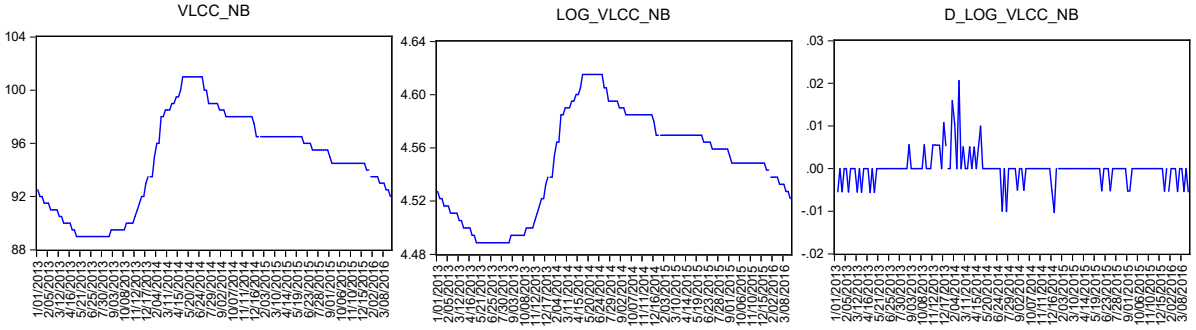


Table 39: Unit Root Test Results of 1 Year Time Charter Rate

Null Hypothesis: VLCC_TC has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.635690	0.8581
Test critical values:	1% level	-3.470679	
	5% level	-2.879155	
	10% level	-2.576241	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(VLCC_TC) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.70420	0.0000
Test critical values:	1% level	-3.470934	
	5% level	-2.879267	
	10% level	-2.576301	

*MacKinnon (1996) one-sided p-values.

Figure 42: Normal, Logarithmic and Stationary Graphics of Time Charter Rates

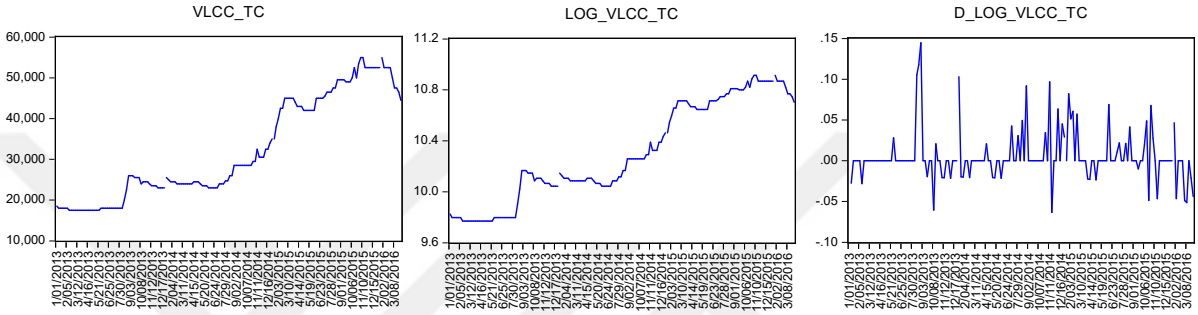


Table 40: Unit Root Test Results of Oil Price

Null Hypothesis: OIL has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.166713	0.9389
Test critical values:	1% level	-3.470934	
	5% level	-2.879267	
	10% level	-2.576301	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(OIL) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.424845	0.0000
Test critical values:	1% level	-3.470934	
	5% level	-2.879267	
	10% level	-2.576301	

*MacKinnon (1996) one-sided p-values.

Figure 43: Normal, Logarithmic and Stationary Graphics of Oil Price

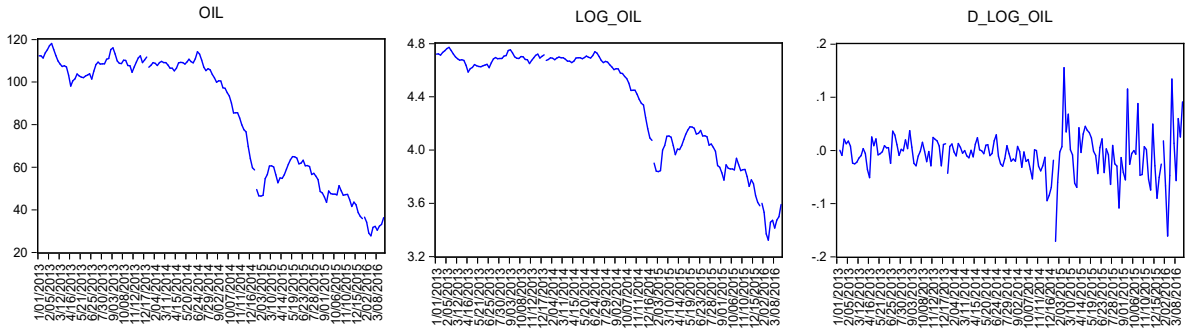


Table 41: Unit Root Test Results of China Demolition Price

Null Hypothesis: CHINA_DEMO has a unit root Exogenous: Constant Lag Length: 1 (Automatic - based on SIC, maxlag=13)				Null Hypothesis: D(CHINA_DEMO) has a unit root Exogenous: Constant Lag Length: 0 (Automatic - based on SIC, maxlag=13)			
		t-Statistic	Prob.*			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.553888	0.8761	Augmented Dickey-Fuller test statistic		-10.35290	0.0000
Test critical values:	1% level	-3.470934		Test critical values:	1% level	-3.470934	
	5% level	-2.879267			5% level	-2.879267	
	10% level	-2.576301			10% level	-2.576301	
*MacKinnon (1996) one-sided p-values.				*MacKinnon (1996) one-sided p-values.			

Figure 44: Normal, Logarithmic and Stationary Graphics of China Demolition Price

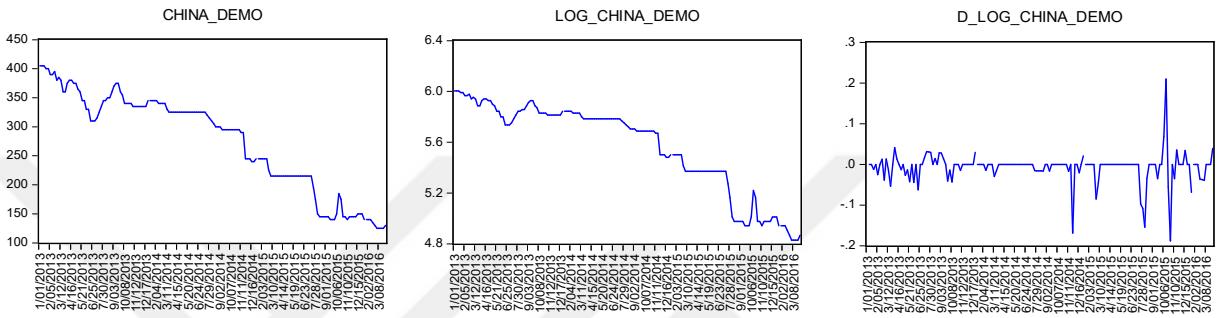


Table 42: Johansen Cointegration Test Analysis for Secondhand Value

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.179801	77.41520	88.80380	0.2493
At most 1	0.146069	45.70181	63.87610	0.6144
At most 2	0.069726	20.43710	42.91525	0.9522
At most 3	0.035948	8.872915	25.87211	0.9639
At most 4	0.018670	3.015376	12.51798	0.8747

According to Johansen test results, our variables are not cointegrated. It means that they don't have relationship in the long run with each other.

Our fist equation is;

$$SH\ VALUE_{VLCC} = f(NB\ VALUE_{VLCC}, TC\ RATE_{VLCC}, OIL\ PRICE, DEMOLITION\ PRICE_{CHINA})$$

We assume that, secondhand values of the VLCC ship are result of VLCC newbuilding Price, VLCC 1 year time charter rate, Oil Price and China Demolition Price.

Table 43: Regression Model of VLCC Secondhand Value-1

Dependent Variable: D_LOG_VLCC_SH
Method: Least Squares
Date: 03/12/16 Time: 20:45
Sample (adjusted): 1/08/2013 3/08/2016
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D_LOG_VLCC_NB	0.729299	0.205219	3.553769	0.0005
D_LOG_VLCC_TC	0.082053	0.024942	3.289727	0.0012
D_LOG_OIL	-0.052090	0.018380	-2.834019	0.0052
D_LOG_CHINA_DEMO	-0.011364	0.020796	-0.546458	0.5855
C	0.000947	0.000777	1.218717	0.2248

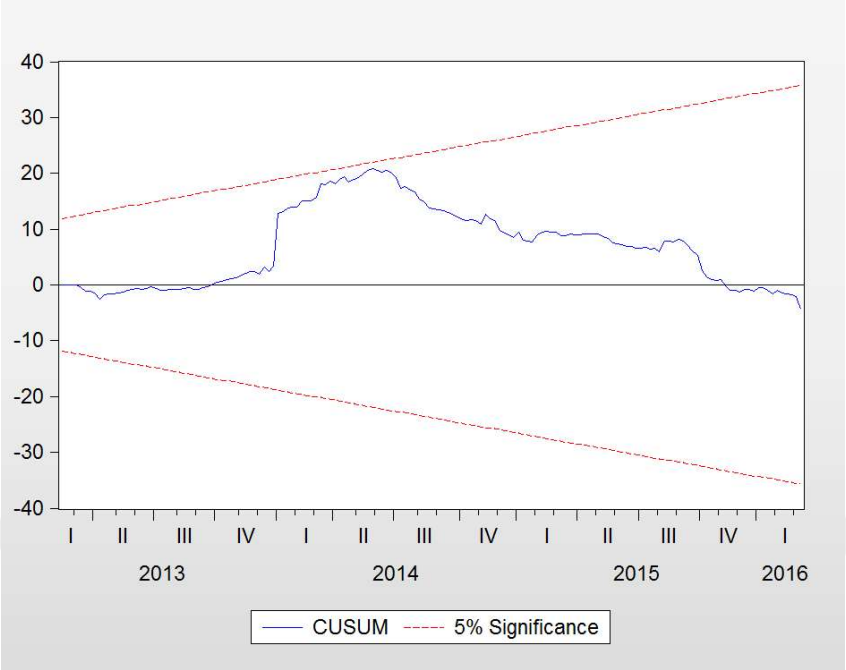
R-squared	0.163548	Mean dependent var	0.001805
Adjusted R-squared	0.142372	S.D. dependent var	0.010246
S.E. of regression	0.009488	Akaike info criterion	-6.447309
Sum squared resid	0.014225	Schwarz criterion	-6.352408
Log likelihood	530.4556	Hannan-Quinn criter.	-6.408780
F-statistic	7.723262	Durbin-Watson stat	1.724689
Prob(F-statistic)	0.000010		

Eviews software was used to run this processes. As a result, or R-squared value was 0.16. This is low but normal result for the equation which consists of stabilized values. Also Prob-F value is smaller than 0,05 which means that our model is meaningful.

The outcomes denote these results;

- 100% increase in oil price results 5% decrease in secondhand value of VLCC tanker ship.
- 100% increase in time charter rates results 8% increase in secondhand value of VLCC tanker ship
- 100% increase in VLCC newbuilding price results 72% increase in secondhand values of VLCC tanker ship

Figure 45: Cusum Structural Change Test for Secondhand Model



According to the Cusum structural change test, there is no structural change in our model. Because blue line doesn't exceed red ones.

Table 44: Autocorrelation Test for Secondhand Model-1

Date: 06/19/16 Time: 18:17
Sample: 1/01/2013 3/08/2016
Included observations: 163

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.124	0.124	2.5477	0.110
		2	0.035	0.020	2.7576	0.252
		3	0.097	0.092	4.3463	0.226
		4	0.062	0.040	5.0042	0.287
		5	0.078	0.063	6.0325	0.303
		6	0.028	0.002	6.1675	0.405
		7	0.086	0.074	7.4520	0.383
		8	0.020	-0.013	7.5232	0.481
		9	0.170	0.164	12.552	0.184
		10	0.015	-0.045	12.593	0.247
		11	0.045	0.042	12.944	0.297
		12	0.030	-0.021	13.101	0.362
		13	0.022	0.013	13.184	0.434
		14	0.042	0.004	13.501	0.488
		15	-0.042	-0.051	13.816	0.540
		16	0.030	0.009	13.982	0.600
		17	0.047	0.044	14.382	0.640
		18	-0.055	-0.101	14.945	0.666

According to the autocorrelation test results, p values are bigger than 0,05 which means there is no autocorrelation between variables.

Our second equation is;

$$SH\ VALUE_{VLCC} = f(NB\ VALUE_{VLCC}, TC\ RATE_{VLCC}, OIL\ PRICE)$$

This model is nearly same as the first one. However, we extracted China demolition prices because of having a high p value. Then we ran the Eviews software again.

Table 45: Regression Model of VLCC Secondhand Value-2

Dependent Variable: D_LOG_VLCC_SH
Method: Least Squares
Date: 03/12/16 Time: 21:00
Sample (adjusted): 1/08/2013 3/08/2016
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D_LOG_VLCC_NB	0.724445	0.204573	3.541244	0.0005
D_LOG_OIL	-0.052235	0.018338	-2.848450	0.0050
D_LOG_VLCC_TC	0.081621	0.024875	3.281292	0.0013
C	0.001028	0.000761	1.349489	0.1791

R-squared	0.161967	Mean dependent var	0.001805
Adjusted R-squared	0.146155	S.D. dependent var	0.010246
S.E. of regression	0.009467	Akaike info criterion	-6.457690
Sum squared resid	0.014251	Schwarz criterion	-6.381770
Log likelihood	530.3018	Hannan-Quinn criter.	-6.426867
F-statistic	10.24333	Durbin-Watson stat	1.715546
Prob(F-statistic)	0.000003		

Then our R-squared value decreased a little but elasticity coefficients remained nearly same. Results of outcomes are nearly same as the first one.

Table 46: Autocorrelation Test for Secondhand Model-2

Date: 06/19/16 Time: 18:12
Sample: 1/01/2013 3/08/2016
Included observations: 163

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.128	0.128	2.7099	0.100
		2	0.037	0.021	2.9442	0.229
		3	0.098	0.093	4.5711	0.206
		4	0.060	0.037	5.1790	0.269
		5	0.077	0.063	6.1921	0.288
		6	0.029	0.002	6.3316	0.387
		7	0.083	0.071	7.5195	0.377
		8	0.024	-0.009	7.6162	0.472
		9	0.168	0.162	12.547	0.184
		10	0.006	-0.054	12.555	0.250
		11	0.038	0.038	12.813	0.306
		12	0.027	-0.023	12.942	0.373
		13	0.018	0.012	13.004	0.448
		14	0.040	0.005	13.297	0.503
		15	-0.042	-0.050	13.623	0.554
		16	0.029	0.010	13.777	0.615
		17	0.041	0.038	14.080	0.661
		18	-0.057	-0.100	14.688	0.683

According to the autocorrelation test results, p values are bigger than 0,05 which means there is no autocorrelation between variables.

Table 47: Johansen Cointegration Test Analysis for Newbuilding Value

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.179801	77.41520	88.80380	0.2493
At most 1	0.146069	45.70181	63.87610	0.6144
At most 2	0.069726	20.43710	42.91525	0.9522
At most 3	0.035948	8.872915	25.87211	0.9639
At most 4	0.018670	3.015376	12.51798	0.8747

According to Johansen test results, our variables are not cointegrated. It means that they don't have relationship in the long run with each other.

Our third equation is;

$$NB\ VALUE_{VLCC} = f(SH\ VALUE_{VLCC}, TC\ RATE_{VLCC}, OIL\ PRICE, DEMOLITION\ PRICE_{CHINA})$$

According to this equation we assumed that newbuilding price of VLCC tanker is function of secondhand value of VLCC tanker, VLCC 1 year time charter rate, oil price and China tanker demolition price. The software is ran again according to new model and results are below.

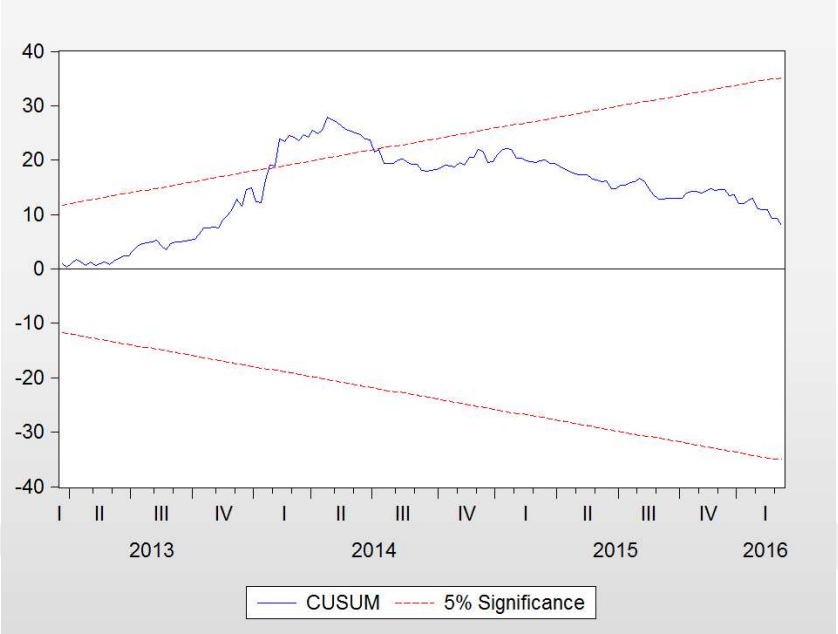
Table 48: Regression Model of VLCC Newbuilding Value

Dependent Variable: D_LOG_VLCC_NB
Method: Least Squares
Date: 03/15/16 Time: 10:12
Sample (adjusted): 1/08/2013 3/08/2016
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D_LOG_VLCC_SH	0.101489	0.028558	3.553769	0.0005
D_LOG_VLCC_TC	-0.016873	0.009524	-1.771650	0.0784
D_LOG_OIL	0.011108	0.006973	1.592935	0.1132
D_LOG_CHINA_DEMO	0.005216	0.007754	0.672628	0.5022
C	-1.22E-05	0.000291	-0.041927	0.9666

R-squared	0.086871	Mean dependent var	-3.33E-05
Adjusted R-squared	0.063753	S.D. dependent var	0.003658
S.E. of regression	0.003540	Akaike info criterion	-8.419442
Sum squared resid	0.001979	Schwarz criterion	-8.324542
Log likelihood	691.1846	Hannan-Quinn criter.	-8.380914
F-statistic	3.757838	Durbin-Watson stat	1.771060
Prob(F-statistic)	0.005993		

Figure 46: Cusum Structural Change Test for Newbuilding Model



According to the Cusum structural change test, there is a structural change in our model. Because blue line exceeds red ones.

Table 49: Autocorrelation Test for Newbuilding Model

Date: 06/19/16 Time: 18:22
Sample: 1/01/2013 3/08/2016
Included observations: 163

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.101	0.101	1.7015	0.192
		2	0.164	0.156	6.2162	0.045
		3	0.185	0.160	11.938	0.008
		4	0.129	0.083	14.762	0.005
		5	0.105	0.043	16.627	0.005
		6	0.056	-0.011	17.159	0.009
		7	0.232	0.188	26.442	0.000
		8	0.125	0.075	29.170	0.000
		9	0.279	0.225	42.813	0.000
		10	0.136	0.037	46.046	0.000
		11	0.039	-0.091	46.314	0.000
		12	0.118	-0.004	48.792	0.000
		13	0.118	0.062	51.283	0.000
		14	0.069	-0.002	52.146	0.000
		15	-0.076	-0.164	53.209	0.000
		16	0.149	0.027	57.258	0.000
		17	0.091	0.024	58.791	0.000
		18	-0.040	-0.112	59.095	0.000

According to the autocorrelation test results, p values are smaller than 0,05 which means there are autocorrelations between variables.

Table 50: Johansen Cointegration Test Analysis for China Demolition

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.179801	77.41520	88.80380	0.2493
At most 1	0.146069	45.70181	63.87610	0.6144
At most 2	0.069726	20.43710	42.91525	0.9522
At most 3	0.035948	8.872915	25.87211	0.9639
At most 4	0.018670	3.015376	12.51798	0.8747

According to Johansen test results, our variables are not cointegrated. It means that they don't have relationship in the long run with each other.

Our fourth equation is;

$$CHINA\ DEMO = f(NB\ VALUE_{VLCC}, SH\ VALUE_{VLCC}, TC\ RATE_{VLCC}, OIL\ PRICE)$$

According to this equation we assumed that China tanker demolition price is function of newbuilding price of VLCC tanker, secondhand value of VLCC tanker, VLCC 1 year time charter rate and oil price. The software is ran again according to new model and results are below.

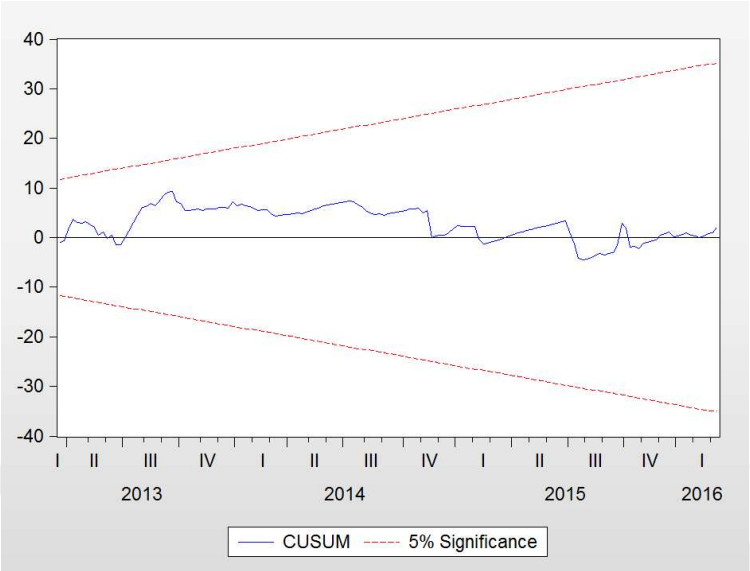
Table 51: Regression Model of China Demolition Prices

Dependent Variable: D_LOG_CHINA_DEMO
Method: Least Squares
Date: 03/13/16 Time: 18:07
Sample (adjusted): 1/08/2013 3/08/2016
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D_LOG_OIL	0.004023	0.072010	0.055868	0.9555
D_LOG_VLCC_NB	0.547446	0.813892	0.672628	0.5022
D_LOG_VLCC_SH	-0.165993	0.303763	-0.546458	0.5855
D_LOG_VLCC_TC	0.051576	0.098450	0.523880	0.6011
C	-0.006903	0.002933	-2.353689	0.0198

R-squared	0.004763	Mean dependent var	-0.006971
Adjusted R-squared	-0.020433	S.D. dependent var	0.035898
S.E. of regression	0.036263	Akaike info criterion	-3.765842
Sum squared resid	0.207771	Schwarz criterion	-3.670942
Log likelihood	311.9162	Hannan-Quinn criter.	-3.727314
F-statistic	0.189030	Durbin-Watson stat	1.527334
Prob(F-statistic)	0.943849		

Figure 47: Cusum Structural Change Test for China Demolition Model



According to the Cusum structural change test, there is no structural change in our model. Because blue line doesn't exceed red ones.

Table 52: Autocorrelation Test for China Demolition Model

Date: 06/19/16 Time: 18:24
Sample: 1/01/2013 3/08/2016
Included observations: 163

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.231	0.231	8.8562	0.003
		2	-0.072	-0.132	9.7123	0.008
		3	-0.117	-0.073	12.004	0.007
		4	-0.108	-0.075	13.970	0.007
		5	-0.030	-0.004	14.119	0.015
		6	0.031	0.015	14.279	0.027
		7	-0.079	-0.118	15.358	0.032
		8	-0.044	-0.004	15.696	0.047
		9	-0.116	-0.133	18.063	0.034
		10	-0.186	-0.163	24.136	0.007
		11	-0.027	0.010	24.263	0.012
		12	-0.005	-0.077	24.267	0.019
		13	0.084	0.058	25.525	0.020
		14	0.157	0.081	29.998	0.008
		15	0.023	-0.042	30.094	0.012
		16	0.025	0.054	30.206	0.017
		17	-0.068	-0.116	31.052	0.020
		18	-0.088	-0.044	32.477	0.019

According to the autocorrelation test results, p values are smaller than 0,05 which means there are autocorrelations between variables.

Table 53: Johansen Cointegration Test Analysis for 1 Year Time Charter Rate

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.179801	77.41520	88.80380	0.2493
At most 1	0.146069	45.70181	63.87610	0.6144
At most 2	0.069726	20.43710	42.91525	0.9522
At most 3	0.035948	8.872915	25.87211	0.9639
At most 4	0.018670	3.015376	12.51798	0.8747

According to Johansen test results, our variables are not cointegrated. It means that they don't have relationship in the long run with each other.

Our fifth equation is;

$$TC\ RATE_{VLCC} = f(NB\ VALUE_{VLCC}, SH\ VALUE_{VLCC}, OI\ \ PRICE, DEMOLITION\ PRICE_{CHINA})$$

According to this equation we assumed that VLCC 1 year time charter rate is function of newbuilding price of VLCC tanker, secondhand value of VLCC tanker, China tanker demolition price and oil price. The software is ran again according to new model and results are below.

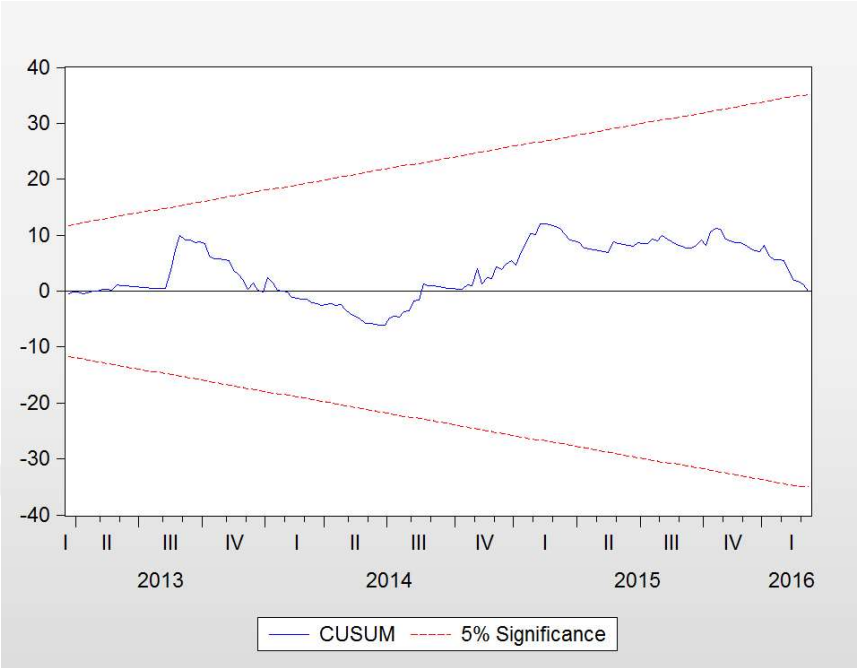
Table 54: Regression Model of VLCC 1 Year Time Charter Rate

Dependent Variable: D_LOG_VLCC_TC
Method: Least Squares
Date: 03/13/16 Time: 18:07
Sample (adjusted): 1/08/2013 3/08/2016
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D_LOG_VLCC_SH	0.781261	0.237485	3.289727	0.0012
D_LOG_VLCC_NB	-1.154443	0.651620	-1.771650	0.0784
D_LOG_OIL	-0.041754	0.058045	-0.719339	0.4730
D_LOG_CHINA_DEMO	0.033621	0.064176	0.523880	0.6011
C	0.003881	0.002389	1.624246	0.1063

R-squared	0.084813	Mean dependent var	0.005385
Adjusted R-squared	0.061643	S.D. dependent var	0.030224
S.E. of regression	0.029278	Akaike info criterion	-4.193763
Sum squared resid	0.135438	Schwarz criterion	-4.098862
Log likelihood	346.7917	Hannan-Quinn criter.	-4.155234
F-statistic	3.660562	Durbin-Watson stat	1.599809
Prob(F-statistic)	0.007011		

Figure 48: Cusum Structural Change Test for 1 Year Time Charter Model



According to the Cusum structural change test, there is no structural change in our model. Because blue line doesn't exceed red ones.

Table 55: Autocorrelation Test for 1 Year Time Charter Model

Date: 06/19/16 Time: 18:26
Sample: 1/01/2013 3/08/2016
Included observations: 163

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.192	0.192	6.1270	0.013
		2	0.249	0.220	16.455	0.000
		3	-0.027	-0.116	16.580	0.001
		4	0.117	0.094	18.882	0.001
		5	-0.025	-0.029	18.988	0.002
		6	-0.099	-0.158	20.662	0.002
		7	0.020	0.109	20.734	0.004
		8	-0.127	-0.124	23.516	0.003
		9	0.028	0.036	23.655	0.005
		10	-0.041	0.051	23.949	0.008
		11	0.068	0.003	24.763	0.010
		12	-0.167	-0.181	29.721	0.003
		13	0.086	0.165	31.050	0.003
		14	-0.091	-0.113	32.536	0.003
		15	0.004	-0.035	32.538	0.005
		16	-0.111	-0.008	34.797	0.004
		17	0.076	0.088	35.850	0.005
		18	0.037	-0.001	36.103	0.007

According to the autocorrelation test results, p values are smaller than 0,05 which means there are autocorrelations between variables.

As a result, the other models without secondhand models have very low scores from econometric tests but nevertheless let's browse the results of nearly meaningful ones:

Newbuilding price is dependent variable in our third equation. Secondhand price, time charter earnings, oil price and demolition price are independent variables. P values of secondhand is significant at 5% confidence interval and t test score of it is high enough. According to the logarithmic elasticity regression, 100% increase on secondhand price causes 10% increase on newbuilding price. This is meaningless in theory and practice.

China demolition price is dependent variable in our fourth equation. Newbuilding price, secondhand price, oil price and time charter earnings are independent variables. But scores of variables are completely meaningless.

1 year time charter earnings is dependent variable in our fifth equation. Newbuilding price, secondhand price, oil price and demolition price are independent variables. According to the results, secondhand price is significant at 5% confidence interval and t test score of it is high enough. According to the logarithmic elasticity regression, 100% increase on 1 year time charter earnings causes 78% increase on secondhand prices. This is very well-directed prediction and meaningful in the theory and practice also.

3.3.3. VAR Granger Causality Test for Main Markets

VAR Granger Causality test is implemented to determine which variable is reason for other one. The test supposes every variable as dependent variable and gives results. Firstly the probability of each variable is evaluated. If the values are smaller than 0.05, that means the variable is a reason for dependent variable by its own. After all the variables are controlled one by one, probability of all variables is evaluated. If the value is smaller than 0.05, that means the all variables in the equation are reasons for dependent variable even if their own probabilities are bigger than 0.05.

Table 56: VAR Granger Causality Test for SH, NB, TC, OIL

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 03/14/16 Time: 22:31
Sample: 1/01/2013 3/08/2016
Included observations: 161

Dependent variable: D_LOG_VLCC_SH

Excluded	Chi-sq	df	Prob.
D_LOG_VLCC_NB	15.82255	2	0.0004
D_LOG_VLCC_TC	0.320141	2	0.8521
D_LOG_OIL	0.901564	2	0.6371
All	15.99638	6	0.0138

Dependent variable: D_LOG_VLCC_NB

Excluded	Chi-sq	df	Prob.
D_LOG_VLCC_SH	25.76685	2	0.0000
D_LOG_VLCC_TC	0.439180	2	0.8028
D_LOG_OIL	6.526934	2	0.0383
All	31.06584	6	0.0000

Dependent variable: D_LOG_VLCC_TC

Excluded	Chi-sq	df	Prob.
D_LOG_VLCC_SH	5.480469	2	0.0646
D_LOG_VLCC_NB	2.693496	2	0.2601
D_LOG_OIL	2.842283	2	0.2414
All	7.450993	6	0.2811

Dependent variable: D_LOG_OIL

Excluded	Chi-sq	df	Prob.
D_LOG_VLCC_SH	0.073380	2	0.9640
D_LOG_VLCC_NB	0.457924	2	0.7954
D_LOG_VLCC_TC	2.920774	2	0.2321
All	4.024942	6	0.6733

When the Eviews software is ran, the results shows these;

In the first equation, secondhand value of VLCC tanker is dependent variable. Newbuilding price, oil price and time charter earnings are the independent variables. According to the results, only p value of VLCC newbuilding price is smaller than 0.05.

That means VLCC newbuilding price is reason for VLCC secondhand price by its own. P values of other variables are bigger than 0.05. That means they are not reason by their own for VLCC secondhand price. However, if the p value of all variables is evaluated, it is smaller than 0.05. This means all variables, which are VLCC newbuilding price, oil price, and time charter earnings, are reasons for VLCC secondhand price together.

In the second equation, newbuilding value of VLCC tanker is dependent variable. Secondhand price, oil price and time charter earnings are the independent variables. According to the results, p values of VLCC secondhand price and oil price are smaller than 0.05. That means VLCC secondhand price and oil price are the reasons for VLCC newbuilding prices by their own. Only p value of VLCC time charter earnings is bigger than 0.05. That means it is not reason by its own for VLCC newbuilding price. When the p value of all variables is examined, it is smaller than 0.05. So all the variables, which are VLC secondhand price, oil price and time charter earnings, are reasons for VLCC newbuilding price together.

In the third equation, time charter earnings of VLCC tanker is dependent variable. VLCC newbuilding price, VLCC secondhand price and oil price are the independent variables. According to the results, p values of all variables are bigger than 0.05. That means all the variables are not reasons for VLCC time charter earnings by their own. When the p value of all variables is examined, it can be seen that the value is bigger than 0.05. This means all the variables are not reasons for VLCC time charter earnings together.

In the fourth equation, oil price is dependent variable. VLCC newbuilding price, VLCC secondhand price, and time charter earnings are the independent variables. According to the results, p values of all variables are bigger than 0.05. That means all the variables are not reasons for oil price by their own. When the p value of all variables is examined, it can be seen that the value is bigger than 0.05. This means all the variables are not reasons for oil price together. This is an expected result, because tanker industry doesn't have the power of affecting oil price by its own. Production policies of countries affects the price mostly.

3.3.4. Secondhand Market Elasticity Simulation

When the data that are obtained from equation 2 is simulated, the results takes place as below. Current Prices means the price on first weeks of March 2016.

The scenario 1 assumes that there is a 100% increase on oil prices. Current value of VLCC secondhand is $76.500.000. According to the data obtained from equation 1, it requires a 5% decrease on secondhand price. So the new value arises as $72.675.000 when oil price becomes from $36.28 to $72.56.

The scenario 2 assumes that there is a 100% increase on VLCC newbuilding prices. Current value of VLCC secondhand is $76.500.000. According to the data obtained from equation 1, it requires a %72 increase on secondhand price. So the new value arises as $132.345.000 when VLCC newbuilding price becomes from $92.500.000 to $185.000.000.

The scenario 3 assumes that there is a 100% increase on VLCC 1 year daily time charter earnings. Current value of VLCC secondhand is $76.500.000. According to the data obtained from equation 1, it requires a %8 increase on secondhand price. So the new value arises as $82.773.000 when VLCC 1 year daily time charter earnings becomes from $44.500 to $89.000.

The scenario 4 assumes that there is a 50% increase on oil prices. Current value of VLCC secondhand is $76.500.000. According to the data obtained from equation 1, it requires a 2.5% decrease on secondhand price. So the new value arises as $74.587.500 when oil price becomes from $36.28 to $54.42.

The scenario 5 assumes that there is a 50% increase on VLCC newbuilding prices. Current value of VLCC secondhand is $76.500.000. According to the data obtained from equation 1, it requires a %36 increase on secondhand price. So the new value arises as $104.422.500 when VLCC newbuilding price becomes from $92.500.000 to $138.750.000.

The scenario 6 assumes that there is a 50% increase on VLCC 1 year daily time charter earnings. Current value of VLCC secondhand is $76.500.000. According to the data obtained from equation 1, it requires a %4 increase on secondhand price. So the

new value arises as $79.636.500 when VLCC 1 year daily time charter earnings becomes from $44.500 to $66.750.

Table 57: 6 Scenarios for Various Possibilities

		Scenario 1	**Scenario 2**	**Scenario 3**	**Scenario 4**	**Scenario 5**	**Scenario 6**
	Rates	%100	%100	%100	%50	%50	%50
	Current Prices	**Increase on Oil Price**	**Increase on NB Price**	**Increase on TC Rates**	**Increase on Oil Price**	**Increase on NB Price**	**Increase on TC Rates**
VLCC SH	76,50	72,675	132,345	82,773	74,5875	104,4225	79,6365
OIL	36,28	72,56	36,28	36,28	54,42	36,28	36,28
VLCC NB	92,50	92,50	185	92,50	92,50	138,75	92,50
VLCC 1 YEAR T/C RATE	44500	44500	44500	89000	44500	44500	66750

CONCLUSION

We feel that our study enhances academic understanding of the relationship between oil price and tanker industry. A number of restrictions of our study and areas for future research should be mentioned. Majority of the data for this study is obtained from weekly reports by authors own means. So, the scope of the data is limited and frequency of the data is weekly for a little time more than 3 years. If the more extensive data can be reached, the results of the study will be more accurate.

The study divides the tanker industry into 5 subdivisions. The first one is the freight market that are divided again 3 subdivisions which are time charter market, spot market and fleet. The second one is newbuilding market which is main source of the supply of the ships. The third one is secondhand market where constant handovers are made. The fourth one is the demolition market which serves opposite of newbuilding for supply side of the tanker industry. It is not placed general resources but we added stock market to tanker industry where stock exchanges are sold to investors.

This study makes mainly four application for analyzing the relationship between oil price and tanker industry. The first one is analyzing correlation matrixes among oil price and 5 subdivision markets. The second application is designing a regression model which consists of logarithmic and stable values to understand elasticity of secondhand market to some variables. The third application is VAR Granger causality test between some variables to get which variables are reasons for the other ones. The fourth application is the simulation which is derived from the second application. According to the elasticity coefficients that are gained from regression, secondhand price of the tanker ship is predicted based on some scenarios.

Clearly, some of propositions that we have offered are not entirely unique. But our study serves as a window to an understanding of the relationship between oil price and tanker industry.

Oil ton miles has reached the highest level in 2015. This show that the supply side of the oil transport work more and demand side is more buoyant in 2015 than other years.

Because of the economic activities, tonnage on order had increased from 2000 to 2009. After the global economic crisis in that year, tonnage on order had started to decreased. In 2013, inverse of the decrease on oil price, tonnage on order has started to increase again.

After the 2008 global crisis, 1 year time charter rates of all kind of tankers were very close to the each other because of recession and high oil price. This truss span has started to increase when oil price has fallen. However, the 1 year time charter rates have started to decrease again because of expectations about OPEC countries' ramping out oil price. Also, there is a strong negative correlation between oil price and 1 year time charter earnings.

Dirty spot market has a negative reasonable correlation with oil price. The relationship isn't strong as relationship between oil price and 1 year time charter rates. Also there is a negative correlation with oil price and clean spot earnings. But this relationship a bit weaker than dirty market's relationship with oil. Reason for these reasonable correlations may be instant demands in the each spot market. Price becomes more volatile because of necessity of meeting instant oil demand.

Tanker transportation is in a small endomnia stage now. But the tanker market is going to go into recession soon due to increase on tonnage on order and increase on oil price.

According to some studies 20% of tanker fleet consists of old and obsolete ships. Marginal costs of these kind of ships are high. Thereby operational costs of these ships are high. When the demand exceeds some level, these old and obsolete ships get into the market because of high freight rates. These ships can defrays their costs on high freight rates. But the profit will be in the short run. After a while, new and more technological ships will get into the market and the freight rates will decrease again. Therefore old and obsolete ships will be obligated to exit from the market.

Baltic dirty index had been moving parallel to the Baltic clean index when the oil price was high. However, after the decreasing trend on oil price, Baltic dirty index has increased more than Baltic clean index. The reaction of dirty market is more than clean market's as seen at this study.

In 2008, 5 years old tanker ship's price had exceeded newbuilding's price because of high demand for transportation. After 2008 global crises, span among newbuilding price and 5 and 10 years old ships' prices had increased. However, when the oil price has started to decrease, span has started to decrease too.

When the oil price has decreased, secondhand prices of crude carriers' has increased more than product carriers'. Generally, secondhand prices of tankers are more volatile than newbuilding prices because of convertibility to the cash instantly. Building a new ship is a process that takes time between 1 and 3 years.

Newbuilding price of ships had firstly increased a little and then has decreased after oil price decreased. Secondhand increasing trend is much more than newbuilding's.

Demolition prices had increased in parallel with oil price and they have decreased in the parallel with oil price again. Demolition prices and oil price have a positive high correlation in the both long and short run.

Stock values of crude oil carrier companies have increased reverse direction to oil price. They have negative correlation with oil price in the short run.

VLCC Secondhand ship regression model has the highest scores in this study. According to the logarithmic regression model of it, if the oil price increases 100%, the secondhand value will decrease 5%. If the 1 year time charter rate increases 100%, the secondhand value will increase 8%. If the newbuilding price increases 100%, the secondhand value will increase 72%. Of course this is an only model and these variables affect each other.

VAR Granger Causality Test is implemented to determine which variable is reason for other one. According to the Granger Causality Test, first equation explains that newbuilding price is a reason for secondhand value by its own. Also newbuilding price, oil price and time charter earnings are reasons for secondhand value together. Second equation explains that secondhand price and oil price are the reasons for newbuilding price. Also, secondhand price, oil price and time charter earnings are reasons for newbuilding price together.

Lastly a simulation is implemented according to some scenarios based on the equation 2. Because it has the highest meaningful scores.

The data of this study is generally obtained from free weekly publications because of high fees demanded by research institutions. Further researches may be done with more accurate and reliable data. If the further researches are made by long-term data, it will be useful to understand market dynamics of tanker market.

REFERENCES

Athenian Shipbrokers, http://www.atheniansa.gr, (10.02.2016)

BP (British Petroleum) (2015): Statistical Review of World Energy 2015

Chang, M. (2014). *Principles of Scientific Methods.* New York: CRS Press

CIA (Central Intelligence Agency), http://www.cia.gov, (22.03.2016)

Dietz, T., Kalof, L. (2009). *Introduction to Social Statistics: The Logic of Statistical Reasoning*. Singapore: Wiley-Blackwell

EIA (U.S. Energy Information Administration), http://www.eia.gov, (22.03.2016)

Fearnleys Weekly, http://www.fearnleys.no, (15.02.2016)

Gordon, R. (2015). *Regression Analysis for the Social Sciences*. New York: Routledge

Grammenos, C. (2010). *The Handbook of Maritime Economics and Business.* Great Britain: MPG Books

Güriş, S., Çaylayan, E., Güriş, B. (2013) .*Eviews ile Temel Ekonometri*. İstanbul: DER Kitabevi

Intermodal Weekly, http://www.intermodal.gr, (20.02.2016)

Jin, D. (2006). Supply and Demand of New Oil Tankers. *Maritime Policy & Management.* 20(3): 215-227

Lun, V., Hilmola, P. (2013) .*Oil Transport Management*. London: Springer-Verlag

Polakidas, A. and Joutz, F. (2009). Exploring the Link between Oil Price and Tanker Rates. *Maritime Policy & Management*. 36(3): 215-233.

SAJ (Shipbuilders Association of Japan) (2016): Shipbuilding Statistics

Sevüktekin, M., Çınar, M. (2014). *Ekonometrik Zaman Serileri Analizi.* Bursa: Dora Basım-Yayın Dağıtım

Shi, W., Yang, Z. and Li, K. (2013). The Impact of Crude Oil Price on the Tanker Market. *Maritime Policy & Management.* 40(4): 309-322

Stopford, M. (2009). *Maritime Economics*. USA and Canada: Routledge

Sun, X., Tang, L., Yang, Y., Wu, D. and Li, J. (2014). Identifying the Dynamic Relationship between Tanker Freight Rates and Oil Prices: In Perspective of Multiscale Relevance. *Economic Modelling*. 42: 287-295

Talley, W. (2012). *The Blackwell Companion to the Maritime Economics.* UK: Blackwell Publishing Ltd.

UNCTAD (United Nations Conference on Trade and Development) (2015): Review of Maritime Transport 2015

UNCTAD (United Nations Conference on Trade and Development) (2014): Review of Maritime Transport 2014

UNCTAD (United Nations Conference on Trade and Development) (2013): Review of Maritime Transport 2013

UNCTAD (United Nations Conference on Trade and Development) (2012): Review of Maritime Transport 2012

UNCTAD (United Nations Conference on Trade and Development) (2011): Review of Maritime Transport 2011

UNCTAD (United Nations Conference on Trade and Development) (2010): Review of Maritime Transport 2010

UNCTAD (United Nations Conference on Trade and Development) (2009): Review of Maritime Transport 2009

UNCTAD (United Nations Conference on Trade and Development) (2008): Review of Maritime Transport 2008

YAHOO FINANCE, http://finance.yahoo.com, (10.02.2016)

Wijnolst, N., Wergeland, T. (2009). *Shipping Innovation*. Netherlands: Delft University Press

APPENDICIES

APPENDIX 1: 5 Years Old Tanker Prices

Date	VLCC 300KTDH	SUEZMAX 150KTDH	AFRAMAX 110KTDH	LR1 75KTDH	MR 52KTDH
8.01.2013	57,00	40,00	27,50	25,00	25,00
15.01.2013	57,00	40,00	27,50	25,00	25,00
22.01.2013	57,00	40,00	27,50	25,00	25,00
29.01.2013	57,00	40,00	27,50	25,00	25,00
5.02.2013	57,00	40,00	27,50	25,00	25,00
12.02.2013	57,00	40,00	27,50	25,00	25,00
19.02.2013	57,00	40,00	27,50	25,00	25,00
26.02.2013	57,00	40,00	27,50	25,00	25,00
5.03.2013	57,00	40,00	27,50	25,00	25,00
12.03.2013	56,50	40,00	27,30	25,00	25,00
19.03.2013	56,00	40,00	27,20	25,00	25,00
26.03.2013	55,80	40,00	27,10	25,00	25,00
2.04.2013	55,80	40,00	27,10	25,00	25,00
9.04.2013	55,00	40,00	27,00	25,00	25,00
16.04.2013	55,00	40,00	27,00	25,00	25,00
23.04.2013	55,00	40,00	27,30	25,70	25,00
30.04.2013	55,00	40,00	27,90	26,00	25,00
7.05.2013	55,00	40,00	29,50	27,00	25,00
14.05.2013	55,00	40,00	29,50	27,00	25,00
21.05.2013	55,00	40,00	29,50	27,00	25,00
21.05.2013	55,00	40,00	29,60	27,00	25,00
4.06.2013	55,00	40,00	29,60	27,00	25,00
11.06.2013	55,00	40,00	30,00	27,00	25,00
18.06.2013	55,00	40,00	30,00	27,00	25,00
25.06.2013	55,00	40,00	29,80	27,00	24,80
2.07.2013	55,00	40,00	29,60	27,00	24,60
9.07.2013	55,00	40,00	29,00	27,00	24,50
16.07.2013	55,00	40,00	28,00	27,00	25,00
23.07.2013	55,00	40,00	28,20	27,50	25,20
30.07.2013	55,00	40,00	28,30	27,80	25,30
6.08.2013	55,00	39,00	30,00	29,00	26,50
13.08.2013	55,00	38,50	30,50	29,00	26,80
20.08.2013	55,00	38,30	30,70	29,00	26,80
27.08.2013	55,00	38,30	30,70	29,00	26,90
3.09.2013	55,00	38,20	30,70	29,00	26,90
10.09.2013	55,00	39,00	30,00	29,00	27,00
17.09.2013	55,00	39,30	29,80	29,00	27,00
24.09.2013	55,20	39,50	29,50	29,00	27,00

Date	VLCC 300KTDH	SUEZMAX 150KTDH	AFRAMAX 110KTDH	LR1 75KTDH	MR 52KTDH
1.10.2013	55,30	39,60	29,40	29,00	27,00
8.10.2013	55,50	40,00	29,00	29,00	27,00
15.10.2013	55,80	40,00	28,80	29,50	27,50
22.10.2013	55,80	40,00	28,50	29,80	27,70
29.10.2013	55,90	40,00	28,40	30,10	27,80
5.11.2013	56,00	40,00	28,50	31,00	28,00
12.11.2013	56,50	40,00	28,80	31,00	28,00
19.11.2013	57,00	40,00	28,80	31,00	28,30
26.11.2013	57,30	40,00	29,10	31,00	28,50
3.12.2013	57,40	40,00	29,30	31,00	28,60
10.12.2013	58,00	50,00	30,00	31,00	29,00
17.12.2013	58,00	50,00	30,50	31,00	29,00
24.12.2013	58,70	40,70	31,00	31,00	29,00
7.01.2014	65,00	44,00	34,00	32,00	30,50
14.01.2014	65,00	44,00	34,00	32,00	30,50
21.01.2014	65,70	44,30	34,00	32,00	30,50
28.01.2014	66,30	44,80	34,00	32,00	30,50
4.02.2014	66,60	45,20	34,00	32,00	30,40
11.02.2014	68,00	47,00	35,00	32,00	30,00
18.02.2014	68,00	47,00	35,00	32,00	30,00
25.02.2014	68,50	47,30	35,30	32,00	29,80
4.03.2014	69,10	47,50	35,80	32,00	29,60
11.03.2014	71,00	48,00	37,00	32,00	29,00
18.03.2014	71,50	49,00	37,50	32,00	29,00
25.03.2014	72,00	49,00	37,50	32,00	29,00
1.04.2014	72,30	49,50	37,80	32,30	29,00
8.04.2014	73,00	50,00	38,00	33,00	29,00
15.04.2014	73,50	50,00	38,00	33,50	29,00
22.04.2014	73,50	50,00	38,00	34,00	29,00
29.04.2014	73,80	50,00	38,00	34,30	29,00
6.05.2014	74,00	50,00	38,00	35,00	29,00
13.05.2014	74,50	50,00	38,00	35,00	29,00
20.05.2014	75,00	50,00	38,00	35,00	29,00
27.05.2014	75,30	50,00	38,00	34,80	29,00
3.06.2014	75,30	50,00	38,00	34,00	29,00
10.06.2014	75,00	50,00	38,00	33,00	28,00
17.06.2014	75,00	50,00	37,50	32,80	27,50
24.06.2014	75,00	50,00	37,30	32,70	27,30
1.07.2014	74,80	49,80	37,30	32,60	27,30
8.07.2014	74,00	49,00	37,00	32,50	27,00
15.07.2014	74,00	48,50	37,00	32,30	26,50
22.07.2014	74,00	48,30	37,00	32,50	26,30
29.07.2014	74,00	48,50	37,00	32,60	26,30

Date	VLCC 300KTDH	SUEZMAX 150KTDH	AFRAMAX 110KTDH	LR1 75KTDH	MR 52KTDH
5.08.2014	74,00	49,00	37,00	33,00	25,50
12.08.2014	74,00	49,00	37,00	33,00	25,50
19.08.2014	74,00	49,00	37,00	33,00	25,50
26.08.2014	74,00	49,00	37,30	32,80	25,50
2.09.2014	74,00	49,20	37,60	32,80	25,50
9.09.2014	74,00	50,00	41,00	32,50	25,50
16.09.2014	74,00	50,00	41,50	32,50	25,50
23.09.2014	74,00	50,00	41,70	32,50	25,50
30.09.2014	74,00	50,00	41,80	32,50	25,50
7.10.2014	74,00	50,00	42,00	32,50	25,50
14.10.2014	74,50	50,50	42,00	32,50	25,50
21.10.2014	75,00	51,20	42,20	32,50	25,50
28.10.2014	75,00	51,20	42,20	32,50	25,50
4.11.2014	75,80	52,10	42,30	32,50	25,50
11.11.2014	77,00	54,00	42,50	32,50	25,00
18.11.2014	77,00	54,00	42,50	32,50	25,00
25.11.2014	77,00	54,30	42,50	32,50	25,00
2.12.2014	77,00	54,80	42,50	32,50	25,00
9.12.2014	77,00	56,50	42,00	32,50	25,00
16.12.2014	77,00	56,50	42,00	32,80	24,50
23.12.2014	77,00	56,50	42,00	32,80	24,30
6.01.2015	79,00	58,00	44,00	34,30	25,00
13.01.2015	79,00	58,00	44,00	34,30	25,00
20.01.2015	79,30	58,20	44,20	34,50	25,20
27.01.2015	79,60	58,30	44,40	34,60	25,40
3.02.2015	79,80	58,40	44,50	34,80	25,50
10.02.2015	80,50	59,00	45,00	35,50	26,00
17.02.2015	80,50	59,00	45,00	35,50	25,80
24.02.2015	80,50	59,00	45,00	35,50	25,70
3.03.2015	80,60	59,00	45,00	35,60	25,60
10.03.2015	80,60	59,00	45,00	35,80	25,40
17.03.2015	81,00	58,50	45,00	36,00	25,00
24.03.2015	81,00	58,50	45,00	36,00	25,00
31.03.2015	81,00	58,50	45,00	36,80	25,00
7.04.2015	81,00	58,50	45,00	39,00	25,00
14.04.2015	81,00	58,50	45,00	39,00	25,00
21.04.2015	81,00	58,20	45,00	35,80	27,00
28.04.2015	81,00	58,10	45,00	35,60	27,00
5.05.2015	81,00	58,50	45,00	35,00	27,00
12.05.2015	80,80	58,80	45,00	34,50	26,80
19.05.2015	80,70	58,80	45,00	34,20	26,70
26.05.2015	80,60	58,90	45,00	34,30	26,60
2.06.2015	80,60	58,90	45,00	34,40	26,60

Date	VLCC 300KTDH	SUEZMAX 150KTDH	AFRAMAX 110KTDH	LR1 75KTDH	MR 52KTDH
9.06.2015	80,50	59,00	45,00	35,50	26,50
16.06.2015	80,50	59,00	45,00	35,50	26,50
23.06.2015	80,50	59,00	45,00	35,70	26,50
30.06.2015	80,50	59,00	45,00	35,80	26,50
7.07.2015	81,00	59,50	45,00	36,00	27,00
14.07.2015	81,30	59,80	45,00	36,00	27,00
21.07.2015	81,50	59,80	45,20	36,00	27,00
28.07.2015	81,90	59,90	45,40	36,00	27,00
4.08.2015	82,20	60,00	45,50	36,00	27,10
11.08.2015	84,00	61,00	46,00	39,00	28,00
18.08.2015	84,00	61,00	46,00	36,80	28,00
25.08.2015	84,00	61,00	46,00	36,80	28,00
1.09.2015	84,00	61,00	46,00	37,00	28,00
8.09.2015	84,00	61,00	46,00	37,50	28,00
15.09.2015	83,50	61,00	45,80	37,50	28,00
22.09.2015	83,00	61,00	45,50	37,50	28,20
29.09.2015	82,50	61,00	45,40	37,50	28,40
6.10.2015	80,00	61,00	45,00	37,50	29,00
13.10.2015	80,00	61,00	45,00	37,50	29,00
20.10.2015	80,00	60,50	45,00	37,50	29,00
27.10.2015	80,00	60,40	44,50	37,40	29,00
3.11.2015	80,00	60,30	45,30	37,20	29,00
10.11.2015	79,50	59,50	46,00	36,00	29,00
17.11.2015	79,30	59,50	46,00	35,80	29,00
24.11.2015	79,20	59,50	46,00	35,70	29,00
1.12.2015	79,10	59,50	46,00	35,50	29,00
8.12.2015	80,00	60,00	46,00	35,00	29,00
15.12.2015	80,00	60,00	46,00	35,00	29,00
22.12.2015	80,00	60,00	46,00	35,00	29,00
5.01.2016	80,50	60,30	46,30	35,50	29,50
12.01.2016	80,50	60,30	46,30	35,50	29,50
19.01.2016	81,00	60,50	46,50	36,00	30,00
26.01.2016	80,80	60,30	46,50	36,30	29,80
2.02.2016	80,60	60,00	46,30	36,40	29,60
9.02.2016	80,00	59,00	44,50	37,00	28,00
16.02.2016	79,80	59,00	44,00	36,80	27,80
23.02.2016	79,30	58,80	43,50	36,50	27,70
1.03.2016	78,90	58,50	43,00	36,40	27,60
8.03.2016	76,50	56,50	40,50	36,00	27,50

Source: Intermodal Weekly Reports, 2016, Processed by the Author

APPENDIX 2: Newbuilding Tanker Prices

Date	VLCC	Suezmax	Aframax	LR1	MR
1.01.2013	92,50	56,00	47,50	41,00	33,50
8.01.2013	92,00	56,00	47,50	41,00	33,50
15.01.2013	92,00	56,00	47,50	41,00	33,50
22.01.2013	91,50	56,00	47,00	40,50	33,50
29.01.2013	91,50	56,00	47,00	40,00	33,00
5.02.2013	91,50	56,00	47,00	40,00	33,00
12.02.2013	91,00	55,50	46,50	40,00	33,00
19.02.2013	91,00	55,50	46,50	40,00	33,00
26.02.2013	91,00	55,50	46,50	40,00	33,00
5.03.2013	91,00	55,50	46,50	40,00	33,00
12.03.2013	90,50	55,50	46,50	40,00	33,00
19.03.2013	90,50	55,50	46,50	40,00	33,00
26.03.2013	90,00	55,30	46,50	40,00	33,00
2.04.2013	90,00	55,30	46,50	40,00	33,00
9.04.2013	90,00	55,30	46,50	40,00	33,00
16.04.2013	90,00	55,30	46,50	40,00	33,00
23.04.2013	89,50	55,30	46,50	40,00	33,00
30.04.2013	89,50	55,30	46,50	40,00	33,00
7.05.2013	89,00	55,30	46,50	40,00	33,00
14.05.2013	89,00	55,30	46,50	40,00	33,00
21.05.2013	89,00	55,30	46,50	40,00	33,00
28.05.2013	89,00	55,30	46,50	40,00	33,00
4.06.2013	89,00	55,30	46,50	40,00	33,00
11.06.2013	89,00	55,30	46,50	40,00	33,00
18.06.2013	89,00	55,30	46,50	40,00	33,00
25.06.2013	89,00	55,30	46,50	40,00	33,00
2.07.2013	89,00	55,30	46,70	40,20	33,00
9.07.2013	89,00	55,30	47,00	40,20	33,00
16.07.2013	89,00	55,30	47,50	40,50	33,00
23.07.2013	89,00	55,50	47,70	40,50	33,00
30.07.2013	89,00	55,50	47,70	40,50	33,00
6.08.2013	89,00	55,50	48,30	40,50	33,30
13.08.2013	89,00	55,50	48,50	40,50	33,30
20.08.2013	89,00	55,50	48,50	40,50	33,30
27.08.2013	89,50	55,50	48,50	40,70	33,30
3.09.2013	89,50	55,50	48,50	40,70	33,30
10.09.2013	89,50	55,50	48,50	41,00	33,50
17.09.2013	89,50	55,50	48,50	41,00	33,80
24.09.2013	89,50	55,50	48,60	41,10	33,80
1.10.2013	89,50	55,50	48,60	41,10	33,80
8.10.2013	89,50	55,50	48,60	41,10	33,80
15.10.2013	90,00	55,50	49,00	41,50	34,00

Date	VLCC	Suezmax	Aframax	LR1	MR
22.10.2013	90,00	55,50	49,00	41,50	34,00
29.10.2013	90,00	55,50	49,00	41,50	34,00
5.11.2013	90,00	55,50	49,00	41,50	34,00
12.11.2013	90,50	55,50	49,00	41,50	34,00
19.11.2013	91,00	56,00	49,50	41,50	34,00
26.11.2013	91,50	56,50	50,00	42,00	34,00
3.12.2013	92,00	57,50	50,50	42,00	34,00
10.12.2013	92,00	57,50	50,50	42,00	34,00
17.12.2013	93,00	58,50	51,50	42,50	34,00
24.12.2013	93,50	59,00	51,70	42,50	34,20
7.01.2014	93,50	59,00	52,00	42,50	34,50
14.01.2014	93,50	59,00	52,00	42,50	34,50
21.01.2014	95,00	63,00	52,50	44,00	36,00
28.01.2014	96,00	63,00	53,50	45,00	37,00
4.02.2014	96,00	63,50	54,00	45,00	37,00
11.02.2014	98,00	64,00	54,00	45,00	37,00
18.02.2014	98,00	64,00	54,00	45,00	37,00
25.02.2014	98,50	64,00	54,00	45,50	37,30
4.03.2014	98,50	64,00	54,00	45,50	37,30
11.03.2014	98,50	64,50	54,50	45,50	37,30
18.03.2014	99,00	65,00	55,00	47,00	37,30
25.03.2014	99,00	65,00	55,00	47,00	37,30
1.04.2014	99,50	65,00	55,00	47,00	37,00
8.04.2014	99,50	65,00	55,00	47,00	37,00
15.04.2014	100,00	65,00	55,00	47,00	37,00
22.04.2014	101,00	65,00	55,00	47,00	37,00
29.04.2014	101,00	65,00	55,00	47,00	37,00
6.05.2014	101,00	65,00	55,00	47,00	37,00
13.05.2014	101,00	65,00	55,00	46,50	37,00
20.05.2014	101,00	66,00	55,00	46,50	37,00
27.05.2014	101,00	66,00	55,00	46,50	37,00
3.06.2014	101,00	66,00	55,00	46,50	37,00
10.06.2014	101,00	66,00	55,00	46,50	37,00
17.06.2014	101,00	66,00	55,00	46,00	37,00
24.06.2014	101,00	66,00	55,00	46,00	37,00
1.07.2014	100,00	66,00	55,00	45,50	37,00
8.07.2014	100,00	66,00	55,00	45,50	37,00
15.07.2014	99,00	65,00	54,00	45,50	37,00
22.07.2014	99,00	65,00	54,00	45,50	37,00
29.07.2014	99,00	65,00	54,00	45,50	37,00
5.08.2014	99,00	65,00	54,00	45,50	37,00
12.08.2014	99,00	65,00	54,00	45,50	37,00
19.08.2014	98,50	65,00	53,50	45,50	37,00
26.08.2014	98,50	65,00	53,50	45,50	37,00

Date	VLCC	Suezmax	Aframax	LR1	MR
2.09.2014	98,50	65,00	53,50	45,50	37,00
9.09.2014	98,00	65,00	53,50	45,50	37,00
16.09.2014	98,00	65,00	54,00	46,00	37,00
23.09.2014	98,00	65,00	54,00	46,00	37,00
30.09.2014	98,00	65,00	54,00	46,00	37,00
7.10.2014	98,00	65,50	54,00	46,50	37,00
14.10.2014	98,00	66,00	54,00	46,50	37,00
21.10.2014	98,00	66,00	54,00	46,50	37,00
28.10.2014	98,00	66,00	54,00	46,50	37,00
4.11.2014	98,00	66,00	54,00	46,50	37,00
11.11.2014	98,00	65,00	54,00	46,50	37,00
18.11.2014	98,00	65,00	54,00	46,50	37,00
25.11.2014	98,00	65,00	54,00	46,50	37,00
2.12.2014	98,00	65,00	54,00	46,50	37,00
9.12.2014	97,50	65,00	54,00	46,00	37,00
16.12.2014	96,50	65,00	54,00	46,00	36,50
23.12.2014	96,50	65,00	54,00	46,00	36,50
6.01.2015	96,50	65,00	54,00	46,00	36,50
13.01.2015	96,50	65,00	54,00	46,00	36,50
20.01.2015	96,50	65,00	54,00	46,00	36,50
27.01.2015	96,50	65,00	54,00	46,00	36,50
3.02.2015	96,50	65,00	53,50	46,00	36,50
10.02.2015	96,50	65,00	53,50	46,00	36,50
17.02.2015	96,50	65,00	53,50	46,00	36,50
24.02.2015	96,50	65,00	53,50	46,00	36,50
3.03.2015	96,50	65,00	53,50	46,00	36,50
10.03.2015	96,50	65,00	53,50	46,00	36,50
17.03.2015	96,50	65,00	53,50	46,00	36,50
24.03.2015	96,50	65,00	53,50	46,00	36,50
31.03.2015	96,50	65,00	53,50	46,00	36,50
7.04.2015	96,50	65,00	53,50	46,00	36,50
14.04.2015	96,50	65,00	53,50	46,00	36,50
21.04.2015	96,50	65,00	53,50	46,00	36,50
28.04.2015	96,50	65,00	53,50	46,00	36,50
5.05.2015	96,50	65,00	53,50	46,00	36,50
12.05.2015	96,50	65,00	53,50	46,00	36,50
19.05.2015	96,50	65,00	53,50	46,00	36,50
26.05.2015	96,00	64,50	53,00	46,00	36,50
2.06.2015	96,00	64,50	53,00	46,00	36,50
9.06.2015	96,00	64,50	53,00	46,00	36,50
16.06.2015	96,00	64,50	53,00	46,00	36,50
23.06.2015	95,50	64,50	53,00	46,00	36,50
30.06.2015	95,50	64,50	53,00	46,00	36,50
7.07.2015	95,50	64,50	53,00	46,00	36,50

Date	VLCC	Suezmax	Aframax	LR1	MR
14.07.2015	95,50	64,50	53,00	46,00	36,50
21.07.2015	95,50	64,50	53,00	46,00	36,50
28.07.2015	95,50	64,50	53,00	46,00	36,50
4.08.2015	95,50	64,50	53,00	46,00	36,50
11.08.2015	95,50	64,50	53,00	46,00	36,00
18.08.2015	95,00	64,50	53,00	46,00	35,50
25.08.2015	94,50	64,50	53,00	46,00	35,50
1.09.2015	94,50	64,50	53,00	46,00	35,50
8.09.2015	94,50	64,50	53,00	46,00	35,50
15.09.2015	94,50	64,50	53,00	46,00	35,50
22.09.2015	94,50	64,50	53,00	46,00	35,50
29.09.2015	94,50	64,50	53,00	46,00	35,50
6.10.2015	94,50	64,50	53,00	45,50	35,50
13.10.2015	94,50	64,00	52,50	45,50	35,50
20.10.2015	94,50	64,00	52,50	45,50	35,50
27.10.2015	94,50	64,00	52,50	45,50	35,50
3.11.2015	94,50	63,50	52,00	45,00	35,50
10.11.2015	94,50	63,50	52,00	45,00	35,50
17.11.2015	94,50	63,50	52,00	45,00	35,50
24.11.2015	94,50	63,50	52,00	45,00	35,50
1.12.2015	94,50	63,50	52,00	45,00	35,50
8.12.2015	94,50	63,50	52,00	45,00	35,50
15.12.2015	94,00	63,00	52,00	45,00	35,50
22.12.2015	94,00	63,00	52,00	45,00	35,50
5.01.2016	93,50	63,00	52,00	45,00	35,50
12.01.2016	93,50	63,00	52,00	45,00	35,50
19.01.2016	93,50	63,00	52,00	45,00	35,50
26.01.2016	93,50	63,00	52,00	45,00	35,50
2.02.2016	93,00	62,50	51,50	45,00	35,50
9.02.2016	93,00	62,50	51,50	45,00	35,50
16.02.2016	93,00	62,50	51,50	45,00	35,50
23.02.2016	92,50	62,00	51,00	44,50	35,50
1.03.2016	92,50	62,00	51,00	44,50	35,50
8.03.2016	92,00	61,50	50,50	44,00	35,00

Source: Intermodal Weekly Reports, Processed by the Author

APPENDIX 3: Demolition Prices by Countries

Date	India	Bangladesh	Pakistan	China	Turkey
4.01.2013	$ 430	$ 425	$ 415	$ 405	$ 325
11.01.2013	$ 430	$ 425	$ 415	$ 405	$ 325
18.01.2013	$ 430	$ 425	$ 420	$ 405	$ 320
25.01.2013	$ 430	$ 425	$ 420	$ 400	$ 320
1.02.2013	$ 430	$ 425	$ 420	$ 400	$ 320
8.02.2013	$ 410	$ 415	$ 415	$ 390	$ 310
15.02.2013	$ 410	$ 415	$ 415	$ 390	$ 310
22.02.2013	$ 410	$ 415	$ 420	$ 395	$ 310
1.03.2013	$ 410	$ 410	$ 415	$ 380	$ 315
8.03.2013	$ 420	$ 415	$ 420	$ 385	$ 315
15.03.2013	$ 430	$ 415	$ 420	$ 380	$ 315
22.03.2013	$ 425	$ 415	$ 425	$ 360	$ 320
29.03.2013	$ 425	$ 415	$ 425	$ 360	$ 320
5.04.2013	$ 425	$ 420	$ 430	$ 375	$ 320
12.04.2013	$ 430	$ 425	$ 435	$ 380	$ 320
19.04.2013	$ 430	$ 425	$ 435	$ 380	$ 325
26.04.2013	$ 425	$ 425	$ 435	$ 375	$ 325
3.05.2013	$ 430	$ 425	$ 435	$ 375	$ 325
10.05.2013	$ 430	$ 425	$ 435	$ 365	$ 325
17.05.2013	$ 430	$ 420	$ 435	$ 360	$ 325
24.05.2013	$ 420	$ 420	$ 425	$ 345	$ 315
31.05.2013	$ 420	$ 420	$ 425	$ 345	$ 315
7.06.2013	$ 415	$ 415	$ 420	$ 330	$ 305
14.06.2013	$ 415	$ 415	$ 420	$ 330	$ 305
21.06.2013	$ 405	$ 410	$ 420	$ 310	$ 300
28.06.2013	$ 405	$ 410	$ 420	$ 310	$ 310
5.07.2013	$ 405	$ 410	$ 420	$ 310	$ 310
12.07.2013	$ 400	$ 410	$ 415	$ 315	$ 300
19.07.2013	$ 400	$ 405	$ 410	$ 325	$ 305
26.07.2013	$ 400	$ 405	$ 410	$ 335	$ 305
2.08.2013	$ 400	$ 400	$ 410	$ 345	$ 305
9.08.2013	$ 400	$ 400	$ 410	$ 345	$ 310
16.08.2013	$ 390	$ 400	$ 410	$ 350	$ 310
23.08.2013	$ 380	$ 390	$ 395	$ 350	$ 310
30.08.2013	$ 375	$ 385	$ 385	$ 360	$ 310
6.09.2013	$ 370	$ 355	$ 375	$ 370	$ 305
13.09.2013	$ 370	$ 360	$ 375	$ 375	$ 305
20.09.2013	$ 375	$ 365	$ 380	$ 375	$ 305
27.09.2013	$ 385	$ 380	$ 385	$ 360	$ 305
4.10.2013	$ 405	$ 400	$ 395	$ 355	$ 310
11.10.2013	$ 405	$ 400	$ 395	$ 340	$ 310
18.10.2013	$ 415	$ 405	$ 400	$ 340	$ 310

Date	India	Bangladesh	Pakistan	China	Turkey
25.10.2013	$ 410	$ 410	$ 415	$ 340	$ 310
1.11.2013	$ 410	$ 410	$ 415	$ 340	$ 310
8.11.2013	$ 410	$ 410	$ 415	$ 335	$ 310
15.11.2013	$ 410	$ 415	$ 410	$ 335	$ 310
22.11.2013	$ 415	$ 410	$ 420	$ 335	$ 310
29.11.2013	$ 420	$ 420	$ 415	$ 335	$ 305
6.12.2013	$ 420	$ 415	$ 415	$ 335	$ 305
13.12.2013	$ 430	$ 425	$ 430	$ 335	$ 305
20.12.2013	$ 435	$ 425	$ 430	$ 335	$ 305
27.12.2013	$ 435	$ 430	$ 425	$ 345	$ 305
3.01.2014	$ 435	$ 430	$ 425	$ 345	$ 305
10.01.2014	$ 440	$ 430	$ 430	$ 345	$ 305
17.01.2014	$ 445	$ 435	$ 430	$ 345	$ 310
24.01.2014	$ 445	$ 440	$ 430	$ 345	$ 310
31.01.2014	$ 450	$ 445	$ 425	$ 340	$ 305
7.02.2014	$ 450	$ 445	$ 425	$ 340	$ 305
14.02.2014	$ 450	$ 445	$ 430	$ 340	$ 300
21.02.2014	$ 445	$ 435	$ 435	$ 340	$ 300
28.02.2014	$ 445	$ 430	$ 440	$ 330	$ 310
7.03.2014	$ 445	$ 430	$ 440	$ 325	$ 310
14.03.2014	$ 445	$ 430	$ 440	$ 325	$ 310
21.03.2014	$ 445	$ 430	$ 440	$ 325	$ 320
28.03.2014	$ 455	$ 430	$ 445	$ 325	$ 325
4.04.2014	$ 460	$ 435	$ 450	$ 325	$ 325
11.04.2014	$ 460	$ 435	$ 450	$ 325	$ 325
18.04.2014	$ 460	$ 435	$ 455	$ 325	$ 330
25.04.2014	$ 460	$ 435	$ 455	$ 325	$ 330
2.05.2014	$ 470	$ 455	$ 460	$ 325	$ 330
9.05.2014	$ 475	$ 460	$ 460	$ 325	$ 340
16.05.2014	$ 485	$ 465	$ 460	$ 325	$ 340
23.05.2014	$ 485	$ 465	$ 460	$ 325	$ 340
30.05.2014	$ 485	$ 465	$ 460	$ 325	$ 340
6.06.2014	$ 480	$ 460	$ 465	$ 325	$ 340
13.06.2014	$ 470	$ 460	$ 465	$ 325	$ 340
20.06.2014	$ 465	$ 460	$ 465	$ 325	$ 340
27.06.2014	$ 465	$ 460	$ 460	$ 325	$ 335
4.07.2014	$ 465	$ 455	$ 460	$ 325	$ 335
11.07.2014	$ 480	$ 460	$ 465	$ 320	$ 335
18.07.2014	$ 470	$ 460	$ 475	$ 315	$ 335
25.07.2014	$ 470	$ 460	$ 480	$ 310	$ 340
1.08.2014	$ 470	$ 460	$ 480	$ 305	$ 340
8.08.2014	$ 465	$ 470	$ 480	$ 300	$ 345
15.08.2014	$ 465	$ 475	$ 480	$ 300	$ 345
22.08.2014	$ 480	$ 475	$ 480	$ 300	$ 345

Date	India	Bangladesh	Pakistan	China	Turkey
29.08.2014	$ 480	$ 475	$ 485	$ 295	$ 345
5.09.2014	$ 480	$ 475	$ 485	$ 295	$ 345
12.09.2014	$ 480	$ 485	$ 490	$ 295	$ 350
19.09.2014	$ 480	$ 485	$ 490	$ 295	$ 350
26.09.2014	$ 480	$ 485	$ 490	$ 295	$ 350
3.10.2014	$ 475	$ 485	$ 490	$ 295	$ 340
10.10.2014	$ 470	$ 485	$ 485	$ 295	$ 340
17.10.2014	$ 470	$ 485	$ 485	$ 295	$ 305
24.10.2014	$ 470	$ 485	$ 480	$ 295	$ 300
31.10.2014	$ 470	$ 470	$ 480	$ 290	$ 295
7.11.2014	$ 470	$ 470	$ 480	$ 290	$ 295
14.11.2014	$ 455	$ 470	$ 470	$ 245	$ 280
21.11.2014	$ 455	$ 470	$ 470	$ 245	$ 280
28.11.2014	$ 450	$ 440	$ 445	$ 245	$ 285
5.12.2014	$ 450	$ 445	$ 445	$ 240	$ 285
12.12.2014	$ 450	$ 445	$ 445	$ 240	$ 285
19.12.2014	$ 425	$ 420	$ 430	$ 245	$ 295
26.12.2014	$ 425	$ 420	$ 430	$ 245	$ 300
2.01.2015	$ 425	$ 415	$ 420	$ 245	$ 315
9.01.2015	$ 425	$ 415	$ 420	$ 245	$ 315
16.01.2015	$ 410	$ 415	$ 405	$ 245	$ 315
23.01.2015	$ 410	$ 415	$ 405	$ 245	$ 315
30.01.2015	$ 410	$ 415	$ 405	$ 245	$ 285
6.02.2015	$ 390	$ 400	$ 380	$ 225	$ 230
13.02.2015	$ 370	$ 365	$ 365	$ 215	$ 230
20.02.2015	$ 380	$ 365	$ 370	$ 215	$ 230
27.02.2015	$ 385	$ 370	$ 380	$ 215	$ 230
6.03.2015	$ 375	$ 380	$ 380	$ 215	$ 230
13.03.2015	$ 390	$ 385	$ 390	$ 215	$ 235
20.03.2015	$ 395	$ 385	$ 390	$ 215	$ 235
27.03.2015	$ 395	$ 390	$ 390	$ 215	$ 235
3.04.2015	$ 410	$ 400	$ 405	$ 215	$ 235
10.04.2015	$ 420	$ 420	$ 415	$ 215	$ 240
17.04.2015	$ 420	$ 420	$ 425	$ 215	$ 240
24.04.2015	$ 415	$ 410	$ 420	$ 215	$ 260
1.05.2015	$ 400	$ 400	$ 400	$ 215	$ 260
8.05.2015	$ 390	$ 385	$ 395	$ 215	$ 260
15.05.2015	$ 390	$ 385	$ 395	$ 215	$ 260
22.05.2015	$ 390	$ 385	$ 390	$ 215	$ 260
29.05.2015	$ 385	$ 380	$ 380	$ 215	$ 255
5.06.2015	$ 385	$ 380	$ 380	$ 215	$ 255
12.06.2015	$ 385	$ 380	$ 380	$ 215	$ 255
19.06.2015	$ 385	$ 380	$ 380	$ 215	$ 255
26.06.2015	$ 380	$ 375	$ 380	$ 215	$ 240

Date	India	Bangladesh	Pakistan	China	Turkey
3.07.2015	$ 375	$ 370	$ 375	$ 195	$ 240
10.07.2015	$ 355	$ 345	$ 350	$ 175	$ 210
17.07.2015	$ 315	$ 305	$ 310	$ 150	$ 195
24.07.2015	$ 315	$ 305	$ 310	$ 145	$ 195
31.07.2015	$ 315	$ 305	$ 310	$ 145	$ 195
7.08.2015	$ 310	$ 305	$ 310	$ 145	$ 195
14.08.2015	$ 310	$ 300	$ 310	$ 145	$ 195
21.08.2015	$ 320	$ 300	$ 310	$ 145	$ 200
28.08.2015	$ 335	$ 300	$ 320	$ 140	$ 210
4.09.2015	$ 340	$ 300	$ 320	$ 140	$ 210
11.09.2015	$ 345	$ 320	$ 330	$ 140	$ 190
18.09.2015	$ 345	$ 330	$ 335	$ 150	$ 190
25.09.2015	$ 340	$ 325	$ 335	$ 185	$ 200
2.10.2015	$ 330	$ 335	$ 330	$ 175	$ 180
9.10.2015	$ 315	$ 330	$ 330	$ 145	$ 165
16.10.2015	$ 315	$ 325	$ 320	$ 145	$ 165
23.10.2015	$ 310	$ 320	$ 320	$ 140	$ 165
30.10.2015	$ 310	$ 320	$ 320	$ 145	$ 180
6.11.2015	$ 310	$ 330	$ 325	$ 145	$ 185
13.11.2015	$ 305	$ 325	$ 325	$ 145	$ 185
20.11.2015	$ 305	$ 325	$ 325	$ 145	$ 185
27.11.2015	$ 305	$ 325	$ 325	$ 150	$ 185
4.12.2015	$ 290	$ 315	$ 315	$ 150	$ 185
11.12.2015	$ 290	$ 300	$ 295	$ 150	$ 180
18.12.2015	$ 300	$ 295	$ 290	$ 140	$ 175
25.12.2015	$ 300	$ 295	$ 290	$ 140	$ 175
1.01.2016	$ 300	$ 305	$ 295	$ 140	$ 165
8.01.2016	$ 300	$ 300	$ 295	$ 140	$ 165
15.01.2016	$ 280	$ 270	$ 275	$ 135	$ 165
22.01.2016	$ 275	$ 265	$ 270	$ 130	$ 160
29.01.2016	$ 260	$ 255	$ 260	$ 125	$ 160
5.02.2016	$ 255	$ 250	$ 255	$ 125	$ 160
12.02.2016	$ 250	$ 245	$ 250	$ 125	$ 160
19.02.2016	$ 250	$ 245	$ 250	$ 125	$ 160
26.02.2016	$ 255	$ 245	$ 255	$ 130	$ 165

Source: Athenian Shipbrokers S.A, 2016, Processed by the Author

APPENDIX 4: Time Charter Earnings by Ship Types

Date	VLCC (modern)	Suezmax (modern)	Aframax (modern)	LR2 105000	Product 80000	Product 40000
2.01.2013	19.000	16.000	14.000	14.500	14.000	13.000
9.01.2013	19.000	16.000	13.500	14.750	14.000	13.250
16.01.2013	19.000	16.000	13.500	14.750	14.000	13.500
23.01.2013	19.000	16.000	13.500	14.750	13.750	13.500
30.01.2013	19.000	16.000	13.500	14.750	14.000	13.500
6.02.2013	19.000	16.000	13.500	15.000	14.000	13.500
13.02.2013	19.000	16.000	13.500	15.000	14.000	13.750
20.02.2013	19.000	16.000	13.500	15.250	14.000	14.000
27.02.2013	18.500	16.000	13.500	15.250	14.000	14.000
6.03.2013	18.500	16.000	13.500	15.250	14.000	14.000
13.03.2013	18.500	16.000	13.500	15.250	14.000	14.000
20.03.2013	18.500	16.000	13.500	15.500	14.250	14.000
27.03.2013	18.500	16.000	13.500	15.500	14.250	14.000
3.04.2013	18.500	16.000	13.250	16.000	14.500	14.000
10.04.2013	18.000	16.000	13.250	16.000	14.500	14.000
17.04.2013	18.000	16.000	13.250	16.000	14.750	14.000
24.04.2013	18.000	16.000	13.250	16.000	14.750	14.000
1.05.2013	18.000	15.750	13.250	16.000	15.000	14.000
8.05.2013	18.000	15.500	13.250	16.500	15.000	14.250
15.05.2013	17.500	15.500	12.750	16.500	15.000	14.250
22.05.2013	17.500	15.500	12.750	16.500	15.000	14.250
29.05.2013	17.500	15.500	12.750	16.000	14.750	14.000
5.06.2013	17.500	15.500	12.750	16.000	14.750	14.000
12.06.2013	17.500	15.500	12.750	15.750	14.750	13.750
19.06.2013	17.500	15.750	12.750	15.750	14.750	13.750
26.06.2013	17.500	16.000	12.750	15.750	14.500	13.750
3.07.2013	17.500	15.750	12.500	15.750	14.500	13.750
10.07.2013	17.500	15.750	12.250	15.750	14.500	13.750
17.07.2013	17.500	15.750	12.250	15.500	14.250	13.750
24.07.2013	17.500	15.750	12.250	15.000	14.250	13.750
31.07.2013	17.500	15.750	12.250	15.250	14.250	14.250
7.08.2013	17.500	15.750	12.250	15.250	14.250	14.250
14.08.2013	17.500	15.750	12.250	15.250	14.250	14.250
21.08.2013	17.500	15.750	12.250	15.250	14.500	14.250
28.08.2013	18.000	15.500	12.250	15.250	14.750	14.250
4.09.2013	18.000	15.500	12.250	15.500	14.750	14.250
11.09.2013	18.000	15.500	12.250	15.500	14.750	14.250
18.09.2013	18.000	15.500	12.250	15.750	14.750	14.000
25.09.2013	18.000	15.500	12.250	16.000	14.750	14.250
2.10.2013	18.000	15.500	12.750	16.000	14.750	14.250
9.10.2013	18.000	15.000	12.750	16.000	15.500	14.250

Date	VLCC (modern)	Suezmax (modern)	Aframax (modern)	LR2 105000	Product 80000	Product 40000
16.10.2013	18.000	15.000	13.000	16.000	15.500	14.250
23.10.2013	18.000	15.000	13.000	16.250	15.750	14.250
30.10.2013	18.000	15.000	13.000	16.250	15.750	14.500
6.11.2013	18.000	14.750	13.000	16.250	15.750	14.500
13.11.2013	20.000	15.250	13.000	16.250	15.750	14.500
20.11.2013	22.500	15.250	13.000	16.250	15.750	14.500
27.11.2013	26.000	15.500	13.000	16.000	15.750	14.250
4.12.2013	26.000	15.000	13.000	16.000	15.750	14.250
11.12.2013	26.000	16.000	13.000	16.000	15.750	14.500
18.12.2013	25.500	17.000	13.500	16.000	15.500	14.500
25.12.2013	25.500	17.000	13.500	16.000	15.000	14.500
1.01.2014	25.500	17.000	13.500	16.000	15.000	14.500
8.01.2014	25.000	19.000	14.700	16.000	15.500	14.750
15.01.2014	24.500	20.000	14.750	16.000	15.500	14.750
22.01.2014	24.500	20.000	14.750	16.000	15.500	14.750
29.01.2014	24.500	20.000	14.750	16.000	15.500	14.750
5.02.2014	24.000	20.000	14.750	16.000	15.500	14.750
12.02.2014	24.000	19.500	15.000	16.000	15.500	14.750
19.02.2014	24.000	19.000	15.000	16.250	15.500	14.750
26.02.2014	24.000	19.000	15.000	16.000	15.250	15.500
5.03.2014	24.000	19.000	15.000	16.000	15.250	15.000
12.03.2014	24.000	19.000	15.000	16.000	15.250	15.000
19.03.2014	24.000	19.000	15.000	16.000	15.250	14.750
26.03.2014	24.000	19.000	15.000	16.000	15.250	14.750
2.04.2014	24.500	19.000	15.000	16.250	15.250	14.750
9.04.2014	24.500	19.000	15.000	16.250	15.250	14.750
16.04.2014	24.500	19.000	15.000	16.500	15.250	14.750
23.04.2014	24.000	18.500	15.000	16.250	15.250	14.750
30.04.2014	23.500	18.000	15.000	16.250	15.000	14.500
7.05.2014	23.500	18.000	15.000	16.250	15.000	14.500
14.05.2014	23.500	18.000	15.000	16.000	15.000	14.500
21.05.2014	23.000	18.000	15.500	15.750	15.250	14.500
28.05.2014	23.000	18.000	15.500	15.750	15.250	14.500
4.06.2014	23.000	18.000	15.500	15.750	15.250	14.500
11.06.2014	23.000	18.000	15.500	15.750	15.250	14.500
18.06.2014	23.000	18.000	15.500	15.750	15.250	14.500
25.06.2014	24.000	20.000	15.750	15.750	15.250	14.250
2.07.2014	24.000	19.500	15.500	15.750	15.250	14.000
9.07.2014	24.000	19.500	15.500	15.750	15.250	14.000
16.07.2014	24.750	21.000	16.000	16.000	15.250	14.000
23.07.2014	24.750	20.500	16.000	16.000	15.250	14.000
30.07.2014	26.000	21.000	16.500	16.500	15.250	14.250
6.08.2014	26.000	21.000	16.500	16.500	15.250	14.250

Date	VLCC (modern)	Suezmax (modern)	Aframax (modern)	LR2 105000	Product 80000	Product 40000
13.08.2014	28.500	22.000	18.000	17.000	15.500	14.250
20.08.2014	28.500	22.000	20.000	17.250	15.500	14.000
27.08.2014	28.500	22.000	18.000	17.250	15.500	14.000
3.09.2014	28.500	22.000	18.000	17.250	15.500	13.750
10.09.2014	28.500	22.500	18.000	17.250	15.500	13.750
17.09.2014	28.500	23.000	18.000	17.500	15.750	14.000
24.09.2014	28.500	23.000	18.000	18.000	15.750	14.000
1.10.2014	28.500	23.000	18.000	18.250	15.750	14.000
8.10.2014	28.500	23.000	18.500	18.250	15.750	13.750
15.10.2014	29.500	23.500	18.750	18.750	15.750	13.750
22.10.2014	29.500	23.500	18.750	18.750	16.000	14.000
29.10.2014	32.500	24.500	19.500	19.500	16.500	14.500
5.11.2014	30.500	23.700	19.000	19.500	16.500	14.500
12.11.2014	30.500	24.000	20.000	20.000	16.750	14.500
19.11.2014	30.500	25.000	20.500	20.000	17.000	14.500
26.11.2014	32.500	28.500	20.500	20.000	17.000	14.500
3.12.2014	32.500	26.000	20.500	20.000	17.250	14.750
10.12.2014	34.000	27.000	21.000	20.500	17.500	15.000
17.12.2014	35.000	27.500	21.500	21.000	17.750	14.750
7.01.2015	38.000	28.000	22.250	22.000	17.750	15.000
14.01.2015	40.000	28.500	22.500	22.000	17.750	15.000
21.01.2015	42.500	32.000	23.000	22.000	18.000	15.000
28.01.2015	42.500	32.000	23.000	22.000	18.000	15.000
4.02.2015	45.000	32.000	23.000	22.500	18.000	15.000
11.02.2015	45.000	32.000	23.000	22.500	18.000	14.750
18.02.2015	45.000	32.000	23.000	22.500	18.000	14.000
25.02.2015	45.000	32.000	23.000	22.500	18.250	14.250
4.03.2015	45.000	32.000	23.000	22.500	18.250	14.500
11.03.2015	44.000	32.000	23.000	22.750	19.000	14.750
18.03.2015	43.000	33.000	23.000	23.750	19.250	15.500
25.03.2015	43.000	33.000	23.000	23.750	20.000	15.500
1.04.2015	43.000	33.000	23.000	23.750	20.000	15.500
8.04.2015	42.000	33.000	23.000	23.750	20.000	15.500
15.04.2015	42.000	32.000	23.000	23.750	20.500	15.500
22.04.2015	42.000	32.000	23.000	24.000	20.750	15.500
29.04.2015	42.000	32.000	23.250	24.000	21.000	15.750
6.05.2015	42.000	32.000	23.250	24.000	21.000	16.500
13.05.2015	42.000	32.000	23.250	24.000	21.000	17.000
20.05.2015	45.000	33.000	25.000	24.750	21.000	17.000
27.05.2015	45.000	33.000	25.000	24.750	21.000	17.000
3.06.2015	45.000	33.000	25.000	25.000	21.250	17.250
10.06.2015	45.000	33.000	25.000	26.000	21.250	17.250
17.06.2015	45.500	33.000	25.000	26.000	22.000	17.500

Date	VLCC (modern)	Suezmax (modern)	Aframax (modern)	LR2 105000	Product 80000	Product 40000
24.06.2015	46.500	34.000	26.500	27.000	22.000	17.750
1.07.2015	46.500	35.000	27.000	27.500	22.000	17.750
8.07.2015	46.500	35.000	27.000	27.750	22.500	18.000
15.07.2015	47500	35500	27000	27750	22500	18000
22.07.2015	47500	35500	27000	29000	26500	18750
29.07.2015	49500	36000	28000	29500	26500	18750
5.08.2015	49.500	36.000	29.000	29.500	26.500	18.750
12.08.2015	49.500	36.000	29.000	29.750	26.500	18.750
19.08.2015	49.500	36.000	29.000	29.750	28.500	18.750
26.08.2015	49.000	36.000	28.500	29.250	28.000	17.750
2.09.2015	49.000	36.000	28.500	29.000	27.500	17.500
9.09.2015	49.000	36.000	28.500	29.000	27.250	17.500
16.09.2015	50.000	36.000	28.500	29.000	27.250	17.500
23.09.2015	52.500	39.000	28.500	29.000	27.000	17.500
30.09.2015	50.000	37.000	28.500	28.500	26.750	17.500
7.10.2015	53.500	37.000	28.500	28.750	26.500	17.500
14.10.2015	55.000	37.000	28.500	28.750	26.500	17.500
21.10.2015	55.000	38.000	28.500	28.750	26.500	17.500
28.10.2015	52.500	38.000	28.500	28.750	26.500	17.500
4.11.2015	52.500	38.000	28.500	28.750	25.000	17.500
11.11.2015	52.500	38.000	28.500	28.750	24.750	17.500
18.11.2015	52.500	38.000	28.500	28.750	24.750	18.000
25.11.2015	52.500	38.000	28.500	28.750	23.500	18.000
2.12.2015	52.500	38.000	28.500	28.750	23.000	18.500
9.12.2015	52.500	38.000	28.500	28.750	23.250	18.500
16.12.2015	52.500	38.000	29.500	29.000	23.250	18.500
6.01.2016	55.000	38.500	29.000	29.000	23.250	18.500
13.01.2016	52.500	38.000	29.500	29.500	24.750	18.750
20.01.2016	52.500	38.000	29.500	29.500	24.500	18.500
27.01.2016	52.500	36.500	29.500	29.500	24.500	18.500
3.02.2016	52500	35000	29500	29250	24250	18250
10.02.2016	50000	35000	29250	29000	23750	18000
17.02.2016	47500	35000	28000	28750	23500	18000
24.02.2016	47500	35000	27000	28000	22500	17750
2.03.2016	46500	34500	26000	27500	21750	17500
9.03.2016	44500	33500	25000	26250	21500	16500

Source: Fearnleys Weekly Reports, 2016, Processed by the Author

APPENDIX 5: Weekly Europe Brent Spot Price Fob

Date	Oil Price	Date	Oil Price	Date	Oil Price	Date	Oil Price
4.01.2013	112,35	25.10.2013	107,82	15.08.2014	101,94	5.06.2015	61,9
11.01.2013	112,37	1.11.2013	107,61	22.08.2014	99,88	12.06.2015	63,24
18.01.2013	111,35	8.11.2013	104,54	29.08.2014	100,64	19.06.2015	60,65
25.01.2013	113,72	15.11.2013	107,1	5.09.2014	100,45	26.06.2015	60,84
1.02.2013	115,13	22.11.2013	109,32	12.09.2014	97,32	3.07.2015	60,36
8.02.2013	117,15	29.11.2013	111,32	19.09.2014	97,02	10.07.2015	56,63
15.02.2013	118,1	6.12.2013	112,28	26.09.2014	95,01	17.07.2015	57,17
22.02.2013	115,3	13.12.2013	109,1	3.10.2014	93,41	24.07.2015	55,75
1.03.2013	112,42	20.12.2013	110,34	10.10.2014	90,19	31.07.2015	54,14
8.03.2013	109,98	27.12.2013	111,72	17.10.2014	85,5	7.08.2015	48,59
15.03.2013	108,41	3.01.2014	108,73	24.10.2014	85,58	14.08.2015	47,94
22.03.2013	107,33	10.01.2014	107,01	31.10.2014	85,56	21.08.2015	46
29.03.2013	107,68	17.01.2014	107,83	7.11.2014	83,04	28.08.2015	43,53
5.04.2013	107,06	24.01.2014	109,14	14.11.2014	79,9	4.09.2015	48,87
12.04.2013	103,25	31.01.2014	108,83	21.11.2014	77,62	11.09.2015	47,6
19.04.2013	98,09	7.02.2014	107,73	28.11.2014	76,63	18.09.2015	47,34
26.04.2013	100,61	14.02.2014	109,12	5.12.2014	69,72	25.09.2015	47,33
3.05.2013	101,53	21.02.2014	109,74	12.12.2014	64,08	2.10.2015	46,99
10.05.2013	103,77	28.02.2014	109,17	19.12.2014	59,77	9.10.2015	51,33
17.05.2013	102,91	7.03.2014	109,14	26.12.2014	58,69	16.10.2015	48,99
24.05.2013	102,3	14.03.2014	108,01	2.01.2015	56,03	23.10.2015	46,81
31.05.2013	102,03	21.03.2014	106,53	9.01.2015	49,47	30.10.2015	47,15
7.06.2013	102,92	28.03.2014	106,54	16.01.2015	46,58	6.11.2015	47,23
14.06.2013	103,39	4.04.2014	105,26	23.01.2015	46,44	13.11.2015	44,75
21.06.2013	103,93	11.04.2014	106,51	30.01.2015	46,76	20.11.2015	41,54
28.06.2013	101,43	18.04.2014	109,07	6.02.2015	54,62	27.11.2015	43,65
5.07.2013	105,18	25.04.2014	109,21	13.02.2015	56,57	4.12.2015	42,41
12.07.2013	108,26	2.05.2014	109,15	20.02.2015	60,57	11.12.2015	38,76
19.07.2013	109,41	9.05.2014	108,48	27.02.2015	60,63	18.12.2015	36,84
26.07.2013	108,4	16.05.2014	109,53	6.03.2015	60,12	25.12.2015	35,9
2.08.2013	108,61	23.05.2014	110,72	13.03.2015	56,51	1.01.2016	36,55
9.08.2013	108,56	30.05.2014	109,62	20.03.2015	52,72	8.01.2016	34,19
16.08.2013	110,73	6.06.2014	108,98	27.03.2015	55,01	15.01.2016	29,1
23.08.2013	111,12	13.06.2014	110,98	3.04.2015	54,79	22.01.2016	27,76
30.08.2013	115,32	20.06.2014	114,29	10.04.2015	56,51	29.01.2016	31,75
6.09.2013	116,03	27.06.2014	113,09	17.04.2015	59,12	5.02.2016	32,18
13.09.2013	113,22	4.07.2014	110,26	24.04.2015	61,41	12.02.2016	30,41
20.09.2013	109,98	11.07.2014	107,03	1.05.2015	63,49	19.02.2016	32,29
27.09.2013	108,8	18.07.2014	105,39	8.05.2015	65,01	26.02.2016	33,12
4.10.2013	108,63	25.07.2014	106,34	15.05.2015	64,9	4.03.2016	36,28
11.10.2013	110,3	1.08.2014	105,71	22.05.2015	64,31	11.03.2016	39,3
18.10.2013	110,11	8.08.2014	103,6	29.05.2015	61,57	18.03.2016	38,5

Source: EIA, 2016, Processed by the Author

APPENDIX 6: Stock Exchange Prices Of Tanker Companies

Date	TEEKAY	NAT	Date	TEEKAY	NAT	Date	TEEKAY	NAT	Date	TEEKAY	NAT
1.01.2013	2,04	6,87	1.10.2013	1,70	6,38	8.07.2014	2,64	7,30	14.04.2015	5,31	11,32
8.01.2013	2,14	6,87	8.10.2013	1,75	6,46	15.07.2014	2,69	7,80	21.04.2015	5,80	11,69
15.01.2013	2,01	6,46	15.10.2013	1,86	6,79	22.07.2014	2,85	7,60	28.04.2015	5,42	10,95
22.01.2013	1,84	6,76	22.10.2013	1,78	6,78	29.07.2014	2,74	7,45	5.05.2015	5,29	10,46
29.01.2013	1,75	6,67	29.10.2013	1,71	6,67	5.08.2014	2,75	7,51	12.05.2015	5,03	11,48
5.02.2013	1,78	6,70	5.11.2013	1,74	6,66	12.08.2014	2,96	7,73	19.05.2015	5,85	11,99
12.02.2013	1,71	6,70	12.11.2013	1,80	7,06	19.08.2014	2,95	7,83	26.05.2015	5,90	11,91
19.02.2013	1,59	6,86	19.11.2013	1,75	6,32	26.08.2014	2,96	7,80	2.06.2015	6,28	12,12
26.02.2013	1,61	6,80	26.11.2013	2,00	6,53	2.09.2014	2,94	7,55	9.06.2015	6,36	12,80
5.03.2013	1,82	6,96	3.12.2013	2,07	6,47	9.09.2014	2,96	7,44	16.06.2015	6,27	13,15
12.03.2013	1,67	7,21	10.12.2013	2,07	6,67	16.09.2014	2,94	7,26	23.06.2015	5,77	12,82
19.03.2013	1,71	8,52	17.12.2013	2,20	7,31	23.09.2014	2,63	7,01	30.06.2015	6,09	13,64
26.03.2013	1,87	8,83	24.12.2013	2,50	7,81	30.09.2014	2,61	6,80	7.07.2015	5,72	13,78
2.04.2013	1,71	7,42	7.01.2014	2,46	7,95	7.10.2014	2,47	6,26	14.07.2015	6,39	15,27
9.04.2013	1,70	7,44	14.01.2014	2,65	9,10	14.10.2014	2,70	6,85	21.07.2015	6,47	14,77
16.04.2013	1,66	6,99	21.01.2014	2,73	8,93	21.10.2014	2,81	6,84	28.07.2015	6,28	14,21
23.04.2013	1,66	7,02	28.01.2014	2,32	8,82	28.10.2014	3,07	7,41	4.08.2015	6,22	14,06
30.04.2013	1,63	6,74	4.02.2014	2,38	8,26	4.11.2014	3,22	7,40	11.08.2015	5,78	14,17
7.05.2013	1,62	6,70	11.02.2014	2,29	8,14	11.11.2014	3,06	7,34	18.08.2015	5,13	13,16
14.05.2013	1,80	6,95	18.02.2014	2,45	8,30	18.11.2014	3,25	7,99	25.08.2015	5,13	13,35
21.05.2013	1,89	6,87	25.02.2014	2,98	8,63	25.11.2014	3,34	7,86	1.09.2015	5,75	13,87
28.05.2013	1,89	6,52	4.03.2014	2,92	8,46	2.12.2014	3,61	8,06	8.09.2015	5,43	13,82
4.06.2013	1,77	6,50	11.03.2014	2,98	8,17	9.12.2014	3,51	8,12	15.09.2015	5,75	14,96
11.06.2013	1,80	6,37	18.03.2014	2,67	8,25	16.12.2014	4,31	8,71	22.09.2015	5,79	14,61
18.06.2013	1,67	6,15	25.03.2014	2,43	8,20	23.12.2014	4,31	8,91	29.09.2015	5,98	15,19
25.06.2013	1,71	5,89	1.04.2014	2,43	8,01	6.01.2015	4,83	10,18	6.10.2015	6,43	15,31
2.07.2013	1,80	5,93	8.04.2014	2,37	6,90	13.01.2015	4,85	10,13	13.10.2015	6,62	14,84
9.07.2013	1,98	6,47	15.04.2014	2,46	7,08	20.01.2015	4,90	9,64	20.10.2015	7,01	15,43
16.07.2013	1,88	6,88	22.04.2014	2,47	6,95	27.01.2015	4,53	9,05	27.10.2015	6,60	14,81
23.07.2013	1,93	7,90	29.04.2014	2,32	6,99	3.02.2015	4,49	8,95	3.11.2015	6,03	14,67
30.07.2013	1,85	7,42	6.05.2014	2,16	6,70	10.02.2015	4,43	9,12	10.11.2015	6,02	14,41
6.08.2013	1,74	7,51	13.05.2014	2,22	6,96	17.02.2015	5,06	9,17	17.11.2015	6,26	14,70
13.08.2013	1,78	6,63	20.05.2014	2,26	7,00	24.02.2015	4,97	9,14	24.11.2015	6,24	14,51
20.08.2013	1,67	6,56	27.05.2014	2,47	6,86	3.03.2015	4,77	9,03	1.12.2015	6,33	14,54
27.08.2013	1,67	6,08	3.06.2014	2,45	7,21	10.03.2015	4,77	9,30	8.12.2015	6,64	13,84
3.09.2013	1,75	6,39	10.06.2014	2,48	7,45	17.03.2015	5,08	10,05	15.12.2015	5,83	13,88
10.09.2013	1,78	6,31	17.06.2014	2,56	7,91	24.03.2015	5,01	10,62	22.12.2015	6,02	14,38
17.09.2013	1,81	6,39	24.06.2014	3,02	8,02	31.03.2015	5,08	10,97			
24.09.2013	1,78	6,66	1.07.2014	2,77	7,73	7.04.2015	5,64	11,17			

Source: Yahoo Finance, 2016, Processed by the Author